Teacher Identity and Self-efficacy Development in an Alternative Licensure Program for Middle and High School Math and Science Teachers

A dissertation presented to

the faculty of

The Patton College of Education of Ohio University

In partial fulfillment

of the requirements for the degree

Doctor of Philosophy

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May 2015

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This dissertation titled
Teacher Identity and Self-efficacy Development in an Alternative Licensure Program for
Middle and High School Math and Science Teachers

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Abstract

WEST, ROBERT J., Ph.D., May 2015, Curriculum and Instruction, Instructional Technology,

Teacher Identity and Self-efficacy Development in an Alternative Licensure Program for Middle and High School Math and Science Teachers

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This mixed-method case study focused on the phenomenon of the transition from student to teacher. The educational system in the United States is constantly shifting to provide the correct number of teachers for our nation’s schools. There is no simple formula for this process and occasionally an area of need arises that is not being met. Recently, the demand for science and math teachers in the K-12 system has outpaced the supply of new teachers (Business-Higher Education Forum, 2011). To complicate the problem further, teachers are leaving the field in record numbers both through retirement and attrition (National Commission on Teaching and America’s Future, 2007). Particularly hard hit are poor rural schools with low-performing students, such as the schools of Appalachia (Barley, 2009; Goodpaster, Adedokun, & Weaver, 2012). Out of this need, alternative licensure programs for teachers have developed.

The alternative teacher-training program studied in this research is the Woodrow Wilson Teaching Fellowship (WWTF) website, “The Woodrow Wilson Ohio Teaching Fellowship seeks to attract talented, committed individuals with backgrounds in the STEM fields—science, technology, engineering, and mathematics—into teaching in high-need Ohio secondary schools” (para. 2).
The researcher was interested in the formation of teacher identity and self-efficacy as these constructs have been shown to manifest in highly effective teachers that are likely to remain in the field of teaching (Beaucamp & Thomas 2009; Klassen, Tze, Betts, & Gordon, 2010). The research method included in-depth interviews, mixed with pretest/posttest administrations of the Teacher Sense of Efficacy Scale (TSES) (Tschannen-Moran & Woolfolk Hoy 2001) given during the teacher-training period and again following the first year of professional teaching.

Results from both the TSES and the interviews indicate that the participants had a successful transition into teaching. They both felt and demonstrated that they were well prepared for their chosen profession after completion of the WWTF and their first year as a professional teacher.
Dedication

To my mother who taught me the value of education.
Acknowledgments

I would like to express my gratitude to all of the members of my dissertation committee. This significant time of my life would not be possible without their guidance, support and encouragement. I would like to extend my deepest gratitude to my advisor, Dr. Teresa Franklin, whom I have had the pleasure of working with since I became a graduate student. Special thanks to:

Dr. Teresa Franklin, Chair
Dr. Gordon Brooks
Dr. David Moore
Dr. Greg Kessler
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Chapter 1: Introduction

The importance of education and its role in elevating a society is undisputable. Examples throughout history indicate that great nations do not become such without considerable attention to the education of their people (Kosak, 2012). According to Baily and Slaughter (2008), “Over the 20th century one of America’s greatest achievements was creating a world-class education system that drove the skills upgrading of the U.S. labor force” (p. 4). This achievement cannot stand as a one-time achievement. The importance of mass education never wanes. As important as education has been to developing countries, it remains just as significant for developed countries if they are to sustain their level of economic development. “The information age has increased the need for an educated population” (Kosak, 2012, p. 3). A United Nations report (2012) stated that, “Education is the basic building block of every society” (p. 4). Nations currently find themselves in a position of global competition on many levels, from environmental protection to economic success (Schwab, 2012). According to the Global Partnership for Education (2013), “The impact of investment in education is profound: education results in raising income, improving health, promoting gender equality, mitigating climate change, and reducing poverty” (The Value of Education, para. 6). A United Nations initiative (2012) Education First reported, “If all students in low-income countries acquired basic reading skills, 171 million people could be lifted out of poverty, equivalent to a 12% cut in world poverty” (p. 4). According to OECD research (2014), “The single biggest impact on [economic] growth is the widening gap between the lower middle class and poor households compared to the rest of society. Education is the key: a lack of investment in education by the poor is the main factor behind inequality hurting
growth” (para. 2). Government policy is not the only vehicle driving the education gap, according to Boak (2014) even in the worst of the recent recession upper middle class parents invested heavily in their children’s education seeking private schools and tutors. A country’s commitment to education must be more than a promise. Actually making mass education work depends on many factors, beginning with strong commitment from the country’s highest leader to the actual classroom teachers. In the United States, these leadership roles are often inconsistent. The President of the United States, as an educational leader, will change every four or eight years. Often policies that the president puts in place do not survive under the new administration. One of the current examples would be the No Child Left Behind Act of 2001, enacted during the Bush administration. This act of congress that was once mandated is currently being waivered away by the majority of states because in the words of Education Secretary Arne Duncan, "No Child Left Behind is fundamentally broken" (NBC News, 2011).

Although changes in leadership and policies at the upper levels of government occur regularly, leadership roles in the classroom do not. Classroom teachers’ terms of employment have, to date, not been subject to the whims of voters. This exploratory case study will focus on teacher candidates, specifically through the period of teacher training and their transition into fully accredited, licensed teachers.

Teachers play an important role in the educational process. Haberman (1995) stated, “No School can be better than its teachers. And the surest and best way to improve the schooling of the approximately 12 million children and youth in poverty is to get better teachers for them” (p. 77). Ney, Konstantopoulos, and Hedges (2004) reported that teachers have the largest effect on student achievement, more than the effect of the
school. The current study focuses on the Woodrow Wilson Teaching Fellowship (WWTF), a teacher-training program designed to produce high quality teachers. Darling-Hammond (2000) stated that, “teacher preparation and certification are by far the strongest correlates of student achievement in reading and mathematics, both before and after controlling for student poverty and language status” (p. 23). This study examines two important constructs, teacher self-efficacy and teacher identity as they relate to highly successful teaching. Research has indicated that teacher self-efficacy can positively influence the effect of the teacher. Klassen, Tze, Betts, and Gordon (2010) stated, “Teacher efficacy—the confidence teachers hold about their individual and collective capability to influence student learning—is considered one of the key motivation beliefs influencing teachers’ professional behaviors and student learning” (p. 21). Beaucamp and Thomas (2009) pointed out the importance of teacher identity, as it is highly correlated to student achievement and the teachers’ likelihood of remaining in the teaching field. These two constructs represent very important facets of a successful teacher-training program.

**Background of Study**

Educational research is a field of study where the findings are actually capable of advancing the field. What we learn from educational research is often applied to how we teach students and prepare new teachers. The main purposes for educational research include: improving the practice, adding and expanding knowledge, and making a call for change, if necessary (Cresswell, 2009). The four problems examined in this study were:

- America’s growing need for science, technology, engineering and math (STEM) teachers;
• Teacher evaluations (as they relate to teacher quality);
• Teacher retention, specifically in STEM areas;
• Student dropout rate (as it relates to high quality teachers).

These challenges in education today are widely known, both within the field of education and within the interest of the public (and their lawmakers). The growing need for STEM teachers was emphasized in President Obama’s (2011) *State of the Union Address*,

Let’s also remember that after parents, the biggest impact on a child’s success comes from the man or woman at the front of the classroom. In South Korea, teachers are known as “nation builders”. Here in America, it’s time we treated the people who educate our children with the same level of respect. (Applause.) We want to reward good teachers and stop making excuses for bad ones. (Applause.) And over the next 10 years, with so many baby boomers retiring from our classrooms, we want to prepare 100,000 new teachers in the fields of science and technology and engineering and math. (Applause.) (para. 38)

In order to assist with this national imperative to staff schools particularly in poor urban and rural areas the 100Kin10 (http://www.100kin10.org/) organization was formed. According to the website (http://www.100kin10.org/page/subsection_aboutus_1_goal), the simply stated goal of this organization is:

To prepare all students with the high-quality STEM knowledge and skills needed to tackle the most pressing national and global challenges of tomorrow. We aim to meet this goal by responding to our country’s need for 100,000 excellent STEM teachers by 2021. *(100Kin10, 2011, para. 1).*
The deficit of STEM teachers has prompted every state in the United States to develop some sort of alternative route (AR) certification program to attract new teachers (Feistritzer, 2011). These AR programs grew out of need, designed to quickly fill teaching positions, they often use novel recruiting methods and expedite the training process. For example, Teach for America, established in 1990, seeks to recruit U.S. citizens, with a bachelor’s degree and a 2.5 GPA. After a five-week summer institute and passing any necessary state teacher’s license tests, they become a Teach for America Teacher (https://www.teachforamerica.org/why-teach-for-america/training-and-support).

Concerns about teacher quality have arisen making improvements in teacher evaluation. Without adequate teacher evaluations how will we know if the goal of providing excellent teachers has been met? According to many researchers, current teacher evaluation practices are incapable of meaningful measurement (Donaldson, 2009; Darling-Hammond, Amrein-Beardsley, Haertel, & Rothstein, 2012). Research has also shown that to this point, teacher tests, such as the PRAXIS II, do not identify effective teachers (Brown, Brown, & Brown, 2008). Nor is there any correlation between teacher tests and retention. “Generally, state-mandated teacher certification examinations are a means to an end (Greiner, 2006, p. 657). Similarly teachers that achieve National Board of Professional Teaching Standards (NBPTS) certification do not conclusively perform better than teachers that do not. (Goldhaber & Anthony, 2007; Hacke, 2010).

The problem of identifying and retaining high quality teachers in the profession is an important consideration. The simple concept of quickly producing more teachers will not solve the problem as long as teachers leave the field at the current rates, which according to Graziano (2005) are 30% after three years and 45% after 5 years of teaching.
Increasing the number of quality teachers that remain in teaching could have an impact on students remaining in school. High dropout rates continue to be a problem, particularly among minority populations; Bridgeland, Diluio, and Morison, (2006) reported, “Each year, almost one third of all public high school students – and nearly half of all black, Hispanic and Native Americans – fail to graduate from public high school with their class” (para. 1). Although improving slowly, low graduation rate continues to be a problem. The national graduation rate increased to 78.2 percent in 2009 - 2010, up from 73.4 percent in 2005 - 2006. The recently published national high school graduation rate for 2008 - 2009 is 78.2 percent (United States Department of Education, 2013 http://www.ed.gov/blog/2013/01/high-school-graduation-rate-at-highest-level-in-three-decades/).

Dropout rate statistics do not imply that all of the students that did not dropout actually achieved full graduation as another category exists, “Students are considered ‘completers’ if they are either awarded a high school diploma or other alternate credentials such as a certificate of completion or an equivalency credential” (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2013, p. 1).

High quality teachers were the most commonly reported factor (reported by 81% of dropouts surveyed) that could have prevented students from dropping out of school (Bridgeland et al., 2006). Although there is some disagreement in what constitutes a high quality teacher, Darling-Hammond (2000) reported, “Among variables assessing teacher ‘quality’, the percentage of teachers with full certification and a major in the field is a
more powerful predictor of student achievement than teachers' education levels (e.g., master's degrees)” (p. 32). This variable is one of the primary goals of the WWTF.

**The need for teachers in STEM areas.** Interestingly, the case to be studied, the Woodrow Wilson Teaching Fellowship, is actually a product of educational research findings in action. The Woodrow Wilson Teaching Fellowship (http://www.wwteachingfellowship.org/program/impact.php) is committed to increasing both the quantity and quality of STEM teachers. The problem of filling teaching vacancies has shown to be particularly present within certain fields, such as the STEM areas. One possible explanation for the high departure rate of STEM teachers is the assumption of increased opportunities in fields other than teaching (Kukla-Acevedo, 2009, p. 444). Math and science were reported as shortage areas in 47 states (U.S. Department of Education, 2009).

Geographic areas can also make it difficult to hire and retain high quality teachers. Monk (2007) stated, “Rural schools have lower than average numbers of highly trained teachers and face the greatest hiring and retention challenges” (p. 159). The Woodrow Wilson Fellowship is designed to transition graduates with a major in a STEM field into middle or high school teachers with full licensure and a master’s degree in Education. The Woodrow Wilson teachers in this study, after graduation, will seek teaching positions in rural Appalachian schools.

**Teacher retention in STEM areas.** One major concern is the fear that we are not only losing teachers at an accelerated rate but also that we are losing our best teachers. Teachers often leave the profession so early that their potential ability remains unknown. As Graziano (2005) stated,
Every year, U.S. schools hire more than 200,000 new teachers for that first day of class. By the time summer rolls around, at least 22,000 have quit. Even those who make it beyond the trying first year aren’t likely to stay long: about 30 percent of new teachers flee the profession after just three years, and more than 45 percent leave after five. (para. 6)

The problem of teacher retention is particularly severe in STEM areas (Ingersol, Merrill & May, 2012). Teacher attrition rates vary by subject taught. STEM areas have been shown to have higher turnover rates than other subjects. Data from the U.S. Department of Education 2004-2005 Teacher Follow-up Survey indicates the percentage of teachers leaving the field in Math (14.5%) and Science (18.2%) exceeded the number of all other subjects (12.3%). While examining the teacher attrition problem, Ingersol, et al., (2012) stated: “Our findings are striking: The preservice education and preparation of new mathematics and science teachers are strongly related to their retention—but it depends on which aspects of preparation we look at” (p. 31). One aspect that was most different was educational training where Ingersol et al. (2012) found, “Sixty-eight percent of new science teachers and 42 percent of new mathematics teachers had a noneducation academic degree, compared with 29 percent of all other new teachers” (p. 32).

Pedagogical preparation was also quite different. According to Ingersol et al. (2012), beginning science teachers—and to a lesser extent, mathematics teachers—tended to have undertaken less pedagogical preparation than other teachers. Strikingly, more than 40 percent of new science teachers had no practice teaching at all, compared with 21 percent of other teachers. (p. 32)
**Why teachers leave.** Stress and burnout are causes for many employees to change professions. Of interest to this study is how and when these conditions occur for teachers. Fives, Hamman, and Olivarez (2007) have suggested that burnout, for teachers, may manifest during student teaching, which means before these teachers have even entered the profession. It is important to study teacher preparation programs and methods to understand this phenomenon.

The sheer number of traditional teacher education programs seems to suggest that a traditional route to teacher certification is superior, but actually little difference in student achievement or teacher retention has been established between alternative and traditional routes to teacher certification (Blazer, 2012). What did make the greatest difference according to Ingersol et al., (2012) was the amount of comprehensive pedagogy the teacher candidates received, “Those receiving little or no pedagogy were more than twice as likely to leave after one year as those who received a comprehensive pedagogy package” (p. 33). As well as the problem of losing new teachers, the U.S. is beginning to experience a teacher shortage due to retirements and attrition, while the school age population continues to increase (Cortez, 2001). According to Hutchinson (2012)

The reality regarding entrance into the teaching field is that teachers are needed because the national public school enrollment will exceed 54 million over the next several years. In addition, urban and rural school districts will need approximately one million teachers over the same time span. (p. 542)

This problem has grown significantly in recent years. In a study for the National Commission on Teaching and America’s Future (NCTAF) Carroll and Foster (2010)
stated, “First-year teacher attrition has been steadily increasing since 1994 and after five years, over 30% of our beginning teachers have left the profession” (p. 4). While the U.S. is experiencing losses of new teachers, there has also been an increase in teacher retirements in recent years. This increase is two-fold. One factor is the aging population as Aaronson and Meckel, 2008 reported, “The percentage of teachers over the age of 50 has increased from 18% in 1980 to 31% in 2000” (para. 1). This creates the eligibility to retire, which has not always contributed to mass exodus; eligible teachers’ plans to retire are largely based on the economy (Darden, 2009, p. 2). This constitutes the second factor: whether the current climate of economy and education will encourage teachers to leave as soon as they are able. As Carroll and Foster (2010) noted, “In addition to hemorrhaging teaching talent at the beginning of the career, we are about to lose accomplished teaching talent at the veteran end of the career on an unprecedented scale” (p. 4). Recently, this trend has accelerated. Efforts to cut state budgets by eliminating collective bargaining and other benefits gained by teachers have encouraged even more teachers to retire. Attacks on collective bargaining as championed by Wisconsin Governor, Scott Walker, are largely credited for record retirements in Wisconsin. According to Bauer (2011),

In the first six months of 2011, overall public employee retirements were double that in all of either 2009 or 2010, according to data provided to the AP by the Wisconsin Retirement System. That includes 4,935 Wisconsin school district employees who started receiving retirement benefits, up from 2,527 teacher retirements in all of 2010 and 2,417 in 2009. (p. 7)

Legislation designed to eliminate job security and tenure passed by New Jersey Governor, Chris Christie, has had a similar effect on teacher retirements in New Jersey.
According to Schachter (2010), “All of the success New Jersey Gov. Chris Christie has had implementing his agenda of fiscal restraint and spending cuts has had an unintended consequence; more New Jersey teachers are retiring this year than in previous years” (para. 1).

**Retaining mid-career teachers.** Added to the high departure rates of new teachers and the increased rate of retirements, we are now facing an exodus of a newly defined group of leavers. Santoro (2011) has defined “principled leavers” (p. 2671) as teachers of any experience level that leave teaching believing that they are being asked to perform tasks they find to be detrimental to good teaching practice and student learning. One of the main tasks that teachers find objectionable is the dramatic increase in standardized testing that seems to accompany new initiatives such as Common Core. Walker, (2014) reported that according to a recent NEA (National Education Association) survey, “Despite the high level of overall [job] satisfaction, nearly half (45 percent) of surveyed member teachers have considered quitting because of standardized testing” (para. 10). While Common Core has advantages and the support of many teachers the testing requirements are objectionable to many teachers as Lyons (2014) reported, The large majority of U.S. public school teachers, 76%, react positively to the primary goal of the Common Core -- to have all states use the same set of academic standards for reading, writing and math in grades K-12. However, this positivity fades when the topic turns to using computerized tests to measure student performance (27%) and linking those test scores to teacher evaluations (9%). (para. 1)
Two of the reasons that cause teachers to consider leaving the field of teaching combine on the Common Core movement, high stakes testing and lack of support. As Brown (2014) stated,

Teachers' high levels of agreement with the possible negative reactions to Common Core tested in the survey may partially reflect the lack of support many teachers feel they are getting from their state or school district. More teachers working in states where Common Core has been adopted say they have not received sufficient support (47%) than say they have (31%). (para. 6)

Teachers often resent being asked to teach something differently without training or ongoing support. Teacher training is expensive, unlike the Finnish education system where at least one afternoon / week is set aside for professional development (Darling-Hammond, 2010), U.S. teachers rarely have any significant professional development time built into their regular teaching schedule. Additional training for new programs, such as Common Core, usually requires paying teachers for additional time (evenings, weekends, or vacations) or paying substitute teachers to teach their classes while training is conducted during the school day.

Statement of Problem

The common assumption is that quality teachers are essential to a successful educational system. Teachers are at the center of all of these problems and the one thing that most educational researchers and the public can agree upon is the need to have the best possible teachers in our public schools; yet as Carey (2009) suggests,

Almost nobody, it seems, disputes the importance of effective teachers - including teachers themselves. Sadly, however, we actually do none of the things you do
when you value something as highly as most people say they value good teachers. We don't recruit them aggressively. We don't celebrate their accomplishments or compensate them in accordance with their value. We don't support their further development. And we don't create vehicles for them to share their expertise. Even more alarming, we don't even put into place the simple systems that could reliably identify which of our teachers really are terrific at moving students from wherever they are academically to higher levels of achievement, and which teachers still need help to attain that level of effectiveness. (para. 1)

These shortcomings are obvious, yet their solutions are not easily obtainable. Economists and policy makers remain unconvinced that increasing teacher compensation would make a difference in student outcomes. The concept of supporting, mentoring or creating learning communities that support teachers needs to be researched further to prove its worth. Teacher evaluation methods have thus far fallen short of the desired potential (Almay, 2011; Darling-Hammond et al., 2000; Donaldson, 2009). The question of what makes a teacher great is not a new question.

First indications that a teachers’ attitude about themselves, (professional self-identity) and their perception of their ability to teach (self-efficacy) could have a positive influence on student achievement were noted in the 1970’s in Bandura's (1977) Social Learning Theory. Yet many years later, when describing the need for more study on this topic, Henson (2002), still described teacher self-efficacy research as being, “ready to move beyond adolescent angst” (p. 148). “A teacher's sense of efficacy is emerging as an important variable in research on teaching and deserves the continued attention of investigators in this area of inquiry” (Coladarci, 2012, p. 326).
Purpose of the Study

This study will focus on the Woodrow Wilson Teaching Fellowship (WWTF) at a Midwestern university. This program was selected for many reasons. This alternative teacher-training program is in many ways is a real world application of current educational research. The goals of the WWTF align with the educational problems identified above. According to the WWTF website (2013) (http://www.wwteachingfellowship.org), “The Woodrow Wilson Teaching Fellowship seeks to attract talented, committed individuals with backgrounds in the STEM fields—science, technology, engineering, and mathematics—into teaching in high-need secondary schools in Indiana, Michigan, and Ohio” (WWTF, 2015, home page). One goal of the WWTF is that the fellows, once they have completed the program, will remain in the teaching field. One of the requirements of the WWTF is that the fellows teach in areas of high need (in this case Appalachian schools) for at least 4 years (WWTF website Commitment section). If the WWTF program manages to retain all of the participants for all 4 years of their commitment, this result would be considerably better than the national average.

Framework of Study

The approach to study this population will be a mixed method. The framework of this study will be the descriptive case study approach. There are several instruments that have proven successful in measuring teacher self-efficacy such as the Teacher Efficacy Scale (Gibson & Denbo, 1984), the Teacher Self-efficacy Scale (Bandura, 1977), the Teaching confidence Scale (Hoy, 2000), and The Ohio State Teacher’s Sense of Efficacy
Scale (Tschannen-Moran & Hoy, 2001). These instruments can provide quantitative data that reflects the participants’ self-report of their perceived level of self-efficacy.

Qualitative research methods can help answer the question of what aspect of teacher training do teacher candidates feel helped improve their self-efficacy. These types of how and why questions can be best answered by qualitative approaches (Yin, 2003). Previous researchers in this area (Hoy & Spero, 2005; Tschannen-Moran & Hoy, 2001) have had success measuring teacher self-efficacy using survey instruments. Comparing these measurements to the data from open-ended interviews, data collection and observations can give a more complete picture. Creswell (2009) stated, “Concurrent mixed methods procedures are those in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem” (p. 14).

A high level of teacher self-efficacy seems to be one of the best teacher traits that a teacher-training program could hope to develop in new teacher candidates. Research has shown that high levels of this trait are better, for the teachers themselves, for their students and for the entire school environment (Bandura, 1997; Klassen et al., 2010; Tschannen-Moran & Woolfolk Hoy, 2001). The research seems to indicate that we have a fairly good understanding of what teacher self-efficacy is and the advantages that it affords teachers and their students. A gap in knowledge seems to exist in the fact that we don’t know how to facilitate the development of this important trait in teacher candidates.
Research Questions

It appears that all teacher candidates project some amount of self-efficacy but not
to the same degree despite similar teacher training. The research questions to be
examined in this study are:

1. What practices involved in teacher training do these new teachers feel most
   contributed toward their professional self-identity and their feelings of self-
efficacy?

2. What types of support do these new teachers feel is or would be most helpful to
   them in their first years of teaching?

3. How do teacher efficacy scores taken during the WWTF program compare to
   scores recorded after the first year of solo teaching in their job placement?

Since there are no preconceived ideas of what part of teacher training is most
responsible for the development of teacher self-identity and self-efficacy, emergent
design will allow the researcher to pursue patterns that may develop during interviews or
data collection.

Significance of Study

Colleges and Universities are currently under pressure to produce more high
quality teachers, especially in STEM areas, than in the past. This pressure has increased
the need for alternative licensure programs such as WWTF. According to an article in
Education Week (2012), “Alternative routes into the teaching profession are becoming
more and more attractive to policymakers and teacher-educators as strategies for
recruiting potential teachers and tackling teacher shortages” (para. 10). These programs
because of their increased flexibility are receptive to results oriented findings. These
programs are also under pressure to produce teachers that can perform at least as well as graduates from traditional programs. A report by Fowler (2003) suggested that teachers from alternative route programs might lack long-term commitment and reduce the value of such programs.

If the research is correct, teachers with a high sense of self-efficacy will be more likely to stay in the profession, they will have a greater positive affect on students (both in achievement and graduation rates), and the motivation to work with reformers in areas like teacher evaluation. According to Ashton (1984), “Teachers with a high sense of efficacy feel a personal accomplishment, have high expectations for students, feel responsibility for student learning, have strategies for achieving objectives, a positive attitude about teaching and believe they can influence student learning” (p. 29).

If this study can suggest practices that are more likely to lead teacher candidates down the path towards a high sense of self-efficacy, everyone involved will benefit. Hopefully shedding the label ‘industry of mediocrity’ (Elliott, 2013). Teacher preparation programs may find ways to be more successful producing teachers that are highly capable of dealing with challenges, more capable of improving student performance and graduation rates and be more likely to remain in the teaching profession.

The Case to be Studied

This case study focuses on the 12 participants of the first Woodrow Wilson Teaching Fellowship specifically designated to serve high need schools in Appalachia. The decision to study this case was based on this unique aspect as well as the following reasons that are common to all other WWTF programs:

1. The program is an alternative route (AR) licensure program.
2. One of the conditions of acceptance for the fellows is that they already have a bachelor’s degree in a STEM field.

3. All of the fellows are seeking both a teaching license and a Master’s Degree in Teacher Education.

Alternative route programs to teacher certification are by their very nature abbreviated (Blazer, 2012). Data collected during the training phase, though plentiful, represents a relatively short period of time, a summer program followed by 2 Semesters. This case will examine the teacher-training program and only the first year of actual teaching. Although the number of participants is low, the opportunity exists to collect both quantitative and qualitative data from a variety of sources providing multiple levels of analysis as suggested by Yin (1984). Because this study examines the transition of the participants from students into teachers, it is also necessary that the case to be studied transitions as well. During the first phase of the program the participants are in the role of student, as they spent the first summer sessions attending classes on campus in a mostly traditional setting. During the second phase the participants not only took classes but were also afforded the opportunity to work with a mentor teacher in a local school two days per week during the first semester then every day during the second semester. During this phase, they transitioned into more of a student practitioner as they filled their fellowship roles. Finally in the third phase, the participants left the university, entered into the workforce as first-year teachers fully employed by a school district. This makes for a complex single-case study but as the case is bound by the single phenomenon of transition from student to teacher in a common group of participants it seems appropriate.
Definition of Terms

*Alternative route teacher preparation programs* are a wide array of programs that are alternative to the tradition 4-year programs offered at traditional colleges and universities. The most common element of these programs is a faster completion rate. According to Wilson (2011) “Alternative routes have been touted as ways to increase the diversity in the teaching ranks, minimize barriers that keep the best and the brightest from entering the profession, and provide professional training that is more relevant than the training offered by universities” (p. 66).

*Collective efficacy* is the general feeling within a group of people that together they have the ability to control their environment to achieve a common goal (Goodard, Hoy & Hoy, 2000).

*Pedagogical preparation* is commonly associated with traditional teacher preparation and deals with instructional theory.

*Principled leavers* (Santoro 2011) is a term used to describe a trending group of teachers leaving the field of teaching that are not in the typical groups of new teachers or retiring teachers, but rather are in mid-career. Their reasons for leaving surround policy and ethics.

*Programme for International Student Assessment (PISA)* is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students (http://www.oecd.org/pisa/aboutpisa/). A project of The Organisation for Economic Co-operation and Development (OECD) (http://www.oecd.org/) often cited in reports of our nations educational status internationally.
Preservice teachers is sometimes used interchangeably with teacher candidates or teaching fellows indicate that a school has not hired these individuals. Any teaching duties they may perform, at this point, are generally a field experience related to their teacher training.

Self-efficacy according to Bandura (1977) is the individual’s perception of their ability to evoke change. As a measurable trait, it is common that individuals that score highly in self-efficacy are more likely to believe that they can achieve success.

Self-identity evolved from the organization of personality studies of Carl Rogers (1947). It is a necessary step in the development of an individual’s personality and was the basis for teacher and other professional identities to be studied.

Standardized test has come to mean much more than just a test given in the same manner to many groups of students, interest has shifted toward using these tests’ scores to evaluate the effectiveness of teachers and schools (Maltese & Hochbein, 2012).

STEM is an acronym for science, technology, engineering and math, which can be applied to students, instructors, programs or occupations.

Student dropout rate refers to students; generally in high schools that choose to leave rather than graduate.

Teacher efficacy is a specific type of professional self-efficacy. Bandura (1977) examined the self-perceived ability of teachers to impact student learning.

Teacher evaluation is a topic of much discussion as these move beyond the simple checklists used by principals in the past to what Donaldson (2009) describes as tools to improve instruction and enable principals to identify the most and least effective teachers.
Teacher identity is a specific type of professional identity. Often used as a methodological lens to study teacher development (Olsen, 2008).

Teacher migration describes the movement of teachers from one school to another, often inspired by better working conditions including better environment, more motivated students and higher pay.

Teacher retention is the function of the administration and school environment to keep teachers employed at the school once they have been successfully recruited and hired.
Chapter 2: Literature Review

The field of educational research, because it is social research, continually walks a fine line between different elements of society. Many elements of society, government, military, business and industry, including the business of education, and all of their interest groups, feel the need to influence education. As Denscombe (2003) pointed out social research spans a wide range of areas and contains wide disagreement amongst the experts in the field. The challenge of this review of the literature is to remain focused on research, evaluate the sources through a lens that evaluates adherence to good research around teacher preparation. Denscombe (2003) listed ground rules for good research, the first of which is purpose. The purpose of this literature review is to attempt to identify ways to produce high quality STEM teachers that are able to remain in the field of K-12 education and positively influence the learning of their students. This review of the literature will take a somewhat chronological path beginning with early identification of the problems with education that have led to the declaration of our STEM crisis in education and working through some of the early attempts at resolving these problems. This approach will illustrate several key points:

1. The problems selected for study have been identified for a significant period of time;
2. Solutions to these problems thus far have failed to impact the problem in a satisfactory manner;
3. Many research-based recommendations for change have simply not been implemented.
Although the main focus of this study is teacher preparation in the United States, one of the major concerns is that the U.S. may not be keeping up on a global level; therefore, some comparisons will need to be made between the U.S. and other countries.

**The Economics of Education**

There is a historical link between education and the economic needs of the United States (Tyack, 1974). Businesses and industry have always looked toward education to provide the skilled workers they need, when they need them. For the purpose of this study, the joining point in this historical relationship might best begin when the *National Commission on Math and Science Teaching for the 21st Century* (2000) released their report to the nation titled *Before it’s Too Late*. This report highlighted three specific problems:

First, at the daybreak of this new century and millennium, the Commission is convinced that the future well-being of our nation and people depends not just on how well we educate our children generally, but on how well we educate them in mathematics and science specifically.

Second, it is abundantly clear from the evidence already at hand that we are not doing the job that we should do—or can do—in teaching our children to understand and use ideas from these fields. Our children are falling behind; they are simply not “world-class learners” when it comes to mathematics and science.

Third, after an extensive, in-depth review of what is happening in our classrooms, the Commission has concluded that the most powerful instrument for change, and therefore the place to begin, lies at the very core of education—with teaching itself. (pp. 4-5)
The *Commission on Math and Science Teaching for the 21st Century* (2000) listed three goals were in *Before it’s Too Late*.

Goal 1: Establish an ongoing system to improve the quality of mathematics and science teaching in grades K–12 (p. 8).

Goal 2: Increase significantly the number of mathematics and science teachers and improve the quality of their preparation (p. 9).

Goal 3: Improve the working environment and make the teaching profession more attractive for K–12 mathematics and science teachers (p. 9).

Today, 14 years later, it would be easy to make the case that these problems, despite the adequate proof, sense of urgency, and solid recommendations provided in this report, have not been resolved.

Other studies further illustrated the growing problems of teacher quality and student achievement followed closely by administrative quality. High quality school principals have been shown to positively affect the school environment and teacher retention (Grossman, 2011a; Watkins, 2005) and need to be included in school improvement plans (Monk, 2008). Ingersol (2000) reported problems in teacher turnover in math and science, making a distinction between migration (transferring to another teaching position) and attrition (leaving the field altogether) (p. 3). Hanushek, Kain and Rivkin (1998) described factors strongly correlated to teachers’ ability to improve student learning and concluded with the dilemma policy makers face in attempting to improve school quality (p. 35). Generally accepted at this time was the assumption that U. S. students were struggling to compete globally and that there was a growing need for more high quality teachers.
Early attempts to solve these problems left the education community with dismal returns. This is not to say that the ideas were entirely flawed but that these attempts should be investigated as case studies, so their mistakes can be corrected.

One early attempt that caught national attention was the Massachusetts Signing Bonus Program for New Teachers (MSBP), a radical, highly funded and rapid response to a rather embarrassing incident in Massachusetts’s educational history. In 1998, in an attempt to improve teacher quality a newly implemented teacher licensure test was administered. The failure rate was 59% as stated in the article “The Flunk Heard Round the World” (Cochran-Smith & Dudley-Manning, 2001). Launched in 1999 with much fanfare MSBP seems to have been conceived upon theories based on assumptions rather than upon sound educational research. The MSBP was so highly, and publicly, touted that the story can practically be told by headlines and article titles beginning with:

“Massachusetts Puts Money Where Math Is: Woos Teachers with Big Signing Bonuses” (Billups, 1999), “Bay State Teacher Recruiting Cheered as Model for the Nation” (Hayward, 2000), “Teacher Bonuses Pay Off in Massachusetts” (School Board News, 2001). Apparently, the incentive alone did not seem to meet the need fast enough as the project included a sub project, named the Massachusetts Institute for New Teachers (MINT) designed by the “New Teacher Project, an offshoot of Teach for America” in order to prepare individuals to become teachers in just seven weeks (Fowler, 2008, p. 381).

It did not take long for MSBP and MINT to fall short of their lofty goals and expectations. According to Fowler (2008) in “April 2002, officials announced that nearly 400 individuals were accepted into MINT: 50 were bonus recipients, and the rest were
eligible for a MINT scholarship. Many of the non-bonus recipients, however, did not attend, and 55% of those who were conditionally accepted failed to pass the state’s licensure tests” (p. 382). Fowler (2008) stated, “The $20,000 bonus did not turn out to be as powerful an inducement as many expected. It was the chance to get into the classroom quickly, not the bonus that attracted individuals to this effort” (p. 382). The recruitment expected didn’t materialize. Many participants recruited were already considering teaching and as for nationwide recruitment expectations Fowler (2003) noted,

Even though the state spent more than $50,000 recruiting individuals from states outside the Northeast over the first four program years, it garnered just seven bonus recipients from the non-Northeast states its recruiters visited, only four of whom were still teaching in Fall 2002. (p. 2)

Not only did recruitment fall short, but the noble idea of placing these new high quality teachers in high need schools also missed the mark. Fowler (2008) stated,

Placement was also a problem. Although officials had stated that bonus recipients would teach in 13 high need school districts, most did not. Fewer than half (45%) of all bonus teachers were initially placed in state designated high-need areas.

This problem worsened with time: only 36% of the fourth and final cohort taught in high-need districts; the other 64% did not. (p. 383)

Fowler (2008) mentioned another failure, “Retention was an even bigger problem. Over the five years from fall 1999 through fall 2004, 15% of the bonus teachers stopped teaching after one year, 31% after two years, and 44% after three years” (p. 383). By the end of the program MSBP had lost more teachers from urban districts (55%) using alternative teacher training than other school districts with mostly traditionally trained
teachers, such as New York (33%) during the same time period (Boyd, Lankford, Loeb, & Wyckoff, 2002, p. 20).

Another way to look at the errors of MSBP is to compare the assumptions made to educational research findings. The assumption that a $20,000 signing bonus will attract quality teachers could be loosely based on research that links salaries to teacher retention, but as Hanushek, Kain, and Rivkin (2001) pointed out many of these earlier studies did not account for variables such as working environment, administrative support, and other characteristics of schools that pay adequately. In their study, they found evidence that it would not be possible to increase salaries to reduce teacher attrition. Instead they suggested, “An alternative to raising salaries is the abatement of the disadvantage associated with particular types of students” (p. 20). Salary alone has not been shown to be a large factor for teachers leaving the field, generally, it is included in a list of other problems as indicated by Ingersol (2000), “schools with low salaries, student discipline problems, and little faculty input into school decision making tend to lose teachers to schools without these problems” (p. 9).

The assumption was made that pedagogy is unnecessary and can be skipped over, in order to produce teachers faster. Alan Safran, director of the MINT program, stated “Content is king for us. We say the most important thing in teaching is know your subject matter” (Billups, 1999). Ingersol, Merrill, and May (2000) however, found the opposite to be true while studying shortages of math and science teachers, they reported, “Most striking, that teachers who receive more pedagogical training are far more likely to stay in teaching after their first year” (p. 34). Wilson, Floden, and Ferrini-Mundy (2001) found pedagogy to play an important role in teacher retention both in traditional and
alternative route teacher preparation programs. The MSBP unintentionally highlighted the problems of recruiting and retaining high quality teachers.

Research continued to drive these points that U.S. students are falling behind and teacher quality needs to improve. Baily and Slaughter (2008) reported, America’s economic strength and competitiveness has come into question. They highlighted educational shortcomings such as a 2004 high school graduation rate of 74.9% (lower than the 1969 rate of 77.1%) and by reporting a near-stagnation in college attendance rates for males and a complete stagnation rate for college graduation rates for the same group (p. 15). Kuenzi (2008) in a report prepared for members of Congress stated, “There is growing concern that the United States is not preparing a sufficient number of students, teachers, and practitioners in the areas of science, technology, engineering, and mathematics (STEM). A large majority of secondary school students fail to reach proficiency in math and science, and many are taught by teachers lacking adequate subject matter knowledge” (para. 1). These are the same problems as stated in Before it’s Too Late (2000). At least one segment of the education community was beginning to rally together and inspire the country to take action. This segment, referred to as STEM, became the spearhead for reform in teaching math, science and the proper use of technology in the public school system.

STEM

As the economy honed in on the severity of these gaps in education, a pattern was observed. The relationship between industry and education was showing signs of dysfunction as shortages of students and workers in specific areas were noticed. These areas were in the areas of special education (Smith, Young, Montrose, Tyler, & Robb,
2011) and the STEM areas. According to the Leonard Gelfand Center for Service Learning and Outreach at Carnegie Mellon University and The Intermediate Unit 1 Center for STEM Education (2008), “STEM is an acronym for Science, Technology, Engineering and Mathematics”, originally used by the Education-related programs of the National Science Foundation (NSF), but not explicitly defined by NSF” (p. 3). Thus, the concept of (and the acronym) STEM was created out of a perceived need to better prepare our students for a future, dependent upon these areas of study. The need for STEM education applies to all students. A two-year initiative by the Carnegie Corporation of New York-Institute for Advanced Study Commission on Mathematics and Science Education (2011) argued that, “schools and school systems must change fundamentally: STEM learning must become exciting, accessible, and challenging for all students, not just those who attend certain schools or who aspire to work in STEM-related jobs or earn advanced STEM degrees” (p. 3).

**STEM in K-12.** Although STEM covers all four areas of study, science, technology, engineering and math, for the purpose of this study much of the focus will be narrowed to the two teaching areas of math and science. The prospective teachers in this case study will become licensed to teach either math or science. The State of Ohio offers Adolescence to Young Adult (AYA) teaching licenses for grades 7 through 12 (Ohio Higher Education, 2012). According to Woodrow Wilson Teaching Fellowships (2013), an AYA Ohio teaching license in science, math or technology as well as a Master’s Degree in Education will be the objectives of the participants of the Woodrow Wilson Teaching Fellowship (WWTF) (para. 3).
Although Ohio has developed academic content standards for technology, (Academic Content Standards, 2003) and a licensure/endorsement area for teaching technology, this is not a commonly offered teaching position in rural Appalachian schools. A web search of the Job Board on the Ohio Department of Education website (2013, April) listed 428 teaching positions, of those only two suggested a technology endorsement. One was for technology/business instructor and the other was a technology coordinator position. Although a few grade 7-12 technology programs exist in Ohio, most of the technology and engineering aspects of STEM are taught in post K-12 institutions.

This traditional approach is partially based on the cumulative nature of STEM subjects. According to President’s Council of Advisors on Science and Technology (2010), “STEM subjects tend to be cumulative and sequential” (p. 18). If science and math are not well taught in the K-12 realm, students will have considerable difficulty in post-secondary pursuits due to this cumulative and sequential nature. Not all STEM advocates agree with this traditional approach of K-12 education focusing on just math and Science. Hanover Research (2011) stated, “Proponents of STEM education advocate increasing the visibility of technology and engineering in the standard K-12 curriculum. Contrary to popular belief, technology education includes more than just incorporating computer literacy into the curriculum” (p. 7).

The global importance of STEM. The President’s words and actions, the vast number of business-education, and foundation-education partnerships demonstrate the importance of STEM to our country. In Ohio, the Ohio STEM Learning Network (OSLN) was formed in 2008. This network is a business and education partnership between the Ohio Business Roundtable, Batelle, and the Bill and Melinda Gates
“Battelle partnered with The Ohio State University and KnowledgeWorks to open Ohio's first STEM School – Metro Early College High School in Columbus, a bold and imaginative design that set the standard for STEM programs, both in Ohio and across the country” (Ohio Stem Learning Network, 2013, About OSLN). The challenge to improve public education often comes from business partnerships, the website for the Bill and Melinda Gates Foundation (2013) stated, “For generations, education has been the springboard to opportunity in America. But today, other countries are catching up with and even outpacing us. The times have changed—our schools need to change with them” (para. 2). The WWTF is another example of a partnership between education, businesses and nonprofit organizations. According to the WWTF website (2013),

The Teaching Fellowship is administered by the Woodrow Wilson National Fellowship Foundation and is funded with the support of the State of Ohio through the Office of the Board of Regents of Higher Education. Additional support comes from the George Gund Foundation, Cleveland Foundation, Martha Holden Jennings Foundation, GAR Foundation, The Battelle Fund at the Columbus Foundation, and Battelle Memorial Institute. Leadership from the Governor's office is also a key part of the program. (para. 2)

Reports and studies conducted by the President’s Council of Advisors on Science and Technology, and most STEM partnerships have very similar warnings and findings. For example, the failure of U.S. students to compete academically on a global level and the need to increase interest in STEM are so related that it is difficult to find studies or reports where these two elements are not reported together (Hanover Research, 2009;
Kuenzi, 2008; Presidents Council, 2010; Business-Higher Education Forum 2012; Hannover Research 2011). The general consensus of these reports is that U.S. students are falling behind students from other developed nations. Much of the research in STEM has been combined efforts of business and educational organizations such as the Business-Higher Education Forum (BHEF). In a BHEF policy brief (2011) the need for STEM was summarized:

Innovations in science and engineering have driven economic growth in the United States over the last five decades. More recently, technology has risen to become a defining driver of productivity in business and industry. In that context, college graduates in science, technology, engineering, and mathematics (STEM) disciplines provide critical talent that fuels America’s competitive ability. Unfortunately, the United States is not producing enough STEM specialists, STEM teachers, or STEM-literate citizens to sufficiently drive innovation, spur economic growth, and produce engaged, informed leaders and citizens. (p. 1)

The focus of the BHEF is based on our nation’s shortcomings and how these shortcomings need to be overcome in order for the U.S. to remain globally competitive. Measuring global competitiveness is not an easy undertaking, as the BHEF study illustrates. Some indicators are very easily collected and interpreted such as the number of STEM degrees earned by American students. BHEF (2011) indicated that although numbers of STEM graduates has increased slightly in the U.S. over the past five years, demand continues to outpace supply and many STEM positions are being filled by foreign nationals (p. 1). Other indicators are more difficult to measure. Ironically, while business and industry require workers that can solve the problems of the future the most
A common measure of student ability is standardized tests, which measure students’ ability to demonstrate knowledge, which is already known. Internationally, students are tested and compared using such tests, and scores are presented in reports such as the BHEF policy brief (2011), which reported,

American high school students rank alarmingly low among students of industrialized countries when it comes to achievement in science and mathematics. The poor performance of American students in the vital fields of science, technology, engineering, and mathematics (the STEM fields) is a fact borne out in test scores and other assessments of academic achievement. (p. 5)

The need for improvement in STEM education is clear. President Obama has set a goal of preparing 100,000 STEM teachers in our schools in the next 10 years (100Kin10). Information about this movement is available on the web site: http://www.100kin10.org/

According to the U.S. Office of Science and Technology Policy (2013), “The President’s Council of Advisors on Science and Technology concluded that the best STEM teachers are those who have both depth of knowledge in the field they are teaching and pedagogical training and experience” (para. 2). This conclusion represents the goal of both the Woodrow Wilson Teaching Fellowship (the case chosen for this study) and the large Midwestern university college of education.

The importance of education to our economy is a theme that will resurface in many of the other areas of this literature review. In the next section, teacher turnover rate will be examined; this has an economic element due to the relationship between education and the economy. The economy of a nation also has a direct effect on the children and the parents that will make up the environment of the school. If it is our goal
to level the playing field on such measures as the “PISA (Program for International Student Assessments) an international test for 15-year-olds in language, math, and science literacy” (Darling-Hammond, 2010, para. 4) we can’t ignore the economic differences between countries and how education and child welfare are funded.

According to Sahlberg (2012)

Early childhood care, voluntary free preschool that is attended by some 98 percent of the age cohort, comprehensive health services, and preventive measures to identify possible learning and development difficulties before children start schooling are accessible to all in Finland. Finnish schools also provide all pupils with free and healthy lunch every day regardless of their home socioeconomic situation. Child poverty is at a very low level, less than 4 percent of the child population (compared with over 20 percent in the United States). (p. 24)

Student dropout rate will also be discussed later, again as an economic tie exists.

Basically, any problem that is a detriment to education, especially true of STEM subjects, also has a negative effect on the economy (Baily 2008; Kuenzi, 2008).

**The naysayers.** One of the changes recently in the literature of STEM is the growing tide of articles with the word *myth* in the titles. Although at first glance, these myth claims appear to be contradictory to the importance of this study, it is important to examine the claims. In a single word *inconsistency* sums the problems of these conflicting viewpoints. The main difference between the message of these articles and the focus of the current study is that the STEM crisis myth articles tend to focus on the overall economy and generally the only mention of education is higher education where funding is a key motivation. For the most part, K-12 education is not mentioned which is
a key element of this study. Actually the point can be made that these myth of stem shortage articles make a very good case for the STEM K-12 education needs (Hutchison, 2012; National Council on Teacher Quality, 2009) pointed out in the current study.

One of the major critics of current STEM initiatives is Anft (2013). He explained that the common thinking (that he aims to change) is that the U.S. needs to produce many more STEM graduates than we are currently, before our economy is overrun by lower paid foreign workers. Anft (2013) claims this message is the battle cry of higher education trying to lobby for increased funding and business and industry motivated by the need to produce home grown low paid STEM workers. He bases his claims upon labor statistics and salary scales that seem to indicate that STEM workers are not in high demand and not over paid. This reveals the first inconsistency: What defines a STEM worker? This basic question has widely varying answers.

In 2010 U.S. Department of Commerce (DOC) reported there were 7.6 million STEM jobs, while the National Science Foundation stated there were 12.4 million STEM jobs (by including healthcare workers and social scientists not counted by U.S. DOC) (Anft, 2000; Charette, 2013). Without a consistent definition of STEM worker, how can employment rates and predictions of the need for such workers be calculated? Carnevale (2013) noted, “Of the 7.6 million STEM workers counted by the Commerce Department, only 3.3 million possess STEM degrees” (para. 9). This statistic often used for the lack of panic actually reinforces the need to focus on K-12 STEM because presumably this is where 4.3 million people learned at least some of the skills needed to fill STEM positions.
Unemployment and underemployment are very common topics in the current economy especially for the age group most represented in the current study. Alix (2013) reports,

Unfortunately the unemployment rate for young workers is shockingly high; nearly 13% for those aged 20-24. Worse yet is the rate of underemployment -- such as working in a job that doesn't require a college degree -- estimates for which range from 41%-46% for those with a bachelor's degree. (para. 2)

Underemployed is basically a self-reported designation with multiple meanings, in the Accenture Survey (2013) the survey item asked, “To what extent do you agree with the following statement: I believe I am underemployed, meaning I am in a job that does not require my college degree” (p. 9). According to Accenture (2013) “41 percent of workers who graduated from college in the past two years (2011/2012 college grads) say they are underemployed and working in jobs that do not require their college degrees” (p. 3). The phrasing of this item could mean that a worker in a job that requires a college degree and pays accordingly may technically be underemployed because their specific college degree was not required. Accenture (2013) reported that, “38 percent of 2011/2012 college grads did not consider the availability of jobs in their field when they chose their major” (p. 32). Despite the claims of the STEM myth studies, unemployment among workers with STEM skills remains lower that those with other degrees. Carnevale and Cheah (2013) in a report for Georgetown University reported unemployment rates: “mathematics (5.9%) and computer science (8.7%) education (5.0%), engineering (7.0%), health and the sciences (4.8%)” (para. 4-5).
In reality there is no conflict between these two viewpoints on the STEM crisis other than a difference in interpretation of the problem and a disagreement on how resources should be allocated. Teaching STEM in K-12 is very important as research shows interest in math and science is formed very early in a child’s educational process (Buschor, Berweger, Frei, & Kappler, 2014). Charette (2013) summarized this well, “Rather than spending our scarce resources on ending a mythical STEM shortage, we should figure out how to make all children literate in the sciences, technology, and the arts to give them the best foundation to pursue a career and then transition to new ones” (para. 34). That is what the current study intends to do, help identify ways to train and retain high quality teachers that can provide this type of foundation to their students.

**Teacher Turnover Rate**

Turnover is a natural process for any organization, employees leave for a variety of reasons. Under normal circumstances employee departures and retirements are easily dealt with; new employees are hired and trained to fill the vacancies and the organization continues to fulfill the mission. Problems occur when the balance cannot be maintained between departing employees and their replacements. According to Tyack (1974), “Teaching has historically had a high turnover rate. A field that was previously dominated by men, shifted majorly by 1905 when only 2 percent of teachers in elementary school were men” (p. 61). “Salary differences between men and women and between teachers and administrators favored men in these higher paid positions and added to turnover rates as men migrated to administrative positions” (Tyack, 1974, p. 62). Researchers have reinforced the importance of highly qualified teachers. According to Ney, Konstantopoulos, and Hedges (2004), teachers have the largest effect on student
outcomes. High turnover rate require an equally rapid production of new, highly
qualified, teachers to fill the vacancies.

While some turnover is normal and expected, one of the problems in education is
that there is no clear picture of the extent of the problem. NCTAF (2007) stated,

Because they have always relied on a steady supply of new teachers, virtually no
school district in the country has systems in place to track or control teacher
turnover. Without these systems, they have no way to know how much money
they are losing, whether they are losing good teachers or bad teachers, or which
schools are suffering the greatest consequences of turnover. (p. 3)

Despite the lack of record keeping it is known that the U.S. is facing financial
problems in meeting the need for teachers. The problem manifests in areas that often
have the greatest needs, financially and academically. According to the National
Commission on Teaching and America’s Future (NCTAF) (2007) “America’s schools are
struggling with a growing teacher dropout problem that is costing the nation over $7
billion a year. It is draining resources, diminishing teaching quality, and undermining our
ability to close the student achievement gap” (p. 1).

In a study of teacher attrition MetLife (2011) reported:

Three in ten (29%) teachers say they are likely to leave the teaching profession to
go into some different occupation within the next five years, a 12 point increase
since 2009 (17%), and a return to a level comparable to 1986 (27%). (p. 13)

In the field of education, according to Guin (2004), “Teacher turnover rates are
one indicator of school health, which school districts should consider when focusing on
school improvements” (p. 1).
Teacher turnover rates are significantly higher in schools that serve low-achieving, low-income, non-white students (NCTAF, 2007; NCTF, 2013; Ronfeldt, Lankford, Loeb & Wyckoff, 2011). Both of the NCTAF (2007) and NCTAF (2013) found that low performing, high poverty schools suffer from higher teacher turnover than more affluent suburban schools.

There is a striking difference in the turnover rates between the U.S. and other countries such as Finland where 85 – 90% of teachers continue to teach until retirement (Hayden, 2014, para.12).

**Teacher migration.** Ingersol (2000) described the difference between migration (moving to another teaching position at another school) and attrition (leaving the field altogether). The result of either of these is the same for low-performing schools trying to improve. In either case a teacher leaves and the struggle to replace them begins. Migration also takes a more severe toll on low-performing schools (Ronfeldt, Lankford, Loeb, & Wyckoff, 2011) as teachers upgrade their position to more affluent higher-performing schools. Teacher migration is an equity issue, because school funding is so inequitable, so are teacher’s salaries and teaching resources available to them. In many cases teachers are able to move to another school that has less discipline problems, more motivated students, less testing pressure, more teaching resources and a higher salary.

**Teacher retirement.** Retirement, an example of attrition, is an expected, and to a certain degree predictable, element of employee turnover. Despite the lack of local data from districts (NCTAF, 2007), predictions of teacher retirements can be made with some degree of accuracy based on the age of our teachers. However, traditionally, not all teachers retire immediately upon reaching retirement age. Major staffing problems arise,
however, when external circumstances (changes to pension, tenure, evaluation methods, etc.) effect personal decisions of a large number of employees such as the baby boomers. According to the NCTAF (2013), “Between 2004 and 2008, 300,000 veteran teachers left the workforce for retirement” (para. 1). While retirements are the least preventable source of teacher turnover, there are significant numbers of teachers leaving the profession for other reasons, and at varying years of experience. Currently, political and economic factors seem to be increasing the number of teachers that are choosing to retire early. Politically, attacks on job security (tenure) and collective bargaining, (Schachter, 2010; Bauer, 2011) and uncertain changes in teacher evaluations (Hu, 2010; Stein, 2012; Strauss, 2012; Tareen, 2012) have caused a significant increase in the number of teacher retirements. The significance of an increase in the number of teacher retirements is an overall lack of experience in teaching field. According to the NCTAF (2013), “In 1987-88 the typical teacher had 15 years of experience, but by 2007-08 the typical teacher had just 1 to 2 years of experience” (para. 1). Studies have shown that increased experience in teachers may reflect increased student achievement and improved scores on standardized tests (Guin, 2004, p. 12). Thus, schools should benefit by studying and taking steps to reduce teacher attrition when possible.

**Teacher experience.** Researchers have identified certain points in a teaching career at which teachers are significantly more likely to leave teaching. According to Ingersol (2000),

Teacher’s decisions whether to stay or leave are influenced, in particular, by the length of their teaching experience. Beginning teachers have very high rates of departure; these rates significantly decline through the mid-career period, and
then rise again in the retirement years. This means that teaching is an occupation that loses many of its newly trained members very early in their careers. (p. 5).

The trend of losing new teachers continued as Kaiser (2011) reported, “Of the teachers who began teaching in public schools in 2007 or 2008, about 10 percent were not teaching in 2008–09, and 12 percent were not teaching in 2009–10” (p. 3). This link between lack of experience and departure from the field has been commonly accepted until recently when it was suggested by Santoro (2011) that many teachers, of all experience levels, are leaving due to moral and ethical objections to changes in their profession. Santoro (2011) suggested the term “principled leavers” (p. 2671) to describe this newly identified demographic. This demographic is likely included in studies that measure the overall likelihood of leaving the teaching profession without specifying experience level.

**Reasons for leaving teaching.** Interestingly teachers across experience levels report similar to the reasons for leaving the profession. MetLife (2011) found that teachers’ perceptions of a lack of job security and professional respect lead to job dissatisfaction and are a major predictor of a teacher’s likelihood of leaving the field (fig. 1.3, p. 16). Respect and job dissatisfaction are broad categories, perceptions of which are based on many subtopics. Teacher salaries, for example, have been noted as a significant cause of dissatisfaction resulting in teachers leaving the field (Ingersol, 2000; Ingersol et al., 2012). Poor salaries for teachers can send a negative message furthering job dissatisfaction. Goodpaster et al., (2012) found that teachers reported feeling less valued based on a low salary. Ingersol et al., (2012) reported the top 5 reasons for teachers
leaving the field: poor salary, poor administrative support, student discipline, lack of faculty influence and poor student motivation.

In some cases the decision to move or leave teaching positions were not made by the teachers, but by administrative decisions. According to Kaiser (2011), “Approximately 21 percent of 2008–09 movers and 27 percent of 2009–10 movers moved across schools because their contract was not renewed. About 31 percent of 2008–09 leavers and 35 percent of 2009–10 leavers left the teaching profession because their contract was not renewed” (p. 3). Contracts for new teachers may have been non-renewed due to poor teacher performance or budget decisions. Although no reason was indicated in the study the implication was that budget conditions were responsible for most non-renewals.

Despite these very legitimate and difficult to solve problems, the majority of teachers elect to remain in the field. Elements of their teacher training may have played a role. Ingersol et al., (2012) found, “Pedagogy was strongly related to teacher attrition. Beginning teachers who had taken more courses in teaching methods and strategies, learning theory or child psychology, or materials selection were significantly less likely to depart” (p. 33). Kukla-Acevedo (2009) conducted a study to determine workplace conditions role in teachers’ decisions to stay or leave a particular work place. Among other recommendations she suggested that future educational research needs to focus on the models of departure specifically based upon years of experience. Reasons for leaving teaching or transferring to another position are unique to a vast set of multiple variables that are beyond the scope of a single study.
**Teacher turnover in STEM areas.** Research has shown that teacher attrition varies by subject matter. For example the percentage of teachers leaving the field in Math (14.5%) and Science (18.2%) exceeds the number of all other subjects (12.3%) (Ingersol et al, 2012, p. 32) suggesting the severity of the problem for STEM education.

The intent of this study is to focus on turnover rates based upon variables presented in the case of the WWTF teacher-training program at a Midwestern University. In this case the focus will be beginning teachers of science and mathematics. Of particular interest are difficulties retaining high quality STEM teachers in the Appalachian region. Rural areas have higher than average teacher turnover and difficulty attracting highly qualified teachers (Barley, 2009; Goodpaster, Adedokun, & Weaver, 2012; Guarino, Santibanez, & Daley, 2006).

The STEM community is specifically interested in the problem of high turnover of STEM teachers as one of the contributing factors in the STEM teacher shortage (Hutchison, 2012, p. 549). Recently, teacher turnover rate has received more attention because of a perceived change in the natural process, leading to perceived negative consequences. This troubling shift in teacher turnover occurs mainly in two areas: first the higher percentage of teachers leaving STEM and secondly the premature departure of teachers that have taught for less than five years. Reports of retention rates and teacher shortages are complicated and results vary. Slight statistical distinctions such as the difference between teachers leaving the field entirely and teacher mobility (where a teacher leaves one school to teach at another school) often have the same negative outcome for disadvantaged schools that are rapidly losing experienced teachers.
The NCTAF (2007) recommended three steps in solving this problem: 1.) Measure teacher turnover and related costs; 2.) Invest in well prepared teachers and teacher training programs; 3.) Transform schools into genuine learning organizations. In order to challenge the problem of teacher turnover, many researchers have collected knowledge of why teachers are leaving the field. The current study is specifically interested in problems faced by beginning teachers. Beginning teachers face many challenges in their first year, which may contribute to the problem of retaining teachers (Andrews & Quinn, 2004; Kardos & Johnson, 2007). As Wong and Wong (2008) stated, “The concept of comprehensive induction can be applied to almost any profession. Doctors, lawyers, engineers, and other professionals must all prove their abilities BEFORE they are allowed to practice their professions independently” (para. 43).

According to Kardos and Johnson (2007),

Taken together, the new teachers’ reports show them working as solo practitioners, expected to be prematurely expert and able to work without the support of a school-based professional network. In integrated professional cultures, new teachers interact with experienced colleagues in an ongoing and reciprocal way. (p. 2100)

Reports from such studies indicate both the need for support and often the lack of perceived available support. Kardos and Johnson (2007) reported,

Taken together, these findings reveal that many new teachers in California, Florida, Massachusetts, and Michigan find themselves working without the support of integrated professional cultures. Even in states such as Massachusetts and California, which have mandated induction and mentoring programs, large
proportions of new teachers report that they are left to do the very difficult work of teaching with little direct or organized involvement from their experienced colleagues. (p. 2101)

Lack of support for new teachers has been a finding of many other studies concerned with the untimely departure of new teachers, and suggestions for mentoring or induction programs are common (Alliance for Excellent Education, 2008; Anhorn, 2008; Womack-Wynne et al., 2011; Goodpaster et al., 2012). This is an area where in depth qualitative research is needed because the important measure is how well supported the teachers feel. The existence of a program is not enough if teachers do not use it or feel that it meets their needs. In Ohio, teacher professional support efforts are summarized in a report by Editorial Projects in Education (2006),

Ohio also posts a better-than-average grade [B] in teacher quality.

The state receives full credit for its measures related to professional support and training for teachers. Ohio is one of 15 states that require and finance mentoring for new teachers. However, Ohio loses points in the area of teacher education and qualifications because it does not require a minimum amount of student teaching or other types of clinical experiences. (p. 2)

The WWTF participants, as new teachers in Ohio, will be required to participate in the new Ohio Resident Educator Program (OREP), which is now a 4-year program that must be completed before Ohio teachers can upgrade their initial 4-year license to a 5-Year Professional License.

As Fulton and Brighton (2011) stated,
Every school needs good teachers—but a school does not become a great place to learn until those teachers have the leadership and support to create a learning culture that is more powerful than even the best of them can sustain on their own. (p. 4)

Good teacher support programs have been shown to have positive effects on student learning as well as powerful tools in teacher retention (Fulton & Brighton, 2011). However, as Wong and Wong (2008) stated, “Tragically, many new recruits in a school district receive little or no training as classroom teachers” (para. 43). This explains the contrast between the support that teacher candidates experience and the lack of support that first year teachers often report.

Teacher retention. The problem of high teacher turnover rates has inspired many researchers to focus on teacher retention, what can be done to keep high quality teachers once they have been recruited and hired. Some of the problems are so engrained in the history of education that they may be very difficult to change, such as the age of new teachers. As Haberman (2012) stated,

At the turn of the 19th century, most of the first public school teachers were itinerant males hired into small rural communities. They kept school for a month or two and then moved on. It wasn’t long before the local taxpayers realized they could get farm girls to keep school for as long as 8 months a year at much cheaper cost. (p. 927)

Although today’s beginning teachers are not teenagers with a sixth grade education, Haberman (2012) argues that today’s teachers, predominately females under 25 years old, are too immature for the task ahead of them. One of the criticisms of education is that we
blindly follow traditions and are slow to change. If Haberman is right, this is a tradition over 100 years old that we cannot seem to break. Haberman (2012) sums up the teacher turnover problem stating, “The problem is that these districts keep replacing quitters and failures with new teachers from the same immature population” (p. 931).

The social environment of the school has been a focus of some researchers such as Kardos and Johnson (2007). They found three things schools could focus on to retain teachers, “promote frequent and reciprocal interaction among faculty members across experience levels; recognize new teachers’ needs as beginners; and develop shared responsibility among teachers for the school and its students” (pp. 2084-2085).

Another research approach was to define and list variables and attempted to measure importance and likelihood of these influencing teachers to stay. Ingersol (2000) listed 9 categorical variables; “poor salary, poor administrative support, student discipline problems, lack of faculty influence and autonomy, poor opportunity for professional advancement, inadequate time to prepare, intrusions on teaching time and class sizes too large” (p. 4). Of these variables, four were found to have enough impact to warrant recommendations. Ingersol (2000) suggested that schools concerned with retaining teachers should increase support from the school administration, increase salaries, reduce student discipline problems, and enhance faculty input into school decision making (p. 10). Coladarci (1992) noted that smaller class sizes and a supportive principal with strong leadership and a good relationship with students and staff inspires greater commitment in teachers. This type of positive environment is commonplace in schools where teachers report feeling a higher degree of collective efficacy (Hoy, Sweetland, & Smith, 2002) and personal self-efficacy. Coladarci (1992) stated, “The central finding of the present study
was that personal and general efficacy were the two strongest predictors of commitment to teaching” (p. 334).

**Teacher evaluations.** Although teacher evaluations may seem more of a challenge for lawmakers and administrators to solve, the implications to teacher candidates are very important to their career. Teacher attitudes towards the evaluation process may help guide the process in a meaningful direction (Almay, 2011). In the current push toward accountability and budget cutting, teacher evaluation has caught the attention of both public and private stakeholder groups.

One example of a private project has been The Bill and Melinda Gates foundation (2013), “Measures of Effective Teaching project—a research study that has helped us better understand what great teaching looks like, and the types of measures that can provide a fair assessment of teaching aimed at helping every teacher be their best” (College ready Education/Areas of Focus/teaching). More troubling to teachers have been the actions of lawmakers. In many states, governors such as New Jersey’s Chris Christie have called for an end to tenure and salary increases based on Master’s Degrees or years of service for teachers (Hu, 2010, para. 1-2). Wisconsin’s Scott Walker cut benefits and collective bargaining rights to all teachers regardless of performance (Stein, 2012, para. 2). Chicago’s mayor, Rahm Emanuel attracted national attention to the issue of teacher evaluation during the September 2012, Chicago Teacher Strike, which was largely based on the evaluation issue (Tareen, 2012, para. 5). Teachers and their unions have expressed concerns that in these hostile budget-cutting measures, some lawmakers lose track of the research-supported purpose of teacher evaluation. Yet, there are some very influential
individuals pressing for standardized test scores to be used as a measure to evaluate teacher performance, as Strauss (2012) states:

The [New York] Times can say that using standardized test scores to evaluate teachers is a sensible policy and Obama can say it and Education Secretary Arne Duncan can say it and [Rahm] Emanuel can say it and so can Bill Gates (who has spent hundreds of millions of dollars to develop it) and governors and mayors from both parties, and heck, anybody can go ahead and shout it out as loud as they can. It doesn’t make it true. (para. 7-8)

Without research-based methods, teachers fear that evaluations may become just another misguided tool to be used against them. Trust becomes an issue; in many other countries teachers are more trusted and less evaluated. In Finland, “The education system places importance on trust and proficiency of teachers. There is no national evaluation system for teachers” (OECD, 2013, p.12). Truly, the motivation for teacher evaluation must be clear. If the purpose is simply to eliminate teachers and reduce costs, it does not matter if the evaluation is fair. In many cases, current principals were not trained for the level of evaluation currently required (Grossman, 2011b). Teacher evaluations are an important aspect of the problem. Although studies have been non-conclusive in determining that we are losing our best teachers (Goldhaber, Gross & Player, 2007) we know that teachers often improve with experience and teachers that leave the profession early are total unknowns in the area of teacher quality. We need to keep teacher evaluation in perspective for what it can and cannot tell us about teachers and teacher candidates. As Golhaber, Gross, and Player (2007) suggested, “Therefore, strategies that focus on teachers’ professional competence should probably be considered only one piece of a
comprehensive set of workforce reforms that are based on assessments of demonstrated teacher effectiveness in the classroom” (p. 29).

**Teaching and Student Dropout Rate**

Besides being a major flaw of our educational system, student dropout rates indicate a substantial economic liability to our economy. President Obama (2010) discussed the problem of student dropouts:

> This is a problem we can’t afford to accept or ignore. The stakes are too high – for our children, for our economy, for our country. It’s time for all of us to come together – parents and students, principals and teachers, business leaders and elected officials – to end America’s dropout crisis. (para. 3)

Student dropout rates have been studied much the same as teacher turnover. Teacher turnover rates have elements of transfer combined with attrition whereas studies of student dropout rates focus mainly on attrition, students that dropout before finishing high school. Although there is a small number of students that dropout for other reasons, like transferring to another school, most studies focus on the larger problem of students that dropout and never complete high school.

Although there are some discrepancies in measuring the extent of the problem, it is common and undisputed knowledge that the U.S. has a significant problem with students dropping out before finishing high school. Student dropout rates are such an embarrassment to the education system that some researchers such as Bridgeland, Dilulio, and Morison (2006) reported that, “We also note that there are concerns that official graduation rates reported by the states and the federal government are believed to be misleading and too optimistic” (p. 25). Generally accepted is the estimate that almost
one third of high school students and nearly half of all black Hispanic and Native Americans do not finish high school (Bridgeland, et al., 2006; Barton, 2005; Chapman, Laird & KewalRamani, 2010). The problem is undeniably severe. There are sound reasons why student dropout rates are included in a study of STEM teaching. The unacceptably high student dropout rate takes a toll on the U.S. economy and weakens our global competitiveness. There is compelling evidence to suggest that improvements to teaching and school environments may result in fewer dropouts.

The cost of dropouts to the U.S. economy is another difficult measure and though it varies, based on formula of calculation, the general consensus it that this cost is high. The cost is multi-level as well; the unemployment rate for young high school dropouts in 2008 was estimated to be 54% (Sum, Khatiwada, McLaughlin, & Palma, 2009). On another level the cost to society, which is in many cases a lifelong expense, grows exponentially. According to Belfield and Levin (2007), “Over a lifetime, an 18-year-old who does not complete high school earns approximately $26,000 less than someone with a high school diploma and contributes about $60,000 less in lifetime federal and state income taxes” (p. 120). As dismal as that seems, those are the dropouts that are fortunate enough to find work. Along with lower tax contributions to society due to meager earnings, non-graduates are also more likely to rely on the services that these taxes fund such as Welfare, Medicare and Medicaid and the criminal justice system (Belfield & Levin, 2007; Bridgeland, et al., 2006). The jobless rate among dropouts is extreme and varies by race “Blacks 69%, Asians 57%, Whites 54% and Hispanics 47%” (Sum, et al., 2009, para. 3) For the even less fortunate, incarceration rates are very highly related to education levels. Sum et al. (2009) reported, “the percent of 16-24 year old high school
High school dropouts also have the highest rates of recidivism. These problems combine to make the estimate of the cost of dropping out very difficult to measure but clearly preventing dropouts has the potential to save taxpayers a considerable amount of money over the lifetime of these individuals.

Surveys taken by high school dropouts indicate that better teaching would have likely prevented them from dropping out of school. Bridgeland, Dilulio, and Morison (2006) discovered that 81% of the 9th and 10th graders that dropped out reported that “better teachers that keep classes interesting” may have prevented them from dropping out (p. 12). A major goal of the Woodrow Wilson Teaching Fellowship (WWTF) is to produce high quality teachers (WWTF, 2012). Bridgeland et al., (2006) stated that high quality teachers are more likely to make their classes interesting and interactive enough to encourage students, thus reducing student dropout rates. Since 1960 the growth rate in science and engineering jobs has exceeded that of all other occupations and employment estimates indicate this gap will continue (Science and Engineering Indicators, 2010). While it is quite possible that today’s high school students of math and science will go on to be the leaders that will create new jobs in the future and further help the economy because of the technology skill they possess, this potential diminishes as students drop out during high school.

Many of the solutions, suggested by economic experts, for high unemployment rates are founded in STEM education. For example, it has been suggested that small startup business may spawn from the ranks of the unemployed. According to Strauss
(2011) small businesses create 80% of new jobs in the U.S. Technology education is a major driver in the developing the skill set needed for entrepreneurship. According to the U.S. Small Business Administration (SBA) (2013), “As a business owner, it is vital that you understand and use advanced technologies. Technology can help increase business efficiency and even expand operations” (*Using Technology to Stay Competitive*, section para. 1). Good teachers lay the framework for this to happen.

**Student retention.** The chance that improving teaching and the educational system can reduce student dropout can be framed by studies that examined and surveyed why students dropout. Bridgeland et al. (2006) reported that the students they surveyed listed *classes were not interesting* as the most significant (48%) reason that they left school (p. 3). Interesting classes are something a school could expect from highly qualified teachers. Respondents listed uninspired teachers that had low expectations for their students as a deterrent to finishing high school.

Recommendations for reducing student drop outs align with the interest of the current study, such as improving teaching to make school more engaging and relevant to the students, creating a better learning environment and ensuring strong relationships between school staff and students. (Bridgeland et al., 2006). Another important reason to make such changes in the school environment is that it is much easier for a student to complete high school with their class than to complete an alternative program later. The availability of second chance programs is lower now than it was in the 1970s and early 1980s when the U.S. had Department of Labor Youth Opportunities Grants (Barton, 2005, p. 29) even though the need for second chance programs continues to grow.
Traditional Teacher Education Program

In order to have a clear picture of the future of teacher preparation it is important to review a typical traditional teacher preparation program. This Midwestern University currently offers two differing paths to teacher licensure: the traditional 4-year program for undergraduates and the WWTF (an alternative licensure program).

The State of Ohio offers two teacher licensure areas, which they have designated; Middle Childhood, grades 4-9 and Adolescent to Young Adult (AYA) grades 7-12. Ohio University defines slightly different conferrals for each degree. This Midwestern University undergraduate Middle Childhood program provides the following, as described by their College of Education (2013),

Conferral of the Bachelor of Science in Education (B.S.Ed.) degree signifies successful completion of a program that enables demonstration of competence in three areas: (1) general/liberal education; (2) the knowledge, skills, and dispositions required for teaching; and (3) the subject matter in the chosen teaching field(s). In addition to the General Education requirement of the University, candidates for a teaching license must also satisfy requirements established for their specific licensure programs. (Middle Childhood, section para. 1).

Students in this program are required to select two specialty areas. The two STEM areas that are offered are math and science. Patton College of Education website (2013) states, The Middle Childhood Education program is Nationally Recognized by the National Association for Middle Level Education (AMLE). Middle Childhood Education (MCE) prepares students for a license to teach in grades 4 - 9 in upper
elementary grades, middle school, and junior high school. All Middle Childhood Education licensure programs require students to choose two content area specializations. (Middle Childhood, para. 1).

The AYA program described by the Patton College of Education (2013), differs slightly, Conferral of the Bachelor of Science in Education (B.S.Ed.) degree signifies successful completion of a program that enables demonstration of competence in three areas: (1) general/liberal education; (2) the knowledge, skills, and dispositions required for teaching; and (3) the subject matter in the chosen teaching field(s). In addition to the General Education requirement of the University, candidates for a teaching license must also satisfy requirements established for their specific licensure programs. (para. 2)

The major differences between Middle Childhood and AYA, other than the grades taught, exist in the subject area. Middle Childhood requires two teaching areas, for example: math and science. The AYA licensure specializes in one area. Patton College of Education (2013) lists the following STEM areas:

- Integrated Math
- Integrated Science
- Earth Science
- Life Science
- Physical Science

Both of these traditional four-year programs feature extensive field experience.
Woodrow Wilson Teaching Fellowship

The Woodrow Wilson Teaching Fellowship, offered in partnership with traditional universities, represents a relatively new trend in teacher education programs, often referred to as alternative route (AR) programs. According to Rosenberg et al., (2007), “Indeed, the U.S. Department of Education (2002, 2004) has proclaimed repeatedly that AR programs, as opposed to the traditional routes offered by colleges of education, are an effective means of streamlining the process of certification to move teachers into the classroom on a fast-track basis” (pp. 224-225). A common feature of AR programs is their ability to produce teachers in less time than traditional 4-year teacher preparation programs. As Rosenberg et al., (2007) describe, “These changing standards require alternative route candidates to pass certification or licensure exams to be highly qualified, but AR programs can alter, shorten, or waive entirely coursework in educational philosophy, pedagogy, and practice teaching” (p. 225). The need to fast-track teacher certification is described by Rosenberg et al., (2007), “The need for high-quality teachers – particularly in such high-demand areas as mathematics, science, and special education – has been a major impetus for the emergence and growth of alternative routes to certification (AR)” (p. 224). The President’s Council of Advisors on Science and Technology (2010) recommends, “The federal government should set a goal of ensuring over the next decade the recruitment, preparation, and induction support of at least 100,000 new STEM middle and high school teachers who have strong majors in STEM fields and strong content-specific pedagogical preparation, by providing vigorous support for programs designed to produce such teachers” (p. 12). This goal is in line with the goal of the WWTF. According to the website WWTF (2013), “The Woodrow Wilson
Teaching Fellowship seeks to attract talented, committed individuals with backgrounds in the STEM fields—science, technology, engineering, and mathematics—into teaching in high-need secondary schools in Indiana, Michigan, and Ohio” (Program Overview, para. 1).

The unique partnership between the WWTF program and the participating university often requires a redesign their teacher education program. The goal of WWTF is to make this redesign last beyond this initial cohort. According to the Ohio Higher Education (2012) fact sheet, one of the goals of WWTF is to “transform university-based teacher education” (para. 1). Courses taken by the WWTF participants are listed in Table 1.

Table 1

*WWTF Courses*

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<tr>
<th>Summer sessions</th>
<th>Fall semester</th>
<th>Spring Semester</th>
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<tr>
<td>EDTE 5600 Adolescent Learning, Development &amp; Culture</td>
<td>EDTE 6720 STEM Teaching with special needs</td>
<td>Professional Internship</td>
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<tr>
<td>EDTE 5100 &amp; 5100L Principles of Curriculum &amp; Teaching - modified for STEM</td>
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<td>EDTE 5260 Reading Across Content Areas</td>
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<td>CAS 5960 STEM Practices: modeling of engineering, mathematics and science practices</td>
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<tr>
<td>MATH 5900 or Science PB10 Special Topics</td>
<td>EDTE 6160 Classroom Management &amp; Assessment for STEM</td>
<td>Seminar courses</td>
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<td></td>
<td>EDTE 6670 Research in Action - STEM Education</td>
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There are significant differences between the WWTF program and a traditional teacher education program that go beyond a shorter completion time. Admission requirements, for example, are much different than for a traditional teacher-training program. According to WWTF Ohio (2013),

The Fellowship is open to college seniors, graduates, and career changers who:

- Have majored in and/or have a strong professional background in a STEM field (science, technology, engineering, or math);
- Demonstrate a commitment to the program and its goals;
- Have U.S. citizenship or permanent residency;
- Have attained, or expect to attain by June 30, 2013, a bachelor's degree from an accredited U.S. college or university;
- A cumulative undergraduate grade point average (GPA) of 3.0 or better on a 4.0 scale is preferred (para. 3)

The award/acceptance into the WWTF is based on a competitive model that requires an application and interview process. Ohio Higher ED (2012) fact sheet states, for the 2012 competition 2,017 applications were received. Selection included screening at the Foundation, a full-day interview process driven by veteran STEM teachers, and a careful admissions review by the partner universities (para. 2). According to Greenberg, McKee, and Walsh (2013), more stringent requirements for teacher candidates entering a program may increase the overall quality of the program, making it less of an “industry of mediocrity” (pp. 1-2). The WWTF award in the Ohio University program includes paid tuition as well as the following benefits listed by WWTF Ohio website (2013),
• Admission to a master's degree program at a well-established partner university;
• Teacher certification in science, mathematics or technology education;
• Extensive preparation for teaching in a high-need urban or rural secondary school for one full year prior to becoming the teacher-of-record in a science or math classroom;
• A $30,000 stipend (Once Fellows are certified teachers at the end of the first year, they obtain salaried employment in high-need schools.);
• Admission to a master's degree program at one of seven participating Ohio universities;
• Support and mentoring throughout the three-year teaching commitment;
• Support of a cohort of WW Fellows passionate about science and math education; and
• Lifelong membership in a national network of Woodrow Wilson Fellows who are intellectual leaders

(https://www.wwteachingfellowship.org/program/ohio.php)

Typical 4-year traditional teacher education programs include teacher licensure as part of the program, but generally do not provide many of the other benefits that a WWTF award includes.

The WWTF expects a commitment from the participants once they have their teaching credentials. According to WWTF (2013), “Woodrow Wilson Teaching Fellows teach for at least three years in high-need secondary urban or rural schools, contingent on
completing their master's degree program and attaining their teaching license”

(Commitment Section, para 1).

The WWTF provides support and mentorship program for graduates during their three-year teaching requirement. Research has shown that support and mentoring are factors that predict the likelihood of a new teacher to remain in the field of teaching (Womack-Wynne, 2011; Ingersol et al., 2012). In support of the WWTF goal of increasing STEM teacher retention (WWTF, The Impact, section, para. 5), the WWTF provides support of a cohort and membership in a national network. These two elements of the program are also research-based and have been shown to generally support teacher retention (Womack-Wynne, 2011; Ingersol et al., 2012) and specifically support teacher retention in rural areas (Goodpaster, Adedokun, & Weaver, 2011).

The WWTF is a good example of an AR program. It combines the benefits of a traditional four-year teacher education program such as an Ohio teacher license, field experience and teaching pedagogy with the fast track pace of a redesigned, research-based AR program. Research evaluating the long-term effectiveness of AR programs is lacking, mostly due to the relative newness of the concept. A Summary of findings by the Education Commission of the States (ECS) (2003) reported:

Although the research on this topic isn’t substantial, there is enough to justify several modest conclusions and provide some guidance for policymakers. Overall, the research provides limited support for the conclusion that there are indeed alternative programs that produce cohorts of teachers who are ultimately as effective as traditionally trained teachers. On the other hand, because of their limited preservice training, alternative route participants may experience more
difficulties than traditionally prepared graduates at the beginning of their teaching assignment. (p. 3)

The WWTF does not suffer “limited preservice training” (ECS, 2003, p. 3) as do many other AR programs and in some ways has fewer limitations than most traditional 4-year programs. For example, the full year teaching experience that WWTF provides exceeds the one semester field experience required by most 4-year programs.

Research seems to indicate that AR programs are at least comparable to traditional teacher preparation programs in producing teachers committed to a teaching career (Decker, Mayer, & Glazerman, 2004; Wilson, 2011). Ingersol et al., (2012) stated, “Contrary to widely held beliefs, we found that the type of college, degree, and preparation route had little bearing on teachers’ likelihood of leaving teaching after one year” (p. 32).

The WWTF program has many components that are quite similar to teacher preparation programs in Finland that are currently being studied as the best in the world (Darling-Hammond, Wei & Andree, 2010; OECD, 2013; Sanchez, 2014). Beginning with the selection of candidates, WWTF has a competitive application process and as Hayden (2014) stated, “There are more than 10 times as many applicants as positions available in Finland's 8 teacher-training schools. This means that statistically, you have as much chance of becoming a teacher in Finland as getting into MIT” (para. 5).

The Woodrow Wilson teaching fellows in the current study received tuition and a living stipend. As Darling-Hammond (2010) reports, “In Scandinavia, for example, teacher candidates in Finland, Sweden, Norway, and the Netherlands now receive two to three years of graduate-level preparation for teaching, completely at government expense,
plus a living stipend (p. 2). The WWTF time frame is shorter than in these countries but the requirement of at least a full year field experience is similar to Scandinavia (Darling-Hammond, 2010).

During the WWTF adequate time is provided for professional development and collaboration, but generally speaking this time shrinks to nearly nothing after employment. Quite a contrast to other countries as Darling-Hammond (2010) stated,

In a model like that found in a number of Asian nations, the New Zealand Ministry of Education funds 20 percent release time for new teachers and 10 percent release time for second-year teachers to observe other teachers, attend professional development activities, work on curriculum, and attend courses. (p 2).

WWTF graduates are highly qualified with a degree in the area they teach plus a Master’s degree; similar to Finland where all teachers have a Master’s degree (Hayden, 2014). The mentor component of WWTF, which transitions into the Ohio Resident Educator program, is also similar to the requirements in other educationally highly effective countries. As Darling-Hammond (2010) stated, “Once teachers are hired, resources are targeted to schools to support mentoring for novices. Induction programs are mandatory in many countries, such as Australia, France, Greece, Israel, Italy, Japan, Korea, New Zealand, and Switzerland” (p. 2).

Unfortunately, WWTF does not represent the majority of teacher preparation programs in the United States nor is it typical of other AR programs. Most of the other countries mentioned here have a much more uniform system of teacher preparation and the descriptions of their requirements and components are the same for all teacher
candidates. Table 2 shows the comparison of WWTF with that of Finland and Teach for America, one of the oldest and best known AR programs in the U.S.

Table 2

*Teacher Preparation Programs*

<table>
<thead>
<tr>
<th>Teacher Preparation in Finland</th>
<th>Woodrow Wilson Teaching Fellowship</th>
<th>Teach for America</th>
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<tbody>
<tr>
<td>Competitive selection process</td>
<td>X</td>
<td>X</td>
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<td></td>
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<tr>
<td>Content degree and Master’s degree</td>
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<td>Tuition at no cost to the student</td>
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<td>X</td>
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<tr>
<td>Living stipend paid to student</td>
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<td>X</td>
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<tr>
<td>Full year of field experience</td>
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<td>X</td>
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<tr>
<td>Peer support group of teachers</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mentor program for new teachers</td>
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<td>X**</td>
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*Teach for America requires a U.S. citizenship and a bachelor’s degree with a 2.5 GPA but encourages all website visitors to apply (https://www.teachforamerica.org/)

**Ohio requires first year teachers to participate in the Ohio Resident Educator Program(http://education.ohio.gov/Topics/Teaching/Resident-Educator-Program)

**Field of Science Teaching in Ohio**

In Ohio, teacher licensure in the STEM areas is different by grade level. In the field of science Middle Childhood, grades 4-9, science licensure is considered a singular
subject. AYA, grades 7-12, are licensed to teach science in a specialty area: integrated
science, earth science, life science or physical science (ODE, 2013). The Ohio
Department of Education (2012) content standards indicate that all lower grades K-8 will
be taught the areas of earth and space science, life science and physical science. In these
lower grades, licensure allows one teacher to cover these areas of science. The Ohio
Department of Education (2012) content standards indicate that grades 9-12 will be
offered: biology, chemistry, environmental science, physical geology, physical science-
high school and physics. Teachers at this level must qualify in the area they intend to
teach.

Ohio requires teachers to pass proficiency tests in order to receive a teaching
licensure. New teachers are required to show proficiency on two tests: Praxis II and Tests
in World Languages. The Praxis II consists of two parts, “Principles of Learning and
Teaching (PLT) and Subject Assessments (content area tests)”. Tests in World
Languages, also contains two parts, “the Oral Proficiency Interview (OPI) and the
Writing Proficiency Test (WPT)” (ODE, 2013, Educator licensure testing requirements,
para 4).

Despite the licensure and testing requirements for teaching science in Ohio, the
National Council on Teacher Quality (NCTQ) finds Ohio lacking in efforts to fill
science-teaching positions with highly qualified teachers. In a report specifically targeted
at loopholes in state requirements NCTQ rates Ohio poor. According to the NCTQ
(2010),

Ohio articulates that preparation in a given teaching field “shall constitute at least
an academic major or its equivalent with sufficient advanced coursework in all
areas to be taught.” This sounds promising, but at the secondary level, Ohio allows for a major in “integrated science.” That translates into 30 to 36 credits across all of the relevant fields of science, meaning a candidate need not be adequately trained in a specific field.

Candidates have two options when it comes to Praxis 2 testing requirements. The first is passing both the Chemistry, Physics and General Science test as well as the Biology test. Candidates could get many questions wrong regarding chemistry, physics, and/or Earth and space science, yet still pass the test—and ultimately teach the subjects in high school. The second option requires candidates to pass both the Biology and General Science tests as well as one of the following: Chemistry, Physics, or Earth and Space Sciences. This option also does not guarantee requisite content knowledge in each of the subject areas in integrated science. (p. 9).

Ohio finds itself in the position of balancing the need for science teachers with the desire to have high quality teachers in every classroom as mandated in Ohio Senate Bill SB 2 (2004) which created the Educator Standards Board (ESB)(Standards for Ohio Educators, 2005, p. 5). Ohio is not alone as thirty-two other states still allow this loose definition of science teacher. According to the National Council on Teacher Quality (2010),

The bottom line is that the so-called flexibility of the “broad field” science teacher is a fantasy. In reality, the concept of the all-purpose science teacher not only masks but perpetuates the STEM crisis, and does so at the expense of students. (p. 2)
States need to ask themselves if their solutions to the problem of filling science teaching positions are helping STEM education or just filling positions (NCTQ, 2009).

Self-Identity

The study of self-identity is one of the oldest areas of interest to educators. Epistemology (Plato, Aristotle, 350BC) questioned how knowledge is acquired. Plato’s theory assumed that a person’s knowledge came from internal logic (rationalism). While Aristotle thought knowledge was more a result of person’s experiences (empiricist). In either case, in many ways the knowledge we gain determines how we feel about ourselves and how we exist in our surroundings. The debate about how people learn continued for many years. Research such as that of Rogers (1947) suggested the importance of self-identity in the development of personality. This important part of human development appears to be critical to teaching and learning. The self-identity of the teacher seems to be a condition that must be successfully met before one can teach others.

The environment of education is always changing. Educational reform movements for example have caused many shifts in the environment of teaching. These shifts influence teacher identity. Interestingly, in other countries such as Finland educational reforms have increased the public image of teachers. Occupational prestige polls in Finland rate teaching as the number one profession (Hayden, 2014). In the United States educational reform has put teachers in a defensive position. Perhaps the best defense for teachers dealing with these changes is a positive self-image. According to Beauchamp and Thomas (2009),
Clearly, student teachers must undergo a shift in identity as they move through programs of teacher education and assume positions as teachers in today’s challenging school contexts. In addition, further identity shifts may occur throughout a teacher’s career as a result of interactions within schools and in broader communities. (p. 175)

The importance of this shift reinforces the need for teacher education programs to explore and enhance the self-image of teacher candidates. Identity is a complicated aspect of personality and sorting the professional identity from the self is not a simple task. This poses problems for researchers studying professional identity (Beijaard, Meijer, & Verloop, 2004). According to Chong (2011), “A strong sense of personal and professional identity will strengthen novice teachers’ understanding of the demands and nature of the teaching role. This process is best not left to chance, and should be nurtured in supportive contexts” (p. 231).

According to Beijaard et al. (2004), “Identity is not something one has, but something that develops during ones whole life (p. 107). The need to support new teachers should extend into the first years of actual teaching. Chong, Low, and Goh (2011) suggested that their findings of mismatched expectations of preservice teachers indicates a need for better teacher preparation programs followed by mentoring programs for the new teachers’ first years.

Ongoing professional development opportunities can also make a difference for new teachers. Fuller (1969) questioned not only the content provided to teacher candidates but also the timing. Professional development that is relevant and delivered to teacher while they are actually teaching and facing the topic is far more effective than
abstract content that may be applied in the future. The lack of identity guidance and collaboration with colleagues combined with a lack of serious developmental opportunities tends to be detrimental to positive self-identity of teachers (Dinkleman, 2011, p. 320). Teacher identity work should be stressed throughout the program. According to Hochstetler (2011), “I can’t help but feel our preparation program is flawed in that it allows students to progress nearly to the end without directly addressing misconceptions about teaching English through opportunities to build a strong teacher identity” (p. 256). According to Alsup (2006), students that are not provided with experiences leading to a holistic teacher identity before they enter the classroom risk potential failure.

Teachers that have well-developed self-identities are more likely to adapt and use more innovative teaching methods. Forbes and Davis (2011) reported,

Positive identity is necessary to implement the use of curriculum materials to teach in a meaningful way. This is an indication that the experiences they are having in the teacher education program are not fundamentally altering their perceptions of what practicing elementary teachers do and are supposed to do with science curriculum materials in many cases. (p. 288)

The disconnect between what is taught in teacher preparation programs, what we know about teaching with curriculum materials in science education, and what actually happens in the classroom hinges upon the teacher’s sense of identity.

The flexibility of teacher candidates is significant in their ability to teach and remain in a constantly changing field as Cooper and He (2012) stated:
In order to better prepare our teacher candidates so they will remain in the classroom, but also be flexible in adapting to changes in the teaching field, teacher educators need to re-evaluate our own visions for teacher education and contextualize our curriculum, including the knowledge of content, pedagogical experience and knowledge of learners, to reflect the reality of today’s schools. (p. 105)

It is difficult to define self-identity, partially because it is a concept of human nature. It is not a static condition or even a developmental level that can be achieved. Identity should be seen as more of a system, or a process. A person’s identity evolves throughout their life. Purkey (1988) stated, “Self-concept is learned. As far as we know, no one is born with a self-concept. It gradually emerges in the early months of life and is shaped and reshaped through repeated perceived experiences, particularly with significant others” (Assumptions Regarding Self-concept section para. 2). This process really has no end - experiences and interactions with others continue to shape us throughout our lives. Traditionally, self-concepts have been measured by giving people checklists or inventories of evaluative statements and have been asked which ones apply to them (Bandura, 1977). These measures vary widely based upon the individual and also among different tasks with the same individual.

Haberman (2012) illustrated an identity problem with new teachers that is deeply rooted in history. In this study he challenged the notion that a typical, mid-twenty year-old, female, beginning teacher is capable of the adult role we expect teachers to fill. This is a potential flaw in the teacher preparation field that requires more study. If this age to
teacher identity paradox proves to be a major problem and a major cause of teacher turnover it will be difficult to solve.

Because identity is so important in many areas of social science as well as in education, and because it is a compilation of many things that make us who we are, there are many psychological theories are involved such as: Social Cognitive Theory, Social Learning Theory, and Self-concept Theory.

**Social Cognitive Theory**

This social theory is significant to the development of teacher identity because it suggests that our interaction with others and our environment shapes our thoughts and actions. Bandura (1989) stated, “In this model of reciprocal causation, behavior, cognition and other personal factors, and environmental influences all operate as interacting determinants that influence each other bidirectionally” (p. 2). In teaching, interaction with students, other teachers, administrators, and parents are all significant environmental influences. The way in which the teacher is influenced by this environment is based on his or her cognition and personal factors such as self-evaluation and self-assessment of the interaction. These assessments may differ from day to day and from lesson to lesson, but the teacher themselves remains the constant in the interaction. The teacher must accept the result of this social interaction to remain motivated to continue teaching.

According to Bandura (1989),

In the social cognitive view, people function as active agents in their own motivation. Self-motivation through cognitive comparison requires distinguishing between standards of what one knows and standards of what one desires to know.
It is the latter standards, together with perceived self-efficacy, that exert selective influence over which of many activities will be actively pursued. (p. 50)

Motivation is necessary in many fields especially where an ongoing effort is necessary. Teachers attempt to motivate their students; coaches wish to motivate their athletes, military officers must to motivate soldiers and business need motivated employees. Attribution theory has shown that self-motivation, because of its intrinsic nature, does not rely on external, observable rewards (Bandura 1977). Teachers whose identity includes a strong sense of self can make the best of the social environment (Ganis, 2009) rather than feeling overwhelmed by the demands of interactions with students, other teachers, administrators and parents.

Social Learning Theory

Bandura’s social learning theory deals with the modeling process. Successful teachers generally serve as positive models of behaviors that are desirable in their students. As Cherry (2012) stated, “Bandura's social learning theory has had important implication in the field of education. Today, both teachers and parents recognize the importance of modeling appropriate behaviors. (Final Thoughts section, para. 13). Social Learning Theory is based on three concepts. According to Cherry (2012),

There are three core concepts at the heart of social learning theory. First is the idea that people can learn through observation. Next is the idea that internal mental states are an essential part of this process. Finally, this theory recognizes that just because something has been learned, it does not mean that it will result in a change in behavior. (Basic Social Learning Concepts section, para. 3)
These three concepts are essential for teachers to understand as observational learning is a common practice, mental states give insight into motivation and modeling is an important skill of effective teaching.

**Self-concept Theory**

Self-concept theory is an underlying concept of self-identity. In order to develop a self-identity it is necessary to organize learned beliefs, attitudes and opinions (Purkey 1988). This theory has significance to teachers and teacher preparation programs as Purkey (1988) stated, “Individuals have within themselves relatively boundless potential for developing a positive and realistic self-concept. This potential can be realized by people, places, policies, programs, and processes that are intentionally designed to invite the realization of this potential” (Summary section). This potential to develop a positive self-concept in teachers and teacher candidates should not be ignored. Purkey (1988), stated,

Self-concept may be defined as the totality of a complex, organized, and dynamic system of learned beliefs, attitudes and opinions that each person holds to be true about his or her personal existence. Self-concept is different from self-esteem (feelings of personal worth and level of satisfaction regarding one's self) or self-report (what a person is willing and able to disclose). (para. 3)

Self-concept theory may indicate whether an individual will remain in the teaching profession. As Purkey (1988) stated “Many of the successes and failures that people experience in many areas of life are closely related to the ways that they have learned to view themselves and their relationships with others” (Some Basic Assumptions section
para. 1). Therefore Self-concept theory deserves the attention of those interested in teacher education.

The study of self-identity has existed for many years. These learning theories form a basis for self-identity. Educational researchers have used these theories as a lens through which many facets of teacher education can be examined.

**Teacher Identity**

Teacher identity is more specific than self-identity in that it relates to the profession of teaching; however, it is closely related. Anyone that develops a successful professional identity must first have a stable self-identity. As we have learned from other theories and the work of previous researchers such as Bandura (1977) Social Learning Theory and the work of Carl Rogers (1947) on Self-concept theory, a person’s identity develops throughout their life. Although some talented teachers may be referred to as ‘a born teacher’ this is probably not the case. Teacher identity also is not a one-time accomplishment, as it is a lifelong, or career long process. Beginning with the idea that teaching may be an interesting and rewarding field, a teacher identity is built. From this concept on, whenever we measure the teacher identity we are likely to get different results (Beauchamp & Thomas, 2009, p.175). Teacher identity must include both construct and class identity. Fuller (1969) while studying the concerns of teachers found that certain elements such as classroom control were critical and universal concerns of teachers. Obviously, if the classroom is out of control behaviorally it will be difficult for teaching or learning to take place. Fuller (1969) also found teachers to be quite concerned by the absence of topics generally taught in teacher education programs to deal with such problems. This absence seems to imply an area of concern. Education students reported...
being most concerned about topics, which they felt were not adequately covered, or covered at all, in their teacher-training program. The transition from a student of education to a teacher changes their concerns from; what grade they will get in an education course, to more realistic concerns of surviving the first year of teaching. The debate, of how teacher-training programs should balance theory and the practicality of actual classroom teaching, continues to this day. Wilson, Floden, and Ferrini-Mundy (2001) prepared a report for the U.S. Department of Education concerning the state of teacher preparation. After extensive study of both traditional and alternative teacher education programs and a search for successful strategies being implemented by universities, school districts and others, no conclusive recommendations for best practices were made. Alternative programs for teacher certification/licensure, such as those examined by Wilson, Floden, and Ferrini-Mundy (2001), developed out of a growing need to fill newly created and newly vacated teaching positions. As Gratch (2001) pointed out, the political environment of increased accountability has taken a toll on the confidence (self-identity) of teachers, teacher retention and the supply of qualified new teachers.

The importance of developing professional identities to match the teaching environment is necessary. Beauchamp and Thomas (2009) stated,

We must then try to incorporate what we know about the contexts and communities and their influence on the shaping of teacher identities into our teacher education programmes to prepare new teachers for the challenges of developing strong professional identities in positive ways.” (p. 186)
Löfström, Poom-Valickis, Hannula, and Mathews (2010) conducted a study to see if variables could be defined that would predict the likelihood of a student entering, and remaining in, the profession of teaching. Another part of the study explored the possibility that university professors’ approaches affected the strengths of their students as teachers. Löfström et al. (2010) concluded,

As the study shows there are factors that appear to predict or be related to teacher potential in students. Future research needs to target how interventions such as those proposed above, impact on students’ thinking about teaching and a career within the teaching profession. (p. 182)

**Construct identity.** Construct identity is often discussed in terms of teacher training and seems to be a product of education reform. More of a team based identity; the concept is that there should be agreement on how to teach within the content area. The intermingling of professional identity and personal identity is a common occurrence for teachers (Beauchamp & Thomas, 2009, p. 179). Construct identity refers to an identity that is constructed in order to fill the requirements of a profession, such as teaching. It differs from self-identity, which is a normal phenomenon of human development. Constructing an identity that guides a teacher into the professional role of teacher is a combination of self and team development. While this may have some effect on a teacher’s confidence because the team approach suggests that since they are all teaching the same way it must be right, it does possibly stifle teacher creativity and the ability to individualize instruction.

**Class identity.** This is an important area of teacher training and closely related to self-identity. Everyone, teachers and students alike are part of a class of people. This is
just the nature of our society. This is an area that requires self-reflection and knowing your students. In many cases a teacher may be teaching students with backgrounds and social conditions very different from what the teacher has personally experienced. As Van Galen (2010) pointed out, “… that faculty in teacher education too often disregard the significance of deep class differences between themselves and many of their students…” (p. 253). Self-reflection exercises should be a part of teacher training.

Teacher candidates should be aware of their own social class and how their students may perceive social class. According to Van Galen (2010), “While we want teacher education students to understand the effects of deep structural inequalities in public schooling, they are essentially left on their own to theorize about class and about their own experiences of social mobility” (p. 255). Excellent teacher preparation programs will address these class identity issues and support teacher education in this area rather than leaving the teachers to understand class issues on their own. Teacher candidates should make every effort to understand their own class and identity that of their students in order to facilitate a better working relationship.

**Teacher Efficacy**

Teacher efficacy and teacher identity are related, but they differ in that efficacy deals with the teacher’s perception of their abilities to change or improve student learning. Studies funded by the Rand Foundation in 1976 began the examination of efficacy in teachers. Increased interest in teacher efficacy arose from studies that reported that it can influence student achievement (Denham & Michael, 1981). More recently Klassen, Tze, Betts, and Gordon (2010) reported, “Teacher efficacy—the confidence teachers hold about their individual and collective capability to influence student
learning—is considered one of the key motivation beliefs influencing teachers’
professional behaviors and student learning” (p. 21). Thus teacher efficacy spans two
dimensions, the belief in self and the belief in ability as stated by Barnes (2000),

Two dimensions of the construct that relate to teaching are general teaching
efficacy which is generally perceived as a belief in the power of teaching to
achieve results in the classroom and personal teaching efficacy as one’s belief in
one’s personal ability to achieve results. (para 5)

According to Gibson and Denbo (1984), teacher efficacy may account for
differences in effectiveness of teachers. They found that teachers with higher efficacy
tend to do better with challenging students. In terms of limitations, Gibson and Denbo
(1984) stated, “Although the importance of teachers' sense of efficacy has been identified,
researchers are not certain how to conceptualize and adequately measure the construct”
(p. 569). Research has established a significant relationship between teacher efficacy and
commitment to teaching. According to Ashton (1984), “Teachers with a high sense of
efficacy feel a personal accomplishment, have high expectations for students, feel
responsibility for student learning, have strategies for achieving objectives, a positive
attitude about teaching and believe they can influence student learning” (p. 29). Bandura
(1993) stated, “Teachers who believe strongly in their instructional efficacy create
mastery experiences for their students” (p. 140). Coladarci (1992) found, “The central
finding of the present study was that personal and general efficacy were the two strongest
predictors of commitment to teaching” (p. 334). Further, addressing the difficulty of
measurement mentioned by Gibson and Denbo (1984), a suggestion was made by
Coladarci (1992), “From a measurement perspective, the teacher efficacy literature also
would be enriched by more qualitative studies, such as those employing a think aloud methodology, in which teachers' thoughts are probed as they respond to teacher efficacy items” (p. 335). Henson (2002) found a substantial need for research in this area but a weakness in measurement problem. Henson (2002) stated,

The study of teacher efficacy has suffered from poor construct validity issues. Given recent substantive theoretical advances and new, better founded, attempts at measuring this elusive construct, it seems apparent that teacher efficacy is ready to move beyond the adolescent angst it has been subject to over the last few years. Assuming continued efforts are made to seek congruence between theory and measurement integrity, the study of teacher efficacy just may be ready for a move into adulthood. (p. 147)

Another aspect that makes measuring teacher efficacy challenging is the fact that teacher efficacy is not a static condition. Efficacy beliefs change throughout a teacher’s life and career, often based on changes in the work environment. Woolfolk Hoy, and Burke Spero (2005) stated, “Results indicated significant increases in efficacy during student teaching, but significant declines during the first year of teaching. Changes in efficacy during the first year of teaching were related to the level of support received” (p. 343). The significance of the perceived level of support and the effect on teacher efficacy suggests the need for research in this area. For example, how effective would teacher-mentoring programs or an online community of support be for supporting new teachers? What could administrators do to make the school environment more inviting and supportive for new teachers? One of the changes in the work environment that has an influence on teacher efficacy has been the reform movement. Jerald (2007) stated,
But the research on teacher efficacy suggests that the evolution will not be easy or automatic. If we want teachers to believe in the ability of all students to learn and to take responsibility for educational outcomes, we must take positive steps to help teachers believe in their own abilities as well. (p. 6)

Teacher efficacy often falls under the description of a teachers’ self-efficacy but we must also consider that teacher efficacy has two significant distinctions: 1. Content efficacy, which refers to how well the teachers feels they know the material that they are to teach, and 2. Classroom management efficacy, which relates to how confident the teacher feel about controlling the learning environment. Each of these concerns can be examined within collective teacher efficacy or teacher self-efficacy.

**Collective teacher efficacy.** Collective teacher efficacy is concerned with the general perceptions of how all of the teachers in a group feel about their ability to impact instruction. Hoy and Hoy (2006) defined collective efficacy as “…the shared perception of teachers in a school that the efforts of the faculty as a whole will have a positive effect on student learning” (p. 309). According to Hoy and Hoy (2000). “There seems to be little doubt that collective efficacy beliefs are an important aspect of an organization’s operative culture” (p. 10). Other types of efficacy are often mentioned under collective efficacy such as content and classroom management efficacy. Content efficacy describes the perception the teacher has for the school communities’ knowledge of the content not just the individual teachers’ content knowledge. Classroom management efficacy represents the entire school climate and overall behavior of the students. Stipek (2012) credits administrative and parental support with the formation of collective efficacy.
In their study Klassen et al. (2010), found that “perceived collective efficacy was a strong positive predictor of student achievement differences among schools even after accounting for the variance in achievement explained by students’ sociodemographic backgrounds” (p.7). The significance of these studies is that a common myth, that teachers cannot overcome certain disadvantages such as students’ economic status, are false.

**Teacher efficacy scale.** One proven method of measuring teacher efficacy is the Teacher’s Sense of Efficacy Scale (TSES), developed by Tschannen-Moran, and Woolfolk Hoy (2001). Many researchers interested in measuring teacher self-efficacy have used the TSES. Heneman, Kimball, and Milandowski (2006) administered the short form TSES to 1,075 classroom teachers (self-selected from a field of 3,228) which they found to be a representative sample. The authors used confirmatory factor analysis to analyze the factor structure of TSES using a principal components extraction with a varimax rotation. The results were similar to the exploratory factor analysis used by Tschannen-Moran & Hoy, 2001 confirming reliability of the 3-factor model. Coefficient alphas for the subscales and the total scores were quite high, ranging from .75 to .90. Heneman, Kimball, and Milandowski (2006) reported,

> Our results, coupled with those of Tschannen-Moran and Hoy (2001), suggest that the TSES should be the preferred measure of teachers’ sense of efficacy in future research. Its replicable psychometric properties, behavioral richness in capturing the teacher role, and predictive capacity for explaining significant variance in teacher classroom performance all support this conclusion” (p. 13).
Klassen, et al. (2009) explored the international applicability of the TSES using settings in Canada, Cyprus, Korea, Singapore, and the United States. This study (N = 1212) included teachers from elementary/middle schools (N = 709) and secondary schools (N = 502). Cronbach’s alpha reliability indices ranged from .71 for the TSE for instructional strategies subscale in the Canadian secondary teacher sample, to .94 for the TSE composite score in the Singaporean sample (p. 72). “The multigroup analysis with no constraints resulted in a baseline $\chi^2$ value of 588.47, df = 299, $p < .001$, with very good fit ($\text{CFI} = .979$, $\chi^2 / df = 1.97$, and $\text{RMSEA} = .028$), providing support for a common three-factor structure across the six groups” (Klassen, et al., 2008, p. 72). “These results suggest that the TSES shows measurement invariance across the six groups, with invariance of form, factor loadings, with mixed support for invariance of factor variances and covariances” (Klassen, et al., 2008, p. 72). This study offered 3 findings that can support and guide the use of the TSES: 1.) The three-factor model is statistically preferable, 2.) Items on the TSES demonstrate internal consistency in a variety of settings, 3.) Results from this study seem to indicate invariance across similar cultural groups but from different school types (p. 75).

Duffin, French, and Patrick (2012) examined the factor structure of TSES administered to 2 samples of undergraduate preservice teachers, sample 1 (N = 272) and sample 2 (N = 180). This study used the three-factor approach based upon the current level of preparation in their sample. Duffin, French, and Patrick (2012) explained, “We anticipated that the stage of teacher development - in this case, those preservice teachers at the beginning of their teacher education programs - would not differentiate between the factors like those pre-service teachers who were at the end of their teacher education (p.
Given this the three-factor model was selected and the three subscales were found to be internally consistent using Cronbach’s alpha. “The two samples [scored] respectively; SE (α = 0.89 & 0.92), CM (α = 0.91 & 0.94), IS (α = 0.91 & 0.94), and total scale (α = 0.96 & 0.97)” (Duffin, French & Patrick, 2012, p. 830). Factor abbreviations used by the authors in this report were: SE (student engagement), CM (classroom management) and IS (instructional strategies).

**Professional development for teacher efficacy.** True reforms will come from helping teachers change, not simply mandating change in an authoritarian manner without reason or guidance. Training that develops self-efficacy can begin a cycle that repeatedly produces desired outcomes. Hoy and Hoy (2006) stated, “Greater efficacy leads to greater effort and persistence, which leads to better performance, which in turn leads to greater efficacy” (p. 147). Hagiwara, Rivera, and Ramos (2011) recommended that professional development opportunities be aligned with goals and motivations of the individual and the collective group of teachers in order to influence overall efficacy levels.

Chong and Kong (2012) stated “Empirical evidence suggests that successful teacher professional development programs are intensive, ongoing, and connected to practice; focused on specific subject content; and foster strong working relationships among teachers” (p. 265). Akiba (2012) focused specifically on professional development for middle school math teachers. Policy Implications recommended by Akiba (2012) described effective professional development programs:

“...In these professional development programs, mathematics teachers are given ample opportunities to work with other teachers to analyze students’ mathematical
thinking, reflect on their own beliefs and ideas about teaching and learning, and
discuss various instructional approaches that promote student learning. It is likely
that mathematics teachers will participate in such activities as they value learning
opportunities focused on student thinking and knowledge.” (p. 27)

Timing of professional development seems to be an important consideration.
Although a teacher’s self-identity and self-confidence are always somewhat in flux, self-
efficacy maybe slightly more concrete, creating a good foundation for developing
excellent teaching skills. According to Hoy and Hoy (2006),

Once established, efficacy beliefs seem resistant to change. A strong sense of
efficacy can support higher motivation, greater effort, persistence, and resilience.
Consequently, helping teachers develop strong efficacy beliefs early in their
career will pay lasting dividends. (p. 148)

Pendergast, Garvis, and Keogh (2011) agreed, stating that they found that self-efficacy
beliefs are most easily formed in the first years of teaching and become more steadfast as
teacher experience increases. Professional development strategies, however, need to be
directed at teachers of all levels of experience not exclusively new teachers. Bolshakova,
Johnson, and Czerniak (2011) stated, “Notably, the teachers in this study who had taught
the longest had the lowest sense of efficacy” (p. 992). This study reinforced the findings
of previous studies that indicated a high correlation between increased teacher
effectiveness and high efficacy. Bolshakova et al. (2011) noted, “This study provides
evidence that links science teacher effectiveness (a potential consequence of teacher self-
efficacy) and urban classroom dynamics to student outcomes, particularly, self-efficacy
and achievement” (p. 991). Therefore, professional development, if it is to be effective for all students, needs to be provided to all teachers.

**Efficacy in other fields.** Business has been interested in self-efficacy of employees (Cherian & Jacob 2013) because of the possible correlation and ability to predict their performance. The search for personality traits that may predict retention of trained candidates and early practitioners is of high interest among many professions such as dental (Chamberlain, Catano, & Cunningham 2005), medical (Crossley, & Vivekananda-Schmidt, 2009), nursing (Freedman, Delaney, Schmidt, Quinn, & Macyk, 2013) and the military (Maddi, Matthews, Kelly, Villarreal, & White 2012).

**Summary**

Much of the research in this literature review has been seminal, beginning with the discussion of self-identity (Plato, Aristotle, 350BC; Rodgers, 1947) and moving toward using this knowledge to train today’s teachers. Teacher training has always been concerned with self-identity formation. Teacher training advocates (Fuller 1969) took a serious look at the formation and timing of the development of teacher personalities. Bandura (1977), with the development of Social Learning Theory, established the foundation for what became the study of Teacher self-efficacy in his work as well as others (Gibson & Denbo, 1984; Ashton, Buhr & Crocker, 1984). Today we know much about teacher self-efficacy and teacher self-identity but we continue to need direction on how to develop these positive traits in new teachers (Klassen, Tze, Betts, & Gordon, 2010).

The connection between education and economy (Tyack, 1974) has been developing over time and many of the citations used were from foundations and
partnerships concerned with this connection and our global competiveness. As is often the case we look toward technology for answers. STEM education plays a major role in all of this, and although not a total solution, could possibly reduce or eliminate many of the problems in education.

The U.S. educational system, despite criticism, continues to function. Unlike a motor vehicle it can’t be shut down or taken offline for repairs, nor is there any need to do so, as long as the system works. Improvements can be made however and it is the goal of this study to explore an attempt to suggest such improvements.
Chapter 3: Methodology

This chapter will present the overall choice of research methodology; because of the complexities of mixed method research, the beginning of the chapter will be devoted to that which is similar. The sample population, the selection method and the rational to study this group are common to both approaches. The choice to use mixed methods research is qualified based on what each method has to offer the study. After these have been established the research takes on slightly different directions, using different instruments and procedures to collect a diverse and sizeable array of data. Finally, all of the data collected will be compiled and analyzed in terms of the research questions.

Study Population

The method of selection in the present study is specific and theoretical which as Eisenhardt (1989) explained, “Focuses efforts on theoretically useful cases – i.e. those that replicate or extend theory by filling conceptual categories” (p. 533). This case study focuses on the 12 participants of the Woodrow Wilson Teaching Fellowship (WWTF) at a large Midwestern university. The gender division for this group is five females and seven males. The WWTF was chosen as a case to be studied for two main reasons. This is the first WWTF program targeted specifically towards the Appalachian region as an area of need and the program is designed to solve or alleviate the identified problems to be studied; STEM teaching shortages, teacher retention, teacher quality and student dropout rate. According to the WWTF website, (http://www.wwteachingfellowship.org) “The Woodrow Wilson Teaching Fellowship seeks to attract talented, committed individuals with backgrounds in the STEM fields—science, technology, engineering, and mathematics—into teaching in high-need secondary schools in Indiana, Michigan, and
Ohio”(home page). Applicants with these prerequisites may then enter into the competitive selection process to become a Woodrow Wilson Fellow.

One goal of the WWTF is that the fellows, once they have completed the program, will remain in the teaching field. One of the requirements stated on the WWTF website is that the fellows teach in areas of high need for at least three years (Commitment section). If the WWTF program manages to retain all of the participants for four years (one year training and three years teaching) of their commitment, this result would be considerably better than the national average. “In the U.S. 30% of new teachers quit in the first three years” (Graziano, 2005, para. 6). Evidence of the progress of this outcome during the first two years and some insight as to how it could be transferred to other teacher preparation programs could prove to be very beneficial. Researchers Ingersol, Merrill, and May (2012) have shown that quality teachers with high efficacy and positive self-identity are more likely to be successful and remain teaching longer. In a study concerned with why students drop out, Bridgeland, Dilulio, and Morison (2006) found that students that had dropped out reported that quality teachers, that taught in interesting and engaging ways, would have likely kept them in school. These are the types of teachers that the WWTF hopes to produce.

The 12 participants in the WWTF program have already obtained a degree in one of the STEM areas between 1999 and 2012. They are currently seeking their first Education Degree through WWTF and the partner university. This degree will be a Master’s Degree in Teacher Education. Ingersol et al. (2012) reported that this type of qualifications, a major in the field they are teaching and a significant amount of pedagogy is the greatest predictor of a teacher’s longevity in the field.
Mixed Methods Rationale

The research design for this study was a mixed methods approach combining a quantitative scale measure, the Teacher’s Sense of Efficacy Scale (TSES) developed by Tschannen-Moran and Woolfolk Hoy (2001), with an interview designed by the researcher and other qualitative data from the WWTF and the partner university. At least one researcher, Henson (2002) specifically mentioned the need for such a mixed methods approach for teacher efficacy research, though not directly with that terminology. Henson (2002) recommended the need for qualitative data collection methods such as conducting ‘think alouds’ to allow participants to elaborate why they responded as they did on the scale items (pp. 147-148). The two methods allowed greater detail for the data collected and as Patton (2002) described methodological triangulation, the use of multiple methods used to study a single program (p. 247). The combination of the TSES data and the rich descriptions from the participant interviews provided the most complete answers to two of the central research questions:

1. How do teacher efficacy scores taken during the WWTF program compare to scores recorded after the first year of solo teaching in their job placement?
2. What practices involved in teacher training do students feel contributed to their professional self-identity and their feelings of self-efficacy?

The concurrent mixed methods approach is a good fit for this study given the limitations of the quantitative approach that cannot be overcome, for example the small sample size, additional qualitative data is helpful.
Quantitative Approach

Instrumentation. The instrument selected to measure self-efficacy of the teachers in this study was the Teacher’s Sense of Efficacy Scale (TSES), developed by Tschannen-Moran, and Woolfolk Hoy (2001). The TSES asks teachers to rate how confident they feel about accomplishing skills related to teacher self-efficacy using a 9-point Likert scale. The long form (24 items) three-factor approach was selected for the current study based on the recommendations of the authors. A pretest/posttest assessment was conducted using this scale. The initial assessment was taken in April 2013, during the first semester of the WWTF and the second was taken May 2014, after a full year of professional teaching. The three factors identified by Tschannen-Moran and Woolfolk-Hoy (2001) are, Factor 1: classroom management; Factor 2: instructional practices; and Factor 3: student engagement. The scores for the three subscales and a composite, overall efficacy, score was obtained. Means and standard deviations were calculated. In order to compare the efficacy scores paired t-tests will be conducted noting changes in efficacy that occur across the two administrations of the scale.

Rationale for instrument selection. In the current study, mainly due to the small size of the population (N=12), it is necessary to examine the instrument selected based on previous research. The following studies have been included as they support the selection of the TSES for the current study based on similarities in population demographics, without the limitation of small size. These studies have allowed the researchers to conduct statistical analysis not possible in the current study due to the small population size of the current study.
The selection of this instrument and the choice to use the long form was based not only its ability to assess teaching efficacy but the fact that it captures efficacy from a wider range of teaching tasks than other measures. The topic to be studied must drive the research questions and method (Creswell, 2009; Patton, 2002; Yin 2003). In case study research the researcher must deal with many factors that are outside of researcher control (Yin 2003) such as the size of the population. Yet the obligation to address these factors must be fulfilled. In such cases it is necessary to look to other studies to show acceptable reliability and validity for instruments used that cannot be measured due to small population size. Previous research conducted by the authors and others has helped determine construct validity and has shown that the TSES could provide valid and reliable scores (Tschannen-Moran & Hoy, 2001). According to Tschannen-Moran and Hoy (2007)

To test the appropriateness of using the full TSES scale, we conducted a second-order factor analysis. All three factors loaded on a single factor (eigenvalue = 2.14) that explained 71% of the variance in teachers’ self-efficacy beliefs, with coefficients of .82 (Instructional Strategies), .70 (Classroom Management), and .74 (Student Engagement), respectively. Consequently, the full scale was used in the analyses. The reliability of the full 24-item scales was .93. Reliabilities for the teacher sense of efficacy subscales were .87, .88, and .84, respectively. (2007, p. 950)

Other researchers have supported the use of the TSES (Heneman, Kimball, & Milandowski, 2006; Klassen, Bong, Usher, Chong, Huan, Wong & Tasos, 2009; Fives & Buehl, 2009; Nie, Lau & Liau, 2012) both by direct analysis of the scale and by electing
to use and report the results of the scale in their work. The findings of these studies can reinforce the methodology and instrumentation choices of the current study. For example, Fives and Buehl (2009) discuss the problem of population size and the distinction between preservice and practicing teachers. The population to be studied (WWTF) will transition from preservice to practicing teachers during the course of the study. Given the extensive teaching experience gained through fellowship during the course of the program the WWTF participants will likely represent practicing teachers more so than preservice teachers. The choice for the current study is to treat the WWTF population more like practicing rather than preservice teachers. The TSES has been used to report results in two different conceptualizations, a one factor and a three factor. The current study will use The TSES long form and a three-factor conceptualization as recommended by Fives and Buehl (2009)

If there is not enough data for such analyses, the results of our investigation suggest that a one-factor solution is more appropriate for preservice teachers’ responses. However, the three-factor conceptualization of teacher efficacy appears to be appropriate for practicing teachers. Further, either the long or short form can be used with both practicing and preservice teachers. (p. 132)

Fives and Buehl (2009) concluded this based on their study of the factor structure of the TSES. The long form scale was given to practicing (N = 102) and preservice (N = 270) teachers. In analysis of the long form given to practicing teachers, Fives and Buehl (2009) concluded, “Horn’s (1965) parallel analysis of the data and the scree plot indicated that a three-factor solution was most appropriate, even though six factors had
eigenvalues greater than 1. The three factors together accounted for 57.09% of the variance in the data” (p. 126).

**Limitations.** The main disadvantage of this type of quantitative approach, using this midwestern university’s WWTF program, is the small sample size (12 student fellows). This limitation means that the data collected from such a small group may not generalize well to the total population of teacher candidates. The data collected on this WWTF by quantitative measures may be of value to this study as a means of supporting the selection of candidates for in-depth interviews and to further qualify their responses. This should be helpful in establishing patterns within the data that occur primarily within certain levels of self-efficacy and not in others.

**Delimitations.** The actual case to be studied set many of the delimitations for this study. The researcher set others. The time frame for this study began in the summer of 2012; the program set some dates. The participants were to receive teacher training during the first summer followed by two semesters of continuing teacher training along with a field placement in an area school for the 2013 – 2014 school year. In order to frame the experience the researcher decided to follow these participants through the first year of their employment as teachers and conduct the interviews in the fall of 2014. The participants for this study were selected by the WWTF, via a competitive application process; therefore, this process set all the gender, age, area of study and the number of participants.

Other factors that made this WWTF interesting and unique were: The program to be studied focused on developing high quality STEM teachers in Appalachia and that
they would graduate and go on to teach in schools of high need in Appalachia. This was the first time that the WWTF had taken on such a challenge.

**Qualitative approach**

The amount of data to be collected by qualitative means should be extensive and help to strengthen credibility and validity for the findings although the small number of participants does impact wider generalizability. Qualitative research methods can help answer the question: What aspects of teacher training do teacher candidates feel helped improve their self-efficacy? These types of questions would be best answered by more qualitative approaches, but then without comparing the responses to the level of self-efficacy of the participant, the answers are less meaningful. The need for both types of data leads the research method to a mixed methods approach. One important aspect of the study that qualitative methods allow access to is the examination of exit surveys. One participant has self-selected out of the WWTF program. Data collected early in the program includes a TSES pretest for this individual but no posttest. From a purely quantitative approach this participant would not qualify for the study, yet the possibility exists that his conclusions and views of the program may be quite relevant to the current study.

**The phenomenological single-case study.** The choice of research method is very important, but it should not be the first decision made. The research questions should guide the research, and according to Yin (2003), “The case study strategy is most likely to be appropriate for ‘how’ and ‘why’ questions” (p. 22). In the case of the WWTF an alternative path teacher licensure program has been specifically designed to counteract the contemporary educational problem of producing quality teachers to meet the current
and future stringent demands of the teaching profession. The ‘how’ and ‘why’ of the transition of these WWTF fellows from being the student to being a teacher are the basis of the initial research questions. How do students transition into the role of teacher? Why do beginning teachers have such a high rate of attrition? How can teacher training play a role in preparing teachers for longer service? Though these questions may change slightly during the study, the form of the question as a ‘how’ or ‘why’ should remain fixed allowing the strategy and research design to be selected. For this study the case study method seems well suited. As described by Creswell (2013),

Case study research is a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed in-depth data collection involving multiple sources of information (e.g., observations, interviews, audiovisual material, and documents and reports), and reports a case description and case themes. (p. 97)

This description seems to be a good match given the educational problems that are being discussed and the information that will need to be collected about this topic. Although, advice given by Yin (2003), “…when you have the choice (and resources), multiple-case designs may be preferred over single-case designs” (p. 53) seems to recommend against single-case design, however, the WWTF case is somewhat unique. Future studies will have the choice of multiple-case methods, but for now this WWTF case is a critical case for this type of teacher preparation in the Appalachian region.

Next year, WWTF will begin a second cohort at this Midwestern University. At this point, it would be possible to conduct a multiple-case study using two different cases. For this study of the initial cohort of the WWTF, it is the transition from student to
teacher that is of interest rather than the program. Therefore, the need for other programs to compare or contrast is not necessary at this time. In the future, any findings from this study could be compared to other WWTF studies that address this same transition or career change. According to Yin (2003), “As a research strategy, the case study is used in many situations to contribute to our knowledge of individual, group, organizational, social, political, and related phenomenon” (p. 1).

This case of the WWTF program consists of 12 individuals that are part of a group, a cohort in this case, sponsored by an organization, the Woodrow Wilson Foundation, who are seeking to achieve a common goal of becoming STEM teachers in public schools in SE Ohio. This common goal represents the transition from student to teacher that will be the phenomenon to be studied as Flyvbjerg (2006) states:

Phenomenological studies of human learning indicate that for adults there exists a qualitative leap in their learning process from the rule governed use of analytical rationality in beginners to the fluid performance of tacit skills in what Pierre Bourdieu (1977) calls virtuosos and Hubert and Stuart Dreyfus (1986) true human experts. (p. 222)

The goal of the WWTF is to have these 12 fellows make the leap from student to expert teacher. This leap or transition would be the phenomenon to be studied. The ‘how’ or ‘why’ question here also leans toward a case study as Yin (2003) stated, “a ‘how’ or ‘why’ question is being asked about a contemporary set of events over which the investigator has little or no control” (p. 9). Although most researchers see case studies as being qualitative, a case study can be either qualitative or quantitative (Flyvbjerg, 2006, p. 242). For this study I would like to look at the issue from both standpoints using a
mixed methods approach. Yin (2003) suggests five components of research design that are especially important (p. 21). Two of these components deal with propositions, stating them and linking them to the study. In this study, examining the transition from student (fellow, teacher candidate) to an employed public school teacher, the proposition seems to warrant a closer look at the teacher self.

The goal of this study is to observe the professional development of teacher candidates as they transition from their roles as students to their professional roles as teachers. Previous attention to this area of teacher development has focused on concepts derived from psychological studies and theories of the self. According to Ashton, Buhr, and Crocker (1984),

Teacher sense of efficacy was first conceptualized in two Rand Corporation studies. The 1976 Rand study of school preferred reading programs in Los Angeles, conducted by David Armor and his colleagues reported a strong and significant relationship between teachers’ sense of efficacy and increases in students’ scores on standardized reading tests. (p. 4)

Albert Bandura’s Social Learning Theory (1977) and Social Cognitive Theory (1989) have led to further research of teacher self-efficacy, which has been shown to be a variable accounting for differences in teaching effectiveness (Gibson & Denbo, 1984). Teacher efficacy can also be useful in predicting a teachers’ success within their career-increased likelihood of enjoying the work and remaining in the field. According to Hoy and Hoy (2006), “Greater efficacy leads to greater effort and persistence, which leads to better performance, which in turn leads to greater efficacy” (p. 147).
According to Bandura (1986), “Perceived self-efficacy is defined as people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performance” (p. 391). Klassen, Tze, Betts and Gordon (2010) stated, “Teacher efficacy—the confidence teachers hold about their individual and collective capability to influence student learning—is considered one of the key motivation beliefs influencing teachers’ professional behaviors and student learning” (p. 21). Research seems to show teacher self-efficacy as a strong indicator of both teacher quality and likelihood of remaining in the profession. Teacher self-efficacy has been shown to be very important to education yet the term is a conceptualization, which can be problematic for a dependent variable.

According to Best and Khan (2006), “Such variables as giftedness, academic achievement, and creativity are conceptualizations that are defined in dictionary terms. But because these aspects cannot be observed directly, they are vague and ambiguous and provide a poor basis for identifying variables” (p. 10). Conceptualizations have also proven difficult to measure. The term giftedness, if defined as exceeding a standardized test score, can then be measured and understood more clearly. The difficulty here in measuring teacher self-efficacy, a proposition, and linking it to the study, as Yin (2003) suggests, warrants a mixed methods approach.

**Participants.** The interview participants, ideally, would be the entire membership of the WWTF cohort one, all 12 of the Woodrow Wilson fellows. Initial requests were emailed to all 12 participants using the WWTF contact list provided by the university. Although it was the intent to interview all of the participants face to face, the first interview was the only one that followed such a format. The WWTF intended to place
these fellows in areas of high need in Appalachia, however, the economic reality of getting hired led to placements scattered all over Ohio (see map).

Figure 1. Map showing WWTF job placements 2013-2014. Push pins are used to indicate county of employment not exact location.

The remaining interviews were completed by phone. Participants were given the choice of real-time virtual face-to-face Internet interviews, however, no one selected this option.

Once interviews started, a version of snowball or chain sampling (Patton, 2002, p. 242) was used to obtain the next participants. After the first interview, the researcher asked the participant to recommend the next participant. This personal recommendation process played out on Facebook and text messaging. It produced more up to date and
more often checked email addresses than the ones on the original list. It also produced cell phone numbers allowing the researcher to text participants, which seemed to produce more prompt replies. After the initial waves of interviews stalled, these types of contacts were used to offer the remaining three participants a final chance to take an abbreviated interview, promised to take less than 15 minutes. This shortened interview would have focused directly on the themes from the previous interviews. Despite this fairly aggressive multi-modal approach there were two nonrespondents and one non-interviewed. The non-interviewed participant did contact the researcher, verbally agree to and attempted to schedule an interview but was then unable to make the appointment. Since 100% participation could not be achieved a wave analysis (Creswell, 2009) was conducted. Wave analysis indicated no difference in the responses over the interview period, once contacted, the later interviewees were just as enthusiastic and their responses were similar to those of the early interviewees. The analysis indicated that the similarity in responses along the determined themes that had occurred in the first waves of interviews were unlikely to be different in the missing three interviews.

Demographics for the nonrespondents. By gender two of the nonrespondents were female and one was male. By subject taught both of the female nonrespondents teach math. This was disappointing because of the percentages that these two nonrespondents represent: two of the five math teachers and two of the five women (40% of the women and 40% of the math teachers). The one male science teacher that did not participate was less problematic because he represented only 20% of the group of male science teachers and 14% of the males in general.
**Instrumentation.** The primary instrument was an informal semi-structured interview. The objective was to make the interview more like a discussion where the participant can tell their story in two parts. The first part concerns the WWTF program at the university including their field placement experience. The second part is designed to collect their reflections on their first year of teaching. Demographics are available in WWTF records so these types of questions were skipped.

Part one was designed to allow the participants to describe their experience in the WWTF program; the following questions were used to guide the discussion:

1. How did you hear about WWTF and what prompted you to apply?
2. What components of the WWTF were the most beneficial to you?
3. Could you describe role of Facebook for you and your cohort?
4. Do you have any suggestions for future programs?

Part two was designed to allow the participants to describe the first year of their teaching career. The following questions were used, if necessary, to guide the discussion.

1. Did you have any problems with student behavior?
2. Did other staff or the administration support you?
3. What were your class sizes?
4. Did you feel you had control of your teaching time and planning?
5. Do you feel you will continue to teach after the 3-year commitment?

**Limitations.** The case for this study actually set some of the limitations for this initial study. At this time the specific interest of examining an alternative teacher licensure program in Appalachia poses a single case design. Next year Ohio University plans to conduct another WWTF cohort. As this second WWTF program develops
similar data could be collected and a multiple case design study could be conducted. The other limitation of time and access to the participants, because it was not built into the teacher-training program, was difficult. The WWTF programs are intense and much faster paced than traditional teacher preparation programs. This pace left very little time for anything that the professors or the students felt was an additional request for their time.

The Researcher

I am an Appalachian educator, now retired from teaching in the Ohio public school system after just over 30 years of service. I started teaching in language arts, English and reading, moving freely through grade levels year by year from high school English to first grade reading. STEM education, for me, didn’t really begin until around 1980 when I put together one of the first elementary school computer labs in my area. This interest in technology led me to pursue a Master’s degree in instructional technology, which I completed in 1999. As a researcher, I should note here that both of my degrees were traditional route programs. The initial degree was a 4-year program with just one quarter of student teaching. The master’s degree was a 2-year endeavor as an individual nontraditional student. I continued to teach full time while taking my college courses, a mix of evening, weekend, summer and online classes. Although my route was traditional, and worked well for me, I feel no bias towards any particular route to teaching and believe there is no perfect system.

My involvement with the WWTF began in the spring of 2012 while I was taking classes in pursuit of a Ph.D. in instructional technology. My advisor told me that WWTF was planning to start a cohort here in Appalachia and they were looking for a student to
help support technology and provide some instructional design. I was employed by the university to provide some training to the WW Fellows and support for instructors as needed. I also set up email listserves for everyone involved, separate one for the instructors and staff and a separate one for the fellows. I set up the Blackboard interface for the WWTF, which included discussion board and wiki spaces for collaboration. I was employed as support staff, not as an instructor, other than a few presentations that I did for classes most of my work was done in the background.

My interest in alternative route programs such as WWTF is founded on my belief that because people and their lives are so different, and because our need for teachers changes, there needs to be more than one path to becoming a teacher. This study is an examination of such a path.

**Summary**

This chapter described the population of the study, including the changes that naturally occurred due to participant dropout and the volunteer nature of the qualitative interview participation. A rationale was given for the choices of mixed methods design and the selection of the quantitative instrument (TSES) used. Limitations of the small sample size for quantitative data collection were discussed. The phenomenon of students transitioning to teachers and the development of teacher identity and teacher efficacy was identified. The interview questions were presented along with a rationale for their creation and the method of interview participant selection was detailed. Finally, the researcher outlined his personal path to becoming an educator and researcher thus exposing a deeply rooted interest in this study.
Chapter 4: Data Analysis

The intent of this chapter is to explain how the data was collected and to explain the findings. The WWTF field experience supervisor gave the TSES; all of the data analysis from the TSES were conducted and reported by the researcher. The researcher conducted the interviews.

The nature of mixed method designs can complicate the reporting of results. Such things as the population, which began with all 12 of the WWTF participants completing the pretest, changed when one participant dropped out of the program. The quantitative data is therefore based on a population of 11, five women and six men. The qualitative results are based on the same population but participation was voluntary. All 12 WWTF participants were invited to participate however only nine in-depth interviews were conducted on six males and three females. Interestingly one of the interviewees was the participant that did not finish the program. The data from this interview added to the study but the teacher efficacy scale could not be included as no posttest was available. Because of the complexity of this method, results will be presented first by research method and then finally blended in the chapter summary.

Qualitative Results

The interviews. Chronologically, the interviews began by the researcher asking how the participant heard about the program and what made them decide to apply. Coding the responses to this question created the first theme (Saldana, 2009) and a new classification for the WW Fellows. In their answer to this question, or in the discussion that followed, it became clear that there were two distinct differences among the applicants: Those who were undergrads when they decided to apply and those who had
graduated previously and had experience working in some post-graduate position. In field notes these themes were labeled the next step participants and the second chance participants. There were four second chance participants and five next step participants.

Table 3

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</tbody>
</table>

Coding the interviews. The transitional nature of the case resulted in three major categories, one for each phase of the case. The first phase, coded as WWTF as students on campus, occurred during the summer sessions on campus. The second phase, coded as WWTF as teacher practitioners, occurred during fall and spring semesters when the participants completed their fellowships at local schools. The third phase, WWTF alumni as professional teachers, occurred during the full time professional teaching year. Each of these categories had sub themes that surfaced in the interviews (see figure 2) leading to
the final interview question: Do you feel you will continue to teach after the 3-year commitment?

**Figure 2.** Coding Diagram shows the flow of the interview and the coding labels assigned to each section.

**WWTF as a student.** The first major category was *WWTF as students on campus* during this part of the interview the participants were asked about the most useful and most enjoyable parts of WWTF. One of the most commonly cited advantages of the WWTF mentioned by the interviewees was the comradery that developed within this cohort. This theme of *comradery* among the cohort emerged in every interview. The following examples of this theme were taken from interview transcripts, in order to preserve anonymity of the participants only interview numbers along with a letter M for
male and F for female will be attached to each statement. In the theme *comradery* these teachers said,

1M: We went from 12 strangers in the beginning to a cohesive group we became bonded that summer and that has never really gone away.

3M: My cohort members were awesome; we developed a very close bond with each other we would go out, support each other. Because a one-year program is pretty strenuous especially when you throw in student teaching with working on a master’s thesis all in the same year.

6F: Our cohort, we were just extremely close all the way through that whole year and it was craziness, I don’t know if it was just because it was the first year, we were the first cohort to go through or everybody was kind of learning. The professors were learning along with us what was working and what wasn’t um and I think personality wise we all just seemed to click really well together to the point where we still stay in touch with each other to a lesser degree [now] because we’re all spread out all over the state.

*The three-hour break*. The first summer sessions of WWTF at this Midwestern university had a schedule that started with classes in the morning then a three hour break followed by afternoon classes. The three-hour break was free time for the students. The classes were all in the same room and no other classes were conducted in this room during the break. Although the students often went out to lunch, the room was always available if they chose to stay. One non-reproducible element of this case was a freak summer storm, a derecho, which caused a power outage that affected the town for nearly a week and the surrounding area even longer. Temperatures following this storm were in
the 90’s and the humidity was very high. Because the university was on a higher level of
distribution, electricity was more quickly restored on campus. This disaster caused many
of the students to elect to stay in the air-conditioned comfort of this classroom where
laptops, phones tablets and other electronic devices could be charged during the break.
This disaster for the community became an advantageous environment for building a
collaborative, supportive peer group within the WWTF.

There were differing opinions as to how this opportunity for collaboration and
comradery building occurred. In the interviews, most students felt it was just a fluke of
scheduling between instructor time and room availability. Instructors, when asked, leaned
more toward the deliberate intention to provide the time and space to allow this to
happen, although certainly the summer storm was not part of any plan, and human nature
(successful collaboration) cannot be planned. This opportunity represents an
uncontrollable variable in the reproducibility of this study. It is impossible to predict if
providing such a time and space would even be productive at all for a different cohort,
much like the proverb, “You can lead a horse to water but you can’t make them drink”
(Old English Homiles, 1175). Another cohort means a whole new set of variables ranging
from where they were living, (one interviewee stated that at the beginning she stayed
simply because her commute was too long to be worth driving home) to outside interests
(one fellow was running his own business while participating in WWTF and stated that
he rarely had time to stay between classes) to the unpredictability of human relationships.
There is no 100% certain way to predict that a group will develop the sense of comradery
described by every interviewee as a positive aspect of the program.
8M: Yeah it was great cause most of us just stayed on campus, stayed in McCracken and it was good for, I mean that’s how most of us got close, staying for lunch. Yeah that break really brought us close and gave us a chance to work on the same projects and assignments and bounce ideas off each other. Probably was just a scheduling thing that they had to do and we kinda like made… I forget, the whole summer we were in the same room in McCracken pretty much the entire time and we just made that our home base and again that helped a lot too.

5M: Yeah I did. It was a good time to get work done and just relax better than… I don’t know just going straight through I think. I mean it’s not like we had a job we had to get to.

**Technology.** In many aspects of technology the WWTF instructors suggested but did not mandate the use of university provided technology. This was apparent in two areas, campus email and Blackboard. The failure to require participants to use their university supplied campus email created communications problems, which were apparent by the large numbers of bounced messages and the flood of error messages from the email administrator. Rather than create a listserv using campus email addresses, the fellows were asked to provide their email of choice, which included gmail, yahoo mail, and other outside email providers. This produced an onslaught of permission problems when these outside email users tried to send or forward messages. Campus email, on the other hand, is considered trusted and is generally not blocked, quarantined or spam filtered (although it is more size restricted). There was a pattern in disclosure by the interviewees in the need for more technology instruction. The second chance participants
were the most obvious in mentioning the need for more technology instruction, including perhaps a dedicated class as indicated here:

8M: As far as technology goes in the program, as a non-traditional student, just going back to a Master’s Program alone was terrifying. Everything that OU wanted us to do there was myself and of course [actual name withheld] that was in my cohort, we had gone through OU at the same time. We’d gone through at the time where you still had to call up to schedule classes.

8M: WW probably didn’t focus on um, just because of the shortness of time, but the one thing we didn’t do, and I understand why, I understand that they took out, but they were talking about putting back in was a technology class, because I understand that going into a classroom you are going into classrooms everywhere from blackboards, to Smartboards, to Elmos, to you know, all these different things.

Though not specifically admitted as a problem with technology some of the next step participants stated things that indicated that more help with technology might have been needed. For example this next step participant, while discussing Facebook, mentions a lack of knowledge or comfort using a Blackboard wiki. This was a perception he felt to be universal in the cohort.

12M: The Facebook page is great. I know they recommended wiki spaces but none of us were really familiar with that at all at that point. Facebook was just easiest for all of us to stay in contact with each other.

Facebook. Another theme that emerged in the interviews that was not a planned, expected outcome of the WWTF was the development of a student owned Facebook
Following the pattern of not insisting upon the use of new university provided technology, the participants elected to start their own Facebook page rather than use Blackboard for online collaboration. This choice, like the choice to use their existing email, demonstrated a definitive preference for using familiar technology and not investing the time to learn new technology. This development was described in the following interview comments:

2M: the Facebook page had two purposes we use it less now than we used to. But occasionally someone will post something, ask if anyone else is getting bogged down by something particular like, um, the next generation assessments deadline or something like that so it serves as a professional tool, but more important for me at least, like group even if it was like a group venting session and that’s more important for me having people that I care about that are going through the same things and we can talk in a safe space is invaluable.

8M: The Facebook page is great. I know they recommended [blackboard] wiki spaces but none of us were really familiar with that at all at that point. Facebook was just easiest for all of us to stay in contact with each other. Yeah I’m pretty sure everyone had Facebook at that point already.

9F: Yeah, at least we… there were five of us that were math specific in our licensure and while we were doing our internship we would share different activities or lessons that we really thought we’d hit home on that we might want to use later or that someone else might be able to benefit from and so that’s what we’d use Facebook for a lot. Then our OU Blackboard we used that occasionally for that also, but now that we’re out in the real world I guess we use Facebook a
lot to keep in contact about what’s going on in our district um if we have I know like the OCTM Math conference all there were 4 out of 5 of us that went to that so we communicated that on Facebook.

**Overall satisfaction.** Most of the teachers interviewed mentioned specifically their satisfaction with the instructors and the instructional program of the WWTF.

4M: I enjoyed the program and the instructors, so I feel like the whole curriculum program at [this Midwestern university] was structured really well and really prepared me.

5F: Really good um… just instructors. Dr. [instructor name spoken in interview was withheld here] was just phenomenal. I don’t know if that’s necessarily a Woodrow Wilson thing or just [the partner university] thing but it seemed like we had some outstanding instructors. Our instructors were really invested in making sure the program works and that we prepared and that we were good representatives once we got out into the real world.

9F: Now that I’ve started teaching I would say um… there were some of the curriculum and type classes that we took where we had to write lesson plans and research different types of learning styles and things like that and work on taking lessons and breaking them down into specific extensions and interventions, um, those classes, like, really helped me to prepare me for what I have to do for my actual job.

**WWTF as teacher practitioners.** The theme *full year teaching placement* was based on the full year field experience also called the fellowship that the participants
completed at local schools. Participant rated this experience highly and it was shown a good deal of appreciation,

4M: One thing that was really beneficial, I would say the most beneficial and I would hope maybe some others would say this as well was the full year placement in the classroom. We were able to see how the school year starts and ends and the transition, how things transition throughout the year. For some of us it allowed us to get involved in the school where we were teaching. Like for example, I coached JV baseball.

6F: I would say probably one of the most valuable was being able to have that whole year we spent in the classroom.

8M: Having that full year was great, we started going three days a week in the beginning of the year and then we were going full time yeah I don’t think I’d change anything in the structure [of the program].

Facebook for practitioners. Although mentioned before in the WWTF as students on campus phase Facebook never really went away in the other two phases. In this section Facebook played a larger role as the physical connection became less prevalent. There was also a greater need to share such things as activities and lessons as the fellows were now actively teaching in their field placements.

3F: Yeah, at least we…there were five of us that were math specific in our licensure and while we were doing our internship we would share different activities or lessons that we really thought we’d hit home on, that we might want to use later or that someone else might be able to benefit from and so that’s what we’d use Facebook for a lot.
**WWTF alumni teachers.** The second category was the first year of employment as a licensed teacher. These first-year teachers were asked specifically about classroom management, support, from administrators and mentors and for their feelings about control of instructional strategies. They were also asked about their grade assignment and class sizes. At the end of this discussion these teachers were asked if they plan to teach beyond their three-year commitment.

**Classroom management.** Every teacher interviewed mentioned problems with classroom management. The degree of difficulty in this area was diverse; some reported severe problems while others just reported what they described as typical first-year teaching problems. At least one fellow reported that if they leave teaching, classroom management problems would likely be the reason.

6M: I had a serious coming to grips with, uh… the lack of respect and it’s not that I take it personally when students don’t respect me because I’m an authority figure and they should because I have certification it’s just that I was surrounded by people that respected those above me and never needed a reason to respect those people. It wasn’t something they had to earn.

Yeah I did have difficulties being a disciplinarian, I still have difficulties with that and that is my…if I leave teaching that will be the reason because I feel like I am more of an academic than a disciplinarian.

11M: Yeah and I think everybody has a different line about what is and what isn’t acceptable in their room so, um, I’d say the biggest problem I had last year in my teaching was that I didn’t quite know what the lines were with other teachers, having not been there, like was I acting more strict than other teachers? Was I
acting too lenient compared to other teachers? Um, I wasn’t super clear on what the discipline policy was.

1F: It was pretty terrible honestly um I did my student teaching in high school and then my first year teaching, the only job I could find was at a charter school teaching 7th and 8th graders and middle school is very different from high school. I was not prepared to deal with middle school.

9F: Yeah I would say that managing student behavior has probably been my biggest struggle.

3F: I did and that’s honestly that’s one of my biggest struggles is classroom management.

**Support.** The support for dealing with first year teaching problems came from different sources and some areas of support that were found to be helpful to some teachers were worthless to others. The theme *support* drew widely varied responses due to diverse employment opportunities available. Since each school district that hired WWTF alumni had a different set of administrators, principals, fellow teachers and mentors, experiences at each school were quite different. The successes of such programs as the Ohio Resident Educator Program depend on the actual implementation at the district level. When done correctly, this mentor program can be a valuable asset that helps new teachers survive their first year.

1F: [My] Resident Educator mentor was next door and he had been at this school for about five years. He was very helpful and supportive and never really critical and offered me suggestions
8M: Well this doesn’t have anything to do with WW, but now the state of Ohio requires new teachers to go into the resident educator program, which means you have a mentor. I was lucky in that my mentor was across the hall with 42 – 43 years of teaching.

12M: One of the other math teachers was my mentor teacher and she helped a lot, she helped more with the general like doings with the school and how all that works.

Other students had less than perfect Resident Educator Program experiences. One student described having a mentor that worked with her and another newly hired math teacher,

9F: I mean my mentor teacher last year was a kindergarten teacher so you know she was wonderful I had one of her students in my class, so I think that’s er one of her children was you know mine and she could only help so much I mean she couldn’t help with curriculum or with behavior because it was so different. She was there any time I needed to talk. I don’t feel like I got anything out of the resident educator program.

Participants reported a similar range in support from administration.

S1: The administration, some of them were helpful and some of them were not, my immediate supervisor would come in the classroom and yell at the kids and ask me why I was doing certain things. I’ve been told that that’s very wrong for an administrator to do. And she was kind of like, everyone is always doing something wrong, and say like, why are the students acting like this? and why can’t you get them to work quietly? There was always something wrong with what I was doing and that was not helpful to me.
11M: Our principal was not great, she actually retired half way through last year and then we had an interim principal that was the bomb.

Other fellows felt well supported by administration,

8M: I had a lot of support from administration the ones that hired me the other math teachers the other teachers that teach seniors.

Instruction. Instructional strategy issues were reported to be important by all of the teachers interviewed. Their comments, however, generally indicated a lower priority during the first year of teaching than they would have preferred.

8M: I feel that the influence of the standards is increasing the influence on the curriculum. Um last year I didn’t hear… I’m hearing a lot more about it now. In all fairness last year I was just trying to keep my head above water.

11M: Yeah. I knew the first year was going to be a struggle and it was going to be me making everything from scratch. The textbook was nice to have because then I had access to worksheets and other materials. The hardest part was not getting to do all the labs that I wanted to do.

Less than ideal placement. Actual job placements for WWTF were often less than ideal. This was not a fault of the program (in most cases) just the nature of the job market in education in the mostly rural Appalachian area. It is difficult to obtain ideal placements because that would entail the ideal combination of many elements, such as geographic location, grade level and specific subject matter and many other personal considerations. Some of the teachers expressed this in their interview,

9F: last year [first year teaching] it was 4th grade. It was a little bit of a lower grade than what I’d hoped to get. 31 [students] in one class and 30 in the other.
11M: The only thing that is not ideal about where I teach is the fact that it is a rural school, which is ok with me but the pay differential between where I live which is in Circleville and Westfall which is only separated by 8 miles, starting teacher pay is something like $7,500 difference.

The one teacher that made a recommendation for the WWTF that she felt would have helped with job placement stated,

1F: One of the big things for me in science especially you specialize in chemistry or biology or earth science but then when you get out into the schools they want you to be integrated science. There are more and more schools that are looking for integrated science. And that wasn’t really something that they made seem like it was a very big deal or something we were even allowed to do and then my first year looking for a job I had a lot of trouble finding a jobs. A lot of schools wanted you to be integrated science. They would call me for an interview and they would be like, are you just life science? And I’d be like, yes and they’d say oh well we kinda need someone to teach this and biology. So I don’t know they need to make that like an option or at least address the, you know you should try to get the [integrated science] license so you can be marketable to find a job when you’re done.

**Current role of Facebook.** The student created WW Facebook page continues to serve these teachers. Interview comments from the participants emphasized the importance and usage of Facebook through their first year of teaching. Every participant interviewed mentioned the current use of Facebook. Most comments were similar to these,
8M: We still keep our Facebook page up the WW FB page we set up. We still talk on FB I still follow have everyone else is doing we still share stories and you know. Like I know for a fact that one… like last year when we would go through hard times, um you know we all kind of shared it with each other cause we were all going through the same thing.

11M: We still use it, like once a week someone posts something in the cohort one Facebook page, like what’s going on or if someone’s having trouble or if someone needs to vent or someone finds something funny or if something like an inside joke or something that pops up from one of our students someone will link it onto the Facebook page.

**Teaching career prediction.** The final question, strategically placed at the end of the interview, asked these teachers if they planned on staying in the field of teaching beyond the WWTF commitment. Themes that emerged were *Yes, I plan to fulfill my commitment* (which had sub-themes, I like teaching but *I may move to a better school* and *I may leave teaching but remain in education* on a different level).

*Yes, I plan to fulfill my commitment* answers,

8M: Yes, I love to teach. I’ve done enough other jobs and I’ve… they’ve lost their luster after a certain amount of time.

11M: Oh yeah. I knew this is exactly what I wanted to do when I started student teaching

*I may leave teaching but remain in education* on a different level answers,

2M: I’ve thought a lot about this and I… don’t know. I’m a little skeptical that I would. Maybe start a database of online teaching resources.
12M: um I… I think I will for a while. I don’t know if it’s a career thing for me or I’d like to go into higher Ed maybe uh but I like where I’m at now for the foreseeable future, uh but it is something I think about a lot like sometimes if you have a bad day, you’re like do I really need another year and a half of this? This isn’t really a bad way to make a living, but in another 5 years will I be teaching still?

Although several times in the interviews teachers suggested reasons that they might leave teaching, which implies that they have considered this option, no one stated directly that they planned to quit as soon as they could.

**Quantitative Results**

**Sample.** During the WWTF cohort one, the size of the study population changed from 12 (7 males and 5 females) to 11 (6 males and 5 females). This change was due to the decision of one participant to withdraw from the program just before graduation. Information was gathered and used where appropriate for this participant because in many ways he represents the problem that this study intended to investigate.

**Instrument.** The Teacher’s Sense of Efficacy Scale (TSES) Tschannen-Moran and Woolfolk Hoy (2001) was used to measure the participants’ self-reported levels of teacher efficacy. The TSES is a 24-item assessment that asks students to rate, on a 9-point scale, how confident they feel about accomplishing skills related to teacher self-efficacy. The TSES, according to Duffin (2012) “has consistently been shown to represent three distinct, but related latent factors associated with three areas of teaching: Efficacy for Classroom Management (CM), Efficacy to promote Student Engagement (SE), and Efficacy in using Instructional Strategies (IS)” (p. 828). These factors were
used for the dependent variables in the current study and were given variable names with a number added to indicate point of administration such as $SE1$ which represents the TSES student engagement (SE) factor from the 1\textsuperscript{st} (pretest) administration and $SE2$ indicates the 2\textsuperscript{nd} (posttest).

**Reliability.** “The TSES scores for the three subscales and the total scale have been found to be internally consistent (Cronbach’s alpha) in previous research (e.g., Tschannen-Moran & Woolfolk Hoy, 2001); they were also in the current study for the two samples respectively; SE ($\alpha = 0.89$ & 0.92), CM ($\alpha = 0.91$ & 0.94), IS ($\alpha = 0.91$ & 0.94)” (Duffin, 2012, p. 830). The following table shows Cronbach’s Alpha for each of the three subscales in sample 1 (pretest) and sample 2 (posttest).

Table 4

*Internal Reliability for the TSES Three-factor structure*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Sample 1 ($n = 12$)</th>
<th>α</th>
<th>Sample 2 ($n = 11$)</th>
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<tr>
<td></td>
<td>Number of items</td>
<td></td>
<td>Number of items</td>
<td></td>
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<td>Instructional Strategies</td>
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<td>.560</td>
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<td>Classroom Management</td>
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<td>.943</td>
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**T-Test.** A paired-samples t-test was conducted for each of the three subscales, to compare the sense of self-efficacy reported by the Woodrow Wilson Fellows during their teacher preparation program and the sense of self-efficacy that they reported after their first year of actual teaching. There was no significant difference in the scores for $SE1$ ($M$
= 5.87, \(SD = 1.08\) and SE2 (\(M = 6.05, SD = 1.05\)); \(t(10) = -.49, p = .635\). There was a significant difference in the scores for IS1 (\(M = 6.34, SD = 7.4\)) and IS2 (\(M = 7.41, SD = .494\); \(t(10) = -2.71, p = .022\). There was no significant difference in the scores for CM1 (\(M=5.95, SD = 1.5\)) and CM2 (\(M = 6.46, SD = 1.37\); \(t(10) = -1.11, p = .292\).

**Scale scores.** TSES scores by gender did not show a difference between efficacy levels.

**Table 5**

*TSES Scores Female*

<table>
<thead>
<tr>
<th>Student</th>
<th>SE1</th>
<th>IS1</th>
<th>CM1</th>
<th>SE2</th>
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<tr>
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<td>6.75</td>
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<tr>
<td>Mean</td>
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*Note:* Headings indicate the factor and the administration. For example SE1 indicates Student Engagement and 1 indicates pretest, SE2 indicates the same factor, posttest score. IS indicates Instructional Strategies and CM indicates Classroom Management.
Table 6

*TSES Scores Male*

<table>
<thead>
<tr>
<th>Student</th>
<th>SE1</th>
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<th>CM1</th>
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<td>5.96</td>
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</table>

*Note:* Headings indicate the factor and the administration. For example SE1 indicates Student Engagement and 1 indicates pretest, SE2 indicates the same factor, posttest score. IS indicates Instructional Strategies and CM indicates Classroom Management.

**Discussion.** The WWTF participants filled out the TSES at two very different times, the first time they were graduate students in a teacher education program and the second time they were teachers in the field with one full year of experience. Efficacy levels show very little difference between genders. The scores show little change between the two administrations, they generally fall into the range of seven “Quite a bit” to nine “A Great Deal” (Tschannen-Moran & Woolfolk Hoy, 2001, p. 1). This would seem to indicate that these teachers not only started with, but also maintained, a high level of efficacy throughout the WWTF and their first year of teaching. This minimal change in efficacy could indicate that the WWTF at this large Midwestern University did a good job of realistically preparing these teachers for their profession. The teachers in this study
as a whole do not seem to have suffered the shock of reality that can cause drops in self-efficacy after the first year of teaching (Swan, Wolf & Cano, 2011).

The TSES scores showed changes that prompted the researcher to match the individual to the qualitative data collected by interviews and document analysis. For example Student 1 dropped in all three factors.

Table 7

*TSES Scores Student 1*

<table>
<thead>
<tr>
<th>Student</th>
<th>SE1</th>
<th>IS1</th>
<th>CM1</th>
<th>SE2</th>
<th>IS2</th>
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</thead>
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</table>

*Note:* Headings indicate the factor and the administration. For example SE1 indicates Student Engagement and 1 indicates pretest, SE2 indicates the same factor, posttest score. IS indicates Instructional Strategies and CM indicates Classroom Management.

Data analysis of WWTF records indicated that Student 1 did a fellowship in a public high school in Appalachia, indicating a preference for geographic area and grade level. The actual teaching position was very different. The job market at the time only offered a 7th and 8th grade position at charter school in an urban area. Data collected during the interview of Student 1 emphasized the *Less than ideal placement* theme.

It was pretty terrible honestly, um, I did my student teaching in high school and then my first year teaching, the only job I could find was at a charter school teaching 7th and 8th graders and middle school is very different from high school. I was not prepared to deal with middle school, [be]cause you know the classroom management where I was, was more applicable to high school, whereas, middleschoolers [middle school students] are very different and almost need to be
treated more like a child. I was trying everything and they were still having terrible behavior and you know I think I wasn’t prepared going in or I just didn’t know what to expect.

The statements from the interview match what the TSES scores accurately indicated. Specifically, the two largest declines between Student Engagement (SE 1 and SE 2) and Classroom Management (CM 1 and CM2), which match the problems, the student described in the interview.

Student 11 dropped on Student Engagement Efficacy from 6.75 on (IS 1) to 5.8 on (IS 2) and on Instructional Strategies Efficacy from 7.1 on (IS 1) to 6.6 on (IS 2). Data analysis revealed that Student 11 did a fellowship in a public high school in Appalachia and was hired to teach 8th grade, which may explain differences between expected student engagement. Student 11 mentioned in the interview frustration with Instructional Strategies Efficacy,

The hardest part was not getting to do all the labs that I wanted to do because I was so… um tunnel vision on Where am I going to be in the curriculum, because I had no idea how fast or slowly they were going to go. So it never was easy for me to judge, ok I need to get these items because I know I’m going to be able to do this specific scientific lab.

Not all individual score differences were in a negative direction. Student 3 gained in Instructional Strategies Efficacy from 5.63 on (IS 1) to 8 on (IS 2). Matching the interview data to the TSES scores provided a possible explanation. Student 3 described the situation,
Actually when I was interviewing they were actually in the middle of a big overhaul in their district they were getting a new superintendent and they were doing a lot of moving around in the middle school. And um when I was hired I was actually one of two middle school teachers, math teachers hired and so for both of us it was our first year teaching. Two other math teachers were moved to different parts of the district so our whole middle school got a new math department.

Student 3, being thrust into the position of resurrecting a failing middle school math program, must have felt able to influence instruction.

Summary

This chapter provided data derived from the interviews and attempted to present in in a categorized and thematic way to allow maximum learning about the case studied. Examples from the interviews were selected from a large amount of data collected and displayed here to represent the findings. Statistical data collected from the two administrations of the TSES was presented along with a brief discussion of the relevance to this case study. Individual’s changes in efficacy levels on the TSES were further investigated by matching the qualitative data associated with the individual participant.
Chapter 5: Summary

The early part of this study was devoted to demonstrating the importance of education, throughout history, to the development and existence of a strong economy and a well-governed nation. The next concept defined, was the importance of teachers to the success of our students, the entire education and economic systems and thus to the successful governance of our country.

The review of the literature detailed problems that the United States is experiencing in keeping our educational system and our country globally competitive. The concern that the U.S. is losing its global competitive edge was demonstrated by the multitude of reports written on this topic such as Before it’s Too Late (2000) and BHEF Policy Brief (2011) and the number of programs formed to address them, including federal programs such as NCLB and 100Kin10 and state programs such as MSBP, MINT and the OSLN.

The global competitive edge concerns not only in test scores (PISA) but also in the ability to recruit, train and retain high quality teachers (Carey, 2009) and the ability to provide an equal education to all students ((Darling-Hammond, 2010). This problem is even more severe in the teaching areas of science and math and in poorer schools such as those in Appalachia (Barley, 2009; Goodpaster, Adedokun, & Weaver, 2012). It was these problems that focused the study on teacher preparation programs, as they are directly responsible for recruiting and training and somewhat responsible for producing teachers that can survive the difficult first years to become career teachers. Previous studies (Beauchamp & Thomas, 2009; Forbes & Davis, 2011; Lofstrom et al., 2010) have indicated that teacher identity can be an strong indicator of the likelihood of staying in
the field of teaching. Another measure of teacher success that also has been attributed to increasing student learning is self-efficacy (Barnes, 2000; Klassen, Tze, Betts and Gordon, 2010; Tschannen-Moran & Hoy, 2007). The review of the literature revealed that although these two traits have been determined to be important to teacher development we still have difficulty measuring and fostering these traits in new teacher candidates. This drove the decision to apply a mixed methods approach, a combination of one of the best quantitative measures of teacher efficacy, the TSES (Tschannen-Moran & Hoy, 2001) and a qualitative data analysis and interview combination.

In order to examine how a teacher training model might foster teacher identity and efficacy a case study was conducted. The WWTF cohort one was selected as the case to be studied for the following reasons:

1. WWTF represented a successful alternative route licensure program
2. This was the first WWTF to concentrate on Appalachian schools
3. WWTF participants are STEM graduates that have chosen to become highly qualified STEM teachers
4. WWTF requires a three year teaching commitment

The qualitative approach was designed to answer the first two research questions:

1. What practices involved in teacher training do these new teachers feel most contributed toward their professional self-identity and their feelings of self-efficacy?
2. What types of support do these new teachers feel is or would be most helpful to them in their first years of teaching?
The TSES (Tschannen-Moran & Hoy, 2001) was the quantitative instrument used to measure the efficacy levels of this population during two phases of the case. The first measure was taken while they were students during the WWTF. The second measure was taken following their first year as professional teachers. The comparison of these two sets of scores answers the third research question:

3. How do teacher efficacy scores taken during the WWTF program compare to scores recorded after the first year of solo teaching in their job placement?

Summary of Findings

The interviews provided the best answer to the first research question: What practices involved in teacher training do these new teachers feel most contributed toward their professional self-identity and their feelings of self-efficacy? When the interviews were conducted participants were asked several questions and encouraged to discuss their experience in the WWTF. The participants of the WWTF already possessed a bachelor’s degree in a STEM area, which meant that they had a pre-established identity as a subject matter expert. In cases where the previous degrees were a direct match to the teaching area sought the participants expressed a high level of confidence. The WWTF seems to have done a good job of transitioning this pre-existing identity into a teacher identity through course work, projects and the full year teaching fellowship.

The interviews provided answers to research question two: What types of support do these new teachers feel is or would be most helpful to them in their first years of teaching? Evidence that a community of support was created during this program is demonstrated in several of the themes. All participants cited the three-hour break, whether they utilized it extensively or not, as an excellent comradery building
component. The development of the student created Facebook page demonstrates that the students valued the peer support that was established in person, on campus, and that they sought a way to keep that support viable. This research question spanned all phases of the case study. The community of support was established early in the program and continued throughout and into the foreseeable future. The support in the school of employment was a totally uncontrolled variable dependent upon the administration, principal, fellow teachers and the mentor assigned by the school district. Totally outside of the control of WWTF, the unsatisfactory support at the school has contributed to the migration of at least one teacher to a different school.

Across all interviews, overall satisfaction with the WWTF was expressed. For the most part participants felt they were well prepared by WWTF for their teaching assignments. In the interviews the teachers did, however, mention two areas where more preparation would have been helpful: technology and classroom management. While technology was mentioned most specifically by returning second chance participants, classroom management was an area of concern expressed by every teacher interviewed.

Results from the TSES answered research question 3: How do teacher efficacy scores taken during the WWTF program compare to scores recorded after the first year of solo teaching in their job placement? Overall the scores seem to indicate that the WWTF did a good job of realistically preparing these teachers for the challenges of first year teaching. Scores did not change dramatically or suffer the drop often seen in the first year of actual teaching as reported by Woofolk Hoy and Burke Spero (2005). Individually, however, there were some drops in efficacy levels particularly in the area of classroom management. Data analysis and a cross-reference with the interview data revealed that in
some of the cases the decline in *efficacy classroom management* on the TSES was due to a mismatch between training and job placement. For example, the participant did a fellowship in high school and then took a teaching job at a middle school.

**Recommendations**

The WWTF represents a model of research-based teacher preparation similar to that of the best teacher preparation programs in the world. This model worked well for these participants. It would make sense to recommend that other teacher preparation programs follow this model. Certain components present in the WWTF, to be broadly implemented throughout the United States, would require major fundamental changes. Free tuition and a living stipend for example are not likely to be provided to all teacher candidates in the United States as they are in Finland (Darling-Hammond, 2010). This reality does need to be considered. It should also be noted that the WWTF is not a shortcut to providing teachers. The participants in this study came into the program with four years of college and a bachelor’s degree meaning that they had already made a considerable contribution of both time and money to this endeavor. As the economy improves the supply of STEM degree holding individuals looking for a job teaching may diminish. Affordable education and a respectable salary seem necessary to keep up with the demand for STEM teachers.

This study focused on the problems of recruitment, training and retention of STEM teachers. These problems are not unique to STEM, but are perhaps the first indication of problems facing the entire field of teaching. Current trends indicate a substantial drop in the numbers of all applicants to teacher training programs. According to Westervelt (2015)
Several big states have seen alarming drops in enrollment at teacher training programs. The numbers are grim among some of the nation's largest producers of new teachers: In California, enrollment is down 53 percent over the past five years. It's down sharply in New York and Texas as well. (para. 2)

The list of problems currently facing new teachers as reported by Westervelt (2015)

The list of potential headaches for new teachers is long, starting with the ongoing, ideological fisticuffs over the Common Core State Standards, high-stakes testing and efforts to link test results to teacher evaluations. Throw in the erosion of tenure protections and a variety of recession-induced budget cuts, and you've got the makings of a crisis. (para. 7)

These “headaches” (Westervelt, 2015, para. 7) highlighted in his article as reasons that students may not selecting teaching as a career closely resemble problems, identified in the current study, facing new STEM teachers.

Alternative route programs are experiencing similar difficulties in recruitment. Teach for America, a substantial provider of new teachers, has also seen a significant decline in applications since its peak in 2013, with the largest drop among recent college graduates (Ehrenfreund, 2015). Obviously with the need for teachers, especially highly qualified STEM teachers, growing and the supply of new teachers declining, recommendations for retaining current teachers are in order.

Other recommendations that do not require nation-moving changes include teacher preparation programs that develop strong teacher identity and self-efficacy by providing teacher candidates with a thorough knowledge of their subject matter such as one would have after completing a bachelor’s degree in the area they teach. A good
understanding of teaching pedagogy including classroom management techniques applicable to the grade level to be taught should be included in all teacher training. The WWTF provided training in classroom management, but a Greenberg, Putnam, and Walsh (2014) stated, “[So] does nearly every teacher preparation program, yet something is not working” (p. 1). If a comprehensive induction program was in place and a coach trained in classroom management systems, such as Responsive Classroom (https://www.responsiveclassroom.org/) was available, support for these new teachers would be greatly improved. Instructional strategies must be taught in teacher preparation programs including the creativity to teach interesting and engaging lessons in an environment of over-emphasis on standardized testing. Teachers need to have up to date technology skills and be taught to learn new technology as it develops. Professional development needs to be meaningful and ongoing with adequate released time from teaching to learn and practice new things (Darling-Hammond & Friedlaender, 2008). Finally new teachers must be provided with a community of support that goes beyond a single mentor. A team approach to mentoring has much improved results (Wong & Wong, 2008). Online peer mentoring should also be included; it was highly valued by the participants of this study and had virtually no cost and has been proven effective in other studies (McAleer, & Bangert, 2011).

Limitations

There were unavoidable limitations to this study; the two most prominent were the size of the population and the fact that there is no perfect way to measure the construct of teacher self-efficacy. The size of the population was set by the research
method. A case study of the WWTF cohort one was obviously bound by the number of fellows accepted into the program.

Although the TSES is the current standard for measuring teacher self-efficacy, more research needs to be done in the area of measurement. Heneman, Kinball, and Milanowski (2006) pointed out a potential problem with range restriction which may have occurred in this study as well, as all but one of the scores were between 4.38 – 8.65, in the range of ‘Some Influence’ to ‘A Great Deal’ basically mid-range and above on the scale. Heneman, Kinball, and Milanowski (2006) stated, “The tendency for a strong upward bias in teachers’ reported self-efficacy may simply be due to the nature of the measuring instrument, or it may reflect a social desirability response bias on the part of teachers” (p. 13).

Recommendations for Future Study

The current study revealed the complexity of teacher identity and self-efficacy. These important concepts are a major predictors of many things related to teacher success. Teacher identity and self-efficacy can be a major predictor of whether a teacher will remain in the field. The opportunity to conduct the interviews did not occur until mid-way through the second year of teaching. The result of this was that the interviewer, in a sense, got a glimpse of the future. The current study was concerned only with the first year of teaching. Changes mentioned by the participants in the interviews made it clear that a follow-up study would prove valuable. Many of the concepts such as teacher migration have already occurred as some teachers stated in their interviews, some of them had already moved to a ‘better school’. It was also clear that some had seriously considered leaving the field. Since teacher efficacy is an ever-developing concept, it
would be beneficial to see how it changes in these teachers over the next few years. The
why questions would be rich in information: Why did you leave teaching? Why did you
change schools?
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## Appendix A: OSU Teachers' Sense of Efficacy Scale

### Teachers' Sense of Efficacy Scale

(1 long form)

<table>
<thead>
<tr>
<th>Teacher Beliefs</th>
<th>How much can you do?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directions:</strong> This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.</td>
<td></td>
</tr>
<tr>
<td>1. How much can you do to get through to the most difficult students?</td>
<td>(1) (2) (3) (4) (5)</td>
</tr>
<tr>
<td>2. How much can you do to help your students think critically?</td>
<td>(1) (2) (3) (4) (5)</td>
</tr>
<tr>
<td>3. How much can you do to control disruptive behavior in the classroom?</td>
<td>(1) (2) (3) (4) (5)</td>
</tr>
<tr>
<td>4. How much can you do to motivate students who show low interest in school work?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>5. To what extent can you make your expectations clear about student behavior?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>6. How much can you do to get students to believe they can do well in school work?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>7. How well can you respond to difficult questions from your students?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>8. How well can you establish routines to keep activities running smoothly?</td>
<td>(1) (2) (3) (4) (5)</td>
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<td>9. How much can you do to help your students value learning?</td>
<td>(1) (2) (3) (4) (5)</td>
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<td>10. How much can you gauge student comprehension of what you have taught?</td>
<td>(1) (2) (3) (4) (5)</td>
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<td>11. To what extent can you craft good questions for your students?</td>
<td>(1) (2) (3) (4) (5)</td>
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<td>12. How much can you do to foster student creativity?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>13. How much can you do to get children to follow classroom rules?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>14. How much can you do to improve the understanding of a student who is failing?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>15. How much can you do to calm a student who is disruptive or noisy?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>16. How well can you establish a classroom management system with each group of students?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>17. How much can you do to adjust your lessons to the proper level for individual students?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>18. How much can you use a variety of assessment strategies?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>19. How well can you keep a few problem students from ruining an entire lesson?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>20. To what extent can you provide an alternative explanation or example when students are confused?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>21. How well can you respond to defiant students?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>22. How much can you assist families in helping their children do well in school?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>23. How well can you implement alternative strategies in your classroom?</td>
<td>(1) (2) (3) (4) (5)</td>
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<tr>
<td>24. How well can you provide appropriate challenges for very capable students?</td>
<td>(1) (2) (3) (4) (5)</td>
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</tbody>
</table>
Appendix B: Permission to Use OSU Teacher Efficacy Scale

Dear

You have my permission to use the *Teachers’ Sense of Efficacy Scale* in your research. A copy of both the long and short forms of the instrument as well as scoring instructions can be found at:

http://www.coe.ohio-state.edu/ahoy/researchinstruments.htm

Best wishes in your work,

Anita Woolfolk Hoy, Ph.D.
Professor