Retired Rural Secondary Mathematics Teachers' Perspectives of Reform

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This dissertation titled
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the Department of Teacher Education
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ABSTRACT

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Retired Rural Secondary Mathematics Teachers' Perspectives of Reform

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This study examined reform and change perspectives of retired rural secondary mathematics teachers in a North Carolina Appalachian community, giving voice to rural mathematics teachers. The investigation is inherently rural because of the nature of the place involved. The study emphasized tensions between reform efforts involving local, state, and national policy. The careers of the participants spanned the period from just prior to the 1957 Soviet Sputnik launch through 2002.

This qualitative study involved ethnographic interview methods. Phenomenological-based interviews combined life histories with focused in-depth interviewing using open-ended questions designed to explore participant responses. The study employed a critical analysis approach to identify themes of change; to view the way change evolved; and to analyze interpretations of the mathematics teachers within a single county school system. Emphasizing contextual analysis, the study included historical documents as well as a limited number of individual interviews and participant journals.

The data revealed three themes of change considered significant by the participants: (a) outside intrusions, (b) treading community boundaries, and (c) understanding and misunderstanding mathematics. Underlying teacher beliefs in the defense of community, the nature of mathematics, and the common good contributed to
data interpretation. Understanding the teachers' perspectives through their lenses of beliefs and their community contexts proved critical to the analysis.

The teachers' perceptions of change depended on their underlying beliefs in the community. Preserving the good of the community evolved as a dominant theme. Decisions made by the rural teachers involved community benefit, which was often of more significance than individual benefit. The mathematics teachers seldom initiated major changes. They were most willing to change when student benefits were clear and when change did not conflict with community values and individual beliefs.

Approved: _____________________________________________________________

George A. Johanson
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DEDICATION

This work is dedicated to three very important women in my life who did not live long enough to see me reach the vision they had for me.

To my mother, that everyone called ‘Polly,’ who walked with me through difficult times – Thank you for the gift of Alanon. One day at a time, I have continued the journey. Everything has worked together for good...

To Dr. Katherine Hodgin and Dr. Kayte Sowell, my student teaching and methods advisors at East Carolina University, who made me promise to remain in teaching for at least three years – Thank you for believing in me and setting forth a legacy of quality, equity and involvement in professional organizations. Your legacy lives on. Doing mathematics in heaven will be fun ...
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CHAPTER ONE: INTRODUCTION

Policies in mathematics education became a subject of national concern with the launch of Sputnik on October 7, 1957; more than half a century later, mathematics education continues to occupy the national spotlight. A wide range of lawmakers, policymakers, business leaders, and academics have advocated for improved mathematics achievement among United States students. Some educators insist that better mathematics knowledge and understanding are imperative for the country to maintain its leadership role in the global economy. To that end, in 2006, the United States government appointed a national panel on mathematics education (Federal Register, 2006).

Prior to that, in the 1980s, many states sought instructional policies that would make teaching, and consequently learning, more demanding (Bush, 2005). According to the National Center for Educational Statistics report section on the 2005 National Assessment of Educational Progress high school transcript study, secondary classrooms were especially in need of improved student accomplishment (NCES, 2007). This study collected and analyzed the reflections of retired teachers in a rural setting regarding past efforts to reform mathematics curriculum and instruction using Tyack’s and Cuban’s (1995) definition of the concept of reform. They noted, "When we speak of educational reforms, we mean planned efforts to change schools in order to correct perceived social and educational problems" (p. 4). Throughout the current study, the terms reform or change convey this notion of planned efforts to correct perceived social and educational woes, denoting a prescriptive approach to school change. The foundational premise of the study is that retired classroom teachers can provide compelling evidence of improvement efforts and changes that affect student learning.
Little research exists on the perspective of rural teachers concerning educational changes in mathematics. Mathematics education researchers (e.g., Ball, Lubienski, & Mewborn, 2001; Barkatsas & Malone, 2005; Beswick, 2005; Confrey et al., 2008; Shulman, 1986; Usiskin, 2008) explored teachers’ knowledge of pedagogical content, mathematics content, and the mathematics needed for teaching. However, previous studies seldom included testimony from secondary mathematics teachers on improvement efforts. In addition, locality has been a neglected aspect of research on classroom practices. Past reform efforts devoted little attention to locale, in particular to shaping programs suiting the needs of rural areas. Reviewing the perspective of rural teachers may foster improvement in mathematics education for students in those areas.

The focus of the current work was to view policy through the perspective of retired mathematics teachers as they described changes during their careers. In other words, in what ways did teachers, especially mathematics teachers in rural settings, interpret policies designed to improve classroom instruction? Battista (1994) suggested that, if change occurred, it happened at the local level; thus, teacher perspectives and views contribute to the teaching of mathematics. Most previous research focused on pre-service and elementary teachers. Secondary-level reform research seemed warranted.

Information supplied by rural secondary mathematics teachers would allow policy makers, researchers, and reformers to make better decisions in influencing mathematics classrooms. Teachers are on the front line of reform efforts and have a direct line of sight toward implementation. If reform efforts succeed, teachers can offer insight into the reasons for success. If reform efforts fail, as research has suggested (Tyack & Cuban, 1995), stronger teacher voices might make future reform efforts more effective.
DeYoung and Theobald (1991) noted that modern perspectives on rural school curriculum and instruction are derived from research in urban settings, with extant research seldom including rural settings. Educational research, conducted by higher education institutions, usually involves urban schools rather than rural ones. In addition, researchers perceived urban schools as in greater need of solutions than rural schools. Interestingly, once solutions emerged from urban research studies, researchers tended to generalize those solutions to multiple settings, including rural areas. On the other hand, researchers rarely viewed findings based on the experiences of rural teachers as having any urban educational implications. These past assumptions are questionable at best. Implications for change in rural education should be based on more than urban research; rural areas merit study, which may, in fact, provide solutions for other settings as well. To that end, this investigation asks: What could the voices of retired rural secondary mathematics teachers in one Appalachian school system reveal? What were the teachers’ perspectives, and how did they understand changes that occurred during their careers?

Background of Study

Initially, this was to be a historical study entitled, *A History of Secondary Mathematics Education in a Rural Appalachian County: A 50-Year Perspective from Teachers*. The intent was to examine sequential mathematical reforms since the New Math era from the perspective of rural teachers, giving voice to those excluded from or minimally included in policy decisions. It would offer a rural perspective on policies largely based on nonrural studies or more advantaged views. The idea for the study emanated from *The Life and Death of an American Rural High School: Farewell Little Kanawha* (DeYoung, 1995), a story of consolidation and other policies that, although
made with little local input, had a profound, long-lasting impact on a school and the surrounding community. As a secondary school teacher for 26 years, living in a state ranked number one for teachers feeling they had minimal, if any, control over issues (Darling-Hammond & Sykes, 1999), I decided that research needed to include teacher voice. Retired teachers, with time to reflect and their legacy in tact provide voice. Teachers who spent their entire careers in rural systems, which, because of consolidations, had seen the death of numerous high schools in the same pattern that DeYoung’s (1995) study revealed for Kanawha provide a much-needed voice. If reforms were local and mathematics education in the United States lagged behind that of other countries, as indicated by NAEP rankings, after 50 years of so-called reform, would it not make sense to ask local mathematics teachers their views? Or if, in fact, as some research suggested (Usiskin, 2008), the reforms of mathematics education in the United States exceed those of other countries, would it still not make sense to ask local mathematics teachers how that reform affected their teaching?

A small pilot study conducted in September 2006 revealed that teachers in rural settings had only minimal knowledge that national reforms were in place. Long after the initiation of reforms, the teachers perceived little change. Indeed, teachers paid scant attention to reform efforts. Specific questions about national efforts to change curriculum produced short responses, and probing further did not produce additional information. The comments of teachers interviewed centered on local decisions that affected the high school curriculum.

The broad interpretation by local teachers of national reform trends proved not worth pursuing. Narrowing the scope of the research question to allow teachers to choose
relevant changes, rather than forcing them to discuss national reform, seemed an obvious next step. What was not yet certain, however, was whether this refinement would provide success—or whether, perhaps, the teachers were merely reluctant to talk to strangers.

Cuban (1993) explained that, when confronted with reform, "many teachers constructed hybrids of particular progressive practices grafted onto what they ordinarily did in classrooms," calling this adaptation model "conservative progressivism" (p. 269). Cohen (1990) provided similar insight in his analysis of the hybrid second grade class of Mrs. Oublier. While Cohen noted that teacher innovation could appear to change progressively, he concluded that, due to Mrs. Oublier’s mathematical background and teacher perspective, "policy implementation was not the intended outcome in her classroom" (p. 38). Would seeing through the eyes of a retired rural secondary mathematics teacher reveal hybrids of reform?

A second pilot study, designed to determine whether a more open-ended approach—one that allowed teachers to discuss change and the results of reform efforts during their careers—produced more data. The second small pilot, conducted in January 2007, took place in a county with demographics similar to both the county proposed for the study and the county used in the first pilot. The demographics included a single high school created in the 1970s by consolidating four rural community schools. The three counties were all located in the western North Carolina mountains, and each experienced community opposition to consolidation efforts.

The teachers interviewed in the second pilot were encouraged to discuss changes in mathematics education over the years with the hope that they would mention national
reform efforts specific to mathematics. Commonalities among the responses in both small pilots included local politics, administrative decisions, state testing, technology, and consolidation as influencing changes in mathematics education. Participants in both pilots mentioned decisions by local principals and administrators that prevented children from taking Algebra 1 in the eighth grade, from taking classes at the community college, or from taking work release for part of the school day. From the teacher perspective, these decisions significantly affected mathematics curriculum and instruction in rural communities.

The second pilot interviewees noted they had little control over the implemented changes. They joyfully reminisced about the days before state testing when they used their own lessons and projects involving the local community. They questioned why, if they had a degree in mathematics and were qualified to teach, they could not select the curriculum and determine implementation methods. They were disappointed with the lack of time for projects, which they reported as developing an in-depth understanding of mathematics. Ironically, the recent mathematical reforms claimed to create richer mathematical understanding; however, the teachers perceived those reforms as unsuccessful. Based on the responses from the second pilot study, a research question evolved around the key issues of mathematics education, rural locations, consolidation, and local decisions.

Statement of the Problem

The question that directed the focus of this investigation was: How did retired rural secondary mathematics teachers perceive changes that occurred in curriculum, instruction, and policy during their careers?
The Dilemma

Teachers are frequently missing from the debate on issues of reform (Darling-Hammond & Sykes, 1999) even though if reform occurs, it does so at the local level (Ball, 1996; Bush, 2005; Howley, Howley, & Helms, 2007). If there are expectations for reform in mathematics education, the views of teachers need examination because of their significant roles in implementing change. The history of mathematics education repeatedly has shown that successful change does not occur without including teachers (Klein, 2003). Therefore, if the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics* (NCTM, 2000) and the *Common Core State Standards* (2010) are to have a greater impact than previous era reforms, teachers who witnessed and participated in attempted reforms since the 1957 Sputnik launch ought to lend their experiences and knowledge to the efforts. This study includes some of those voices.

*The Nation’s Report Card* (2007) stated that, although United States "high school students were taking more difficult classes and making better grades than their counterparts from 15 years earlier, test measures indicated the students were learning less" (NCES, 2007a, p. 7). The teachers interviewed for the current study shared experiences from not only the last 15 years but also from the past 30 years. NCES (2007) stated, "Sobering questions about the past two decades of educational reform, including whether the movement to raise school standards has amounted to much more than window dressing" (p. 4). University educators and policy makers looked into the windows and saw the dressing, but those in the classrooms behind the windows have the knowledge needed to improve the teaching of mathematics. Retired teachers know their
students, the pedagogical methods, the mathematical content, and their community. Yet, over the span of multiple reform efforts, we have not availed ourselves of their wisdom.

Significance

Mathematics reform rhetoric in the United States has had prominence over the 50 plus years following the 1957 Sputnik launch. Numerous voices contributed to the rhetoric. The public cried out for change; university educators conducted research and offered their perceptions; and politicians created policies to address the problems. Missing from the reform discussions, however, were the voices of teachers; indeed, many regarded teachers as part of the problem and not as contributing to the solution. Past reform rhetoric carried an urban bias emanating from urban centers of research and the desire to fix urban problems (Howley, 2002). Thus, the perspective of classroom teachers and, in particular, rural classroom teachers, would complete the list of voices joining the rhetoric of reform. It is hoped the teacher perspective garnered from this study will lead from rhetoric to reality.

In the National Council of Teachers of Mathematics Sixty-Sixth Yearbook, entitled Perspectives of the Teaching of Mathematics (NCTM, 2004), there is not a single entry written from the perspective of a secondary classroom teacher. The authors are from universities or large urban school systems, with none from public, non-specialized, K-12 classrooms. Given the absence of teacher perspective, researchers initiating reform should not be surprised by failures (Bossé, 1995; Lappan, 1997; Osborne & Crosswhite, 1970).
The New Math era offers an instructive example of the gap between the rhetoric and the experience of actual teachers. As a result of the top-down approach of the New Math reforms that included primarily teachers from more prestigious schools, universal reform failed (Ball, 1991; Wasley, Donmoyer, & Maxwell, 1995) and was even less likely to succeed in rural classrooms (Silver & Castro, 2007). Schmidt, Houang, and Cogan (2002) discussed the present day "mile wide, an inch deep [U.S. mathematics] standards and thus enacted curricula" (p. 3), wherein teachers mire in content but teach nothing in-depth. Carrying the lack-of-depth issue further, one might conclude that Cohen’s (1989) reform arguments implied a film of reform floats on an ocean of tradition. With rural places perhaps more likely to honor tradition than in other places, it is logical that reform may be less likely to occur there. That is, of course, one possible explanation—but only one. When theory emerges without teacher perspective, it is difficult to judge whether the theoretical and the practical align. Asking retired mathematics teachers for perspective on teaching could resolve discrepancies between theory and practice.

Sputnik’s launch was not the only major event to reshape education. The United States Supreme Court’s ruling in Brown v. Topeka Board of Education, wherein the federal government stepped in to desegregate schools, resulted in a conflict of three traditional values: efficacy, equity, and liberty (Kirst, 1979). As fears for the lack of readiness of American children in the new technological era prompted new federal investment and involvement in education, so did the push for greater equity in the classroom between African Americans and Caucasians. This new federal involvement in education produced a major educational change. Research before 1960 assumed that
school governance was *apolitical* (Brint, 1998). With the federal government’s newly emerging role in education, that assumption was no longer true.

The fears of policy makers half a century ago that American children had fallen behind in mathematics knowledge compared to Soviet scientific skills echo today as the national media warn, based on Program for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) scores, that American children continue to fall short (NCES, 2007). Instead of the Soviets, however, China and India are the current educational and economic competitors (Friedman, 2006). According to school leaders in Graham’s (2002) research and from the North Carolina Department of Public Instruction’s State Report Card (NCDPI, 2006), "competing in the global economy requires greater technological sophistication and knowledge" (p. 8). Again, rural schools may be at a disadvantage because rural teachers often have limited technological resources (Rural School and Community Trust, 2005). How do rural teachers view the role of technology in the instruction of students? Do rural communities view competing in the global economy as an aim of education?

Finally, there is the discrepancy between the bulk of educational research and the national research agenda—namely, the focus on solutions to problems of *urban schooling*—and the needs of rural schools for which current research offers little relevance. Sherwood’s (2000) review of the literature discovered only one study focused on rural issues and few that contained any mention of rural education. In the program of the 2007 American Educational Research Association (AERA) conference, which exhibited current research, only 20 of 12,832 papers focused on rural mathematics. The percentage of rural mathematics papers at the 2010 AERA conference was similar.
Equity was the theme of the 2009 National Council of Teachers of Mathematics annual meeting, and although "urban" appeared in session titles and descriptions, few titles or session descriptions included "rural." Clearly, the rural research base is lacking and rural mathematics education research is almost nonexistent.

Because teachers are the most significant facilitators of instructional policy and change (Barkatsas & Malone, 2005; Cohen, 1989; Stigler & Hiebert, 1999; Weiss, Herbst, & Chen, 2009), it is imperative to obtain teacher views and include them in decisions impacting educational change. Unfortunately, state and national initiatives often view teachers as the problem when students have deficiencies in knowledge and skills. When teachers are from rural settings, this deficit view becomes further embedded in the assumptions of those conducting the analysis because rural, itself, is portrayed as deficient and needing fixing (Howley, A., 2003).

Stakeholders and policy makers need to understand the impact that sweeping reform policies have on small rural schools and their communities. This study is potentially significant because it could influence practice in a number of schools. Nearly half of the schools in the United States are located in rural areas and small towns (NCREC, 2002). In North Carolina, over one-half of students are educated in rural settings (Boatright & Bachtel, 1988). Often, small rural schools must adapt to standards and uniform practices that make little sense in light of their lack of resources, isolation, and organization. Purposes of reform in urban and/or suburban schools may be extremely different from those in rural schools. Even rural schools are quite diverse. For example, rural schools in Alaska are quite different from rural schools in Nebraska. Therefore, one-
size-fits-all reform ignores the unique attributes, concerns, and communities attached to rural schools.

North Carolina is one of only two states ranking in the highest quartile on both rural student population and total percentage of rural population. Over 778,000 students, more than half of those enrolled, attended rural schools, and North Carolina had the nation’s second largest rural population (McCullough & Johnson, 2007). Although fewer than 10 per cent of students attended small rural schools, the overall organizational scale of rural schooling was the highest in the nation.

In western North Carolina, the area in which this study occurred, there are seeming contradictions in educational achievement statistics. Students in western North Carolina performed better on state testing than the rest of those from other areas, yet graduation rates were among the lowest in the nation, and NAEP scores, monies spent on instruction, and student-teacher ratios were lower than the national median (Rural School and Community Trust, 2005). The North Carolina Economic Development Center (2002) indicated that rural residents were much less likely to have a college degree, but rural students were improving their scores on SAT college entrance exams. Of particular interest was that rural students in western North Carolina led the state in end-of-grade test results. Among the top 10 counties whose students passed both reading and math tests, nine were in the western NC mountains. All mountain counties had passing rates exceeding 80 percent (North Carolina Rural Economic Center, 2002). Findings such as these suggest the possibility that characteristics other than the educational backgrounds of parents, for example, aspirations for children or values stressing responsibility and hard work, perhaps based on religion—may have more relevance in rural environments.
Finally, cultural and economic circumstances may place rural school districts at further disadvantage. In the 1992 North Carolina Leandro school-funding case, several rural counties insisted the state provide a *sound basic education* to every child, as mandated by the state constitution. The 2006 session of the North Carolina General Assembly initiated low-wealth funding for school systems; however, the basis for funding and the measure of poverty were the percentage of students on free and reduced price lunch. In rural Appalachia, administrators often report the unwillingness of rural mountain parents to apply for free-lunch programs or any type of government assistance even when they clearly qualify (Bottoms & Carpenter, 2005). The disadvantage for rural places in North Carolina is not improving as evidenced by the 2009 General Assembly’s decisions to cut the low-wealth budget substantially. Will the retired rural teachers in this study consider their experiences equitable when compared to other places?

**Goals**

Several goals were intended for this research besides that of widening the research base in rural secondary mathematics education.

*Personal*

One of the reasons I undertook this study was to provide a more in-depth understanding of the secondary mathematics program in Hewlett County (pseudonym). The county was unreceptive to outsiders, and the political structure of the school system controlled the hiring of teachers. The elected school board hired all teachers and depended on local references for potential candidates. Thus, a majority of teachers in the system was native to the region and spent their entire careers there. This might provide one of the few opportunities left for a study regarding traditional rural systems in western
North Carolina. I also wanted to hear the voices of local mathematical heroes who were legends in the community.

My maternal grandparents and my mother were city dwellers. My paternal grandparents and my father farmed. My parents’ dichotomous lifestyles encouraged my interest in rural life and the ways in which it differs from urban life. Attending and teaching in rural and urban high schools stirred my passion for investigating the rural-urban contrast. As a retired secondary mathematics teacher who taught for 10 years in rural settings, I wanted to see if my personal patterns of change mirrored those of other teachers. Strong personal interest can "help to counteract the inevitable interference from work, family and procrastination" (Maxwell, 2005, p. 47) inherent in research.

Practical

Because I lived in the region and had personal experiences with the school system, I had a perspective (with and without bias) that another researcher might not bring to the study. Not being native to the area but having local connections allowed me inroads into questioning techniques and interpretations that another researcher might not have.

Intellectual

It is important that teachers be included in discussions about change and reform. In order to include teachers, their views and perspectives need exploration. Because mathematics education remains at the forefront of concerns of United States policy makers (Lappan & Wanko, 2003), it is imperative that studies be conducted on the effect of previous policies on mathematics education in rural secondary classrooms. Secondary school mathematics teachers see students as they transition from middle school to
collegiate level mathematics and can provide useful insights into *what works*. Retired teachers have a wealth of knowledge and experiences on which to reflect and they have the time to share these experiences. In addition, retired teachers desire to see their legacy preserved. Why not benefit from that wealth and investigate what teacher voice can contribute to their profession?

**Limitations and Delimitations of the Study**

One limitation in replicating this study is finding a similar population of retired teachers who spent their teaching careers in a single rural environment. A second limitation is that this type of research does not allow generalization to other populations. In addition, the researcher’s personal experiences as a secondary mathematics teacher in the public school system provided insights that another researcher in a similar study might not possess.

Having a study population of retired teachers, who were somewhat removed from the educational system, added to the credibility of the study. These teachers were still concerned about educational issues, but not fearful of the job repercussions they had witnessed in their teaching years. The researcher depended on the honesty and openness of the participating teachers, and the rich data that they provided. Participants exhibited trust by allowing the researcher to enter their homes, indicating they were forthright in providing the researcher with reliable data.

A limitation of the data is a reliance on recollections of an elderly population who, due to memory lapses, may have answered questions in a manner congruent with what they perceived as the intended focus of the research. Alternately, there is a "tendency for researchers, especially in the semi-structured interview format; to obtain
results they expect" (Seidman, 2006, p. 72). There is the possibility that more fascinating comments or controversial issues received more in-depth probing. Avoiding preconceived results cannot always override personal interest.

Multiple interviews over time triangulated the data and eliminated concerns of participants’ emotional states affecting interpretations. "Interview data is also subject to recall error, reactivity of the interviewee to the interviewer and self-serving responses," (Patton, 2002, p. 298). Multiple participants responding to the same prompts alleviated this limitation.

The cultural perspective of this study’s participants might contrast with the perspectives of participants in similar studies; these differences in cultural perspectives might invalidate comparisons between other studies and this work. The participants in this study shared a distinctive cultural perspective because they lived in one area, had several generations of family nearby, taught there, obtained their education nearby, and elected to remain in the area. The data from this study represents the particular characteristics of the participants, and the results may not be transferable. Other rural populations of retired secondary mathematics teachers might exhibit different characteristics.

Summary

This study analyzed the perspectives of retired rural secondary mathematics teachers regarding educational reform. The knowledge gained could enable understanding of the issues that impede and enhance reform, especially in rural areas. Failure to understand the differences in perspectives of teachers and reformers creates tension between the reform effort and local attempts to improve mathematics education.
Only by asking those who have seen reform efforts succeed and fail inside the classroom will we know what works and what does not work. Past reform efforts in mathematics have mostly ignored classroom teacher voice. This is especially true for secondary school mathematics teachers and for rural teachers. The tensions between reform efforts and the successful implementation locally of improvements in mathematics education would lessen if teachers were included.
CHAPTER TWO: REVIEW OF THE LITERATURE

To understand the ways in which teachers perceive change, a review of the literature in three key areas follows. First, a review of the broader concept of reform, including both mathematics and secondary education reform contains a historical perspective from the New Math Era of the mid-twentieth century. The New Math Era shares similar characteristics with other mathematical reforms. Graham (1993) claimed that it took 50 years for reform efforts to become an ingrained part of the school culture. The 50-year anniversary of Sputnik was in October 2007. Retired teachers started their careers during these past 50 years.

The second key literature area involves rural education, including community, consolidation, and mathematics education research specific to Appalachia. According to the literature, reform in rural education has long met resistance. If it exists, this resistance may be significant in understanding the rural teacher perspective. The third key area incorporates the literature on teacher perception and its contribution to mathematics reform. Intersections and overlaps of the three key areas show the intertwining nature of the research in these areas. Finally, the review merges the three key areas. To discover what the voices of retired rural secondary mathematics teachers in one Appalachian school system tell us about how they understand changes that occurred in mathematics curriculum and instruction during their careers, I first explored related prior research.

Educational and Mathematics Reform

Hard, plain truths about school reform are extremely difficult to find in the literature. Placing blame for the failure to tell it like it is may be in part on those who most frequently do the telling. Traditionally, those who report on the fate of reform
initiatives are outsiders—researchers and consultants with a stake in promoting specific programs. "Journals have traditionally preferred reporting the happy product over the painful process; tales of slow and ambiguous change lack the glitzy appeal of stories that document successful programs in broad terms" (Cohen, 1994, p. 150).

School Reform

The traditional connotation of reform implies that something has gone awry and requires correction, similar to the idea that delinquent boys need to be in a reform school. Studying national efforts of educational reform, Goodlad (2004) found that fewer than 10% of the approximately 450 superintendents surveyed perceived their districts as better off following national reform efforts. Not every district or school has the resources to implement the reforms in the manner intended (Ready, 1992). A view permeating reform efforts in rural places is that rural education is lacking and needs 'fixing.' This view has contributed to reform resistance in rural places where the locals view the rural school as an asset. Tyack and Cuban (1995) noted that schools are naturally conventional social institutions conforming to norms of locale.

School change, regardless of place, has been difficult. "Change is not always smooth nor does it proceed in anticipated directions" (Cohen, 1989, p. 23). Harvard’s Warren Professor Graham (2002) stated:

American schools in the twentieth century resemble the battleships of World War II. Large, powerful, cumbersome, with enormous views [...] Maneuverability is not their strength. When ordered to change course, they do so, but there are significant delays. The bigger the change in direction, the longer it takes the ship to achieve the new course. (p. 1)

Interestingly, seldom are passengers on the ship consulted about course directions nor is teacher voice included when curricular changes will influence education. Claims are
made that teachers are included, as evidenced with the inclusion of teachers in developing the more recent NCTM standards (Klein, 2003). Closer inspection of those claims, however, indicate the included teachers were often from more advantaged schools with rural teacher inclusion clearly missing.

Top-Down Reform. School reform in most societies has been primarily a top-down affair. Schön (1997) discussed an "epistemology of the schools" (p. 2) tied to predictability and control, often inherent in a bureaucracy. "The centre-periphery model of reform through large scale government intervention demands the packaging of knowledge and the presentation of replicable methods stamped with rewards and punishments" (Schön, p.1). Schön claimed this epistemology of the schools was a central reason that educational reforms fail.

Moon (1986) recognized that the subject-based development had its origins in the United States, subsequently grafted onto the different national systems and creating not only a top-down structure, but also an external reform. The typical approach included a research-development-dissemination (RDD) model in which the product filtered down from university mathematicians and mathematics educators with only modest consultation of teacher customers (Howson, Keitel, & Kilpatrick, 1981). Most successful businesses listen to their customers.

Bossé (1995) asserted that the top-down structure was a fallacy and that mathematics teachers served as experts on every committee in the United States. A closer examination showed that, if there were practicing teachers included, they were minimal in number and often from more advantaged and prestigious high schools. Speaking in January 2007, Kilpatrick pointed out that teams of authors from Western countries were
disappointed that reform did not occur when they provided curriculum materials rather than assisting teachers with their own curricula in Africa, Latin America, and the Middle East. A top-down approach with lack of teacher voice seems a significant variable when reforms fail.

*United States School Reform.* School reform in the United States has been cyclical, as well as top-down, with alternating periods of liberal and conservative reform. Liberal, as used here, is not a political term but rather refers to reform focused on child-centered thought process and rational thinking. Similarly, conservative refers to a reform emphasis involving teaching of skills. Brint (1998) outlined these cyclical periods of liberal and conservative educational reform (see Appendix A, Table I). "The argument goes: The more relaxed and inclusive standards, brought on by liberal reforms feed dissatisfaction among conservatives. The rigidity of conservative approaches eventually fuels demands for more inclusive and child-centered schooling" (Tyack & Cuban, 1995, p. 47). Early examples in the United States of a liberal cycle included prominent sociologists like Parsons (1959) and Dreeban (1968) articulating an interpretation of schools as a functional approach in both curricular and values transmission. DeYoung and Theobald (1991) asserted that the focus of educational reform (even with an emphasis at times on a more liberal child-centered approach) during the past four decades was on maximizing the teaching of skills and knowledge required for an urban-based national economy.

According to Brint (1998) and Theobald (1997), what they called the conservative reform cycles in public education emerged when national security threats produced a perception of schools’ inadequate educational preparation of scientists and thinkers. The
Sputnik launch in 1957 is one example of a catalyst propelling public education into a conservative cycle. Evidence from international testing, such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Achievement), called into question the United States’ ability to produce scientists and mathematicians capable of providing national security. In addition, the September 11, 2001 terrorist attacks provided conservative skill-based reform impetus due to national security concerns.

*Education as Competition.* Educational change in the United States has not always been synonymous with competition on a world stage, and not all agree with the inadequacies of public education or that competition on a world stage should drive reform efforts. In fact, some (Berliner & Biddle, 1995; Bracey, 2003; Glass, 2008; Kozol, 2005) argued quite compellingly that the United States’ educational system was not deserving of such criticism and that inequity in the quality of education was the real crisis (Amankwatia & Hilliard, 2003). Usiskin (2008) even argues that when there are fair comparisons of students, the United States surpasses every other educational system.

Is mathematics reform different from reforms in other subjects? National politics plays a larger role in determining the type of mathematics taught and learned in America’s high schools due to the perception that mathematics is the skill lacking for global competitiveness. To understand mathematical reform, it is important to consider the reform eras experienced by the teachers interviewed for this study. This historical context illustrates the cyclical patterns of reform and can aid understanding of their perspectives.
Historical Perspective of Mathematics Reform

If Graham (1993) is correct that it takes 50 years for reform to occur, we should expect the Sputnik-inspired reforms to have taken effect by 2007. "Sputnik forced a national self-appraisal that questioned American education" (NSF, 1988, p. 2) and mathematics education, in particular. This questioning of education and the role it served existed prior to Sputnik. However, Sputnik triggered the end of the liberal phase involving process and the beginning of a conservative phase of education focusing on skills. The history of the changes in the role of the federal government in education, and how such changes affected mathematics education, makes for interesting and informative reflection (Lappan & Wanko, 2003).

At times, critics questioned the need for all students to learn more than the basic arithmetic needed for daily life, which promoted a decreased emphasis on mathematics education (Fey & Graeber, 2003). Advocates of this perspective criticized the standards-based reform movement, noting lack of concern for individual student needs (Theobald, 1991) and questioning the necessity of students needing higher-level mathematics courses for their chosen vocations. Often, however, a threatening event, such as the World Trade Center bombing, followed, which again legitimized the place of the higher-level mathematics (Bossé, 1995) needed for national security. During such periods, mathematics became the tool to create outstanding scientists who could restore the United States to the top of the international scoreboard (Wasley, Donmoyer, & Maxwell, 1995). When perceptions of political and economic stability return, mathematics reverts to being only one of many components within the school curriculum, thus completing the cycle.
Mathematicians, mathematics educators, politicians, and the public seldom agreed on the role of mathematics in the curriculum, even within their own groups (Klein, 2003).

In 2003, NCTM released an 1807-page, two-volume *A History of School Mathematics*. The purpose of the historical account was to "gain perspective on how individuals and society changed over time and to illuminate the coming days in mathematics education" (Stanic & Kilpatrick, 2003, p. xi). The enormity of the work pointed out a number of issues that contributed to the failures and successes in mathematics reform efforts.

As part of the Barrett Lecture Series, Zal Usiskin outlined and reiterated four periods of mathematics reform efforts in the United States since 1957 (University of Tennessee Mathematics Department, 2008). Usiskin’s four periods focused on the emphasis of New Math, Back-to-Basics, Constructivism, and NCTM Standards within mathematics education, although the researcher acknowledged fluid starting and ending times for the periods (Usiskin, 1993). The four periods outlined by Usiskin correlate to the general educational reforms cycles alternating between conservative skill-based and liberal process phases. New Math was considered a progressive liberal agenda with Back to Basics being the conservative response to the threat of Soviet dominance once Sputnik launched. Constructivism was a reform effort designed to include more of the progressive ideas of mathematics involving how students learn and construct their thought processes. Following public outcry that too much focus on thinking resulted in students not knowing basic skills, NCTM standards focused on both (Klein, 2003). However, often the standards were seen as the basic things students needed to learn. Usiskin’s periods reflected the alternating liberal and conservative cycles previously discussed in the
general history of educational reform, which he and others (e.g., Barlage, 1982; Hayden, 1981; Klein, 2003) noted were the result of changing educational foci regarding mathematics instruction.

**New Math Era Exemplar.** The New Math Era demonstrates how reform efforts lacking teacher voice played out in mathematics classrooms. Reform involved constant adaptation (Tyack & Cuban, 1995) and the New Math era required an abundance of adaptation. In *The New Math’s Curriculum Controversy*, Moon (1986) evaluated the response of a national system to the changing developments in the period after 1960. The educators at the more prestigious universities of higher education speaking for mathematics reform were not confined to the United States. In each of the six European countries studied by Moon, the leading mathematics educators creating and directing New Math movements were from universities. Only one person on the reform committee, Matthews of England, had roots in the school system and he represented a private school. However, the New Math reform in England fared better than it did in other countries. Was teacher voice a contributing factor in the more successful outcome in England?

**Secondary School Mathematics.** Compounding the problem of reform at the secondary mathematics level, teachers trained in subject specific areas were less likely to discard their specialties, which Klein (2003) asserted made the high school more resistant to reform. High schools proved relatively impervious to change and responded most to local demands (Haselkorn, 1982). Research has found that high school mathematics teachers could be among the most resistant (Wasley, Donmoyer, & Maxwell, 1995). Howley’s (2002) analysis of interviews, observations, and documents revealed that "math
teachers address calls for improvement by building on traditional practices [and that they] meld traditional and reform practices” (p. 16).

In a study designed to assess the ways in which top-down reform efforts played out, Cohen (1994) observed high school faculty for over two years as they attempted to reform. The endless philosophical conversations became a burden for the majority of teachers—consuming precious work time on the rare teacher workdays when faculty might have graded papers or organized materials. Little reform efforts intended by those in more prestigious and advantaged higher education sites occurred. If reform were local, perhaps examining rural education would benefit our understanding through rural teachers’ perspectives.

*Mathematics Reform in North Carolina.* Varied national reforms in mathematics have occurred over time, and the current study explored the impact of this reform on rural places, such as Appalachian western North Carolina, from the perspective of teachers who were part of those historical reforms. Standards for curriculum, teaching, and assessment released by the National Council for Teachers of Mathematics played a role in school mathematics reform, particularly in North Carolina. Many view North Carolina as a leader in implementing national standards and developing end-of-course and end-of-grade assessments to mirror national reform (Joyner & Bright, 2001). Joyner and Bright summarized the way in which standards played a role in North Carolina's mathematical reform as follows:

The standards released by NCTM (1989, 2000) have had a dramatic influence on how mathematics teacher educators understand the purposes and methods of mathematics instruction. These standards, moreover, have served as the model for state level mathematics content standards in North Carolina. (p. 284)
Content standards in North Carolina led to the creation of supplementary and curricular materials that facilitated implementation of the standards’ intentions of reform. "Changes in teachers’ instructional practices are the result of particular interactions between teachers and curricular materials around specific subject matter and pedagogical content" (Drake & Sherin, 2006, p. 155). How did the North Carolina teachers in this study perceive the changes made or not made? How would teachers in rural western North Carolina perceive mathematics reform efforts? The inclusion of teacher voice from rural places was not evident in any of the research.

Rural Education

Scholarship on rural education in the United States is relatively sparse (DeYoung, 1987). In the 1990 U.S. census, although nearly half of the population lived in rural areas and over one-third of children attended rural schools (DeYoung, 1995; Theobald, 1997), there were indications that people in poor and rural areas were less likely to be counted. According to DeYoung (1991), rural education issues rarely attracted the attention of education professors at prestigious universities. Thus, because rural students make up such a large proportion of the students in the United States, DeYoung and Theobald’s focus on rural issues is still pertinent.

An NCTM task force publication, entitled Mathematics Teaching and Learning in Poor Communities (NCTM, 1997), asserted, "it is more costly to provide equal educational opportunities in rural locations" (p. 6). The National Center for Education Statistics (NCES, 2007) in The Status of Education in Rural America asserted that equity of access to educational opportunities was a significant concern in rural places. Both
documents confirmed that,

Rural districts pay higher costs per course because funds are typically determined on a per-student basis. Rural districts typically have inadequate cost equalization formulas based on population density, so local taxes are critical for funding education. The resulting lack of funds decreases access to quality mathematics and advanced placement course offerings. (Children's Defense Fund, 1992, p. 45)

Additionally, dropout rates in rural places were higher than they were in urban and suburban places. In the United States, approximately 20 per cent of the people recognized as residing in poverty lived in rural places (Dalaker, 1999).

Academic discussions of rural schools and rural education typically take one of two forms. The dominant form details the statistically assessed inadequacies of rural schools (e.g., Conant, 1940; Cubberly, 1914). Alternatively, a host of romantic writers championed the cause of small and rural schools as the remaining community centers (DeYoung, 1991; C. Howley, 2002; Peshkin, 1978; Tyack & Hansot, 1982). However, the truth is that origins of metropolitan and rural schools are essentially quite different (DeYoung, 1995). Metropolitan schools usually began as specific training sites for jobs in factories or businesses while rural schools developed from parents wanting their students to have the core knowledge needed for good citizenship. Important cultural differences between rural schools and metropolitan areas are still detectable and important to the experiences of teachers. A more serious weakness of the rural education literature is its lack of consequence in the national education literature (DeYoung, 1995). Additionally, educational history is often seen as unimportant when preparing teachers (Theobald & Nachtigal, 1995), which means educators are often unaware of rural issues such as community and consolidation.
Rural Community

Rural schools traditionally value community (DeYoung, 1994). Peshkin (1978) in *Growing Up American* chronicled a rural school system as it sought to hire a new superintendent. Peshkin explained that the candidate chosen had to fit in. The relationship between school and community in rural areas is defined by frequent interactions among kin, neighbors, and community members that populate the school and community (Sampson-Cordle, 2001).

Geographic locations, personal selections, public organizations, or genetic bonds can identify communities. Community can be a feeling, a sense of belonging, a view of a place, or a set of shared experiences—all of which can be valued, shared, or shunned. Nachtigal (1998) referred to community as "how we collectively create a story about our place and provide narrative of who we are [and] how we all get along together" (p. 21). Berry (1993) considered community as "the commonwealth and common interests, commonly understood, of people living together in a place and wishing to continue to do so" (p. 120). Alternately, Coleman (1987) warned that our concept of community could be so protective and narrow that some of its members may lose opportunities for self-expression and become isolated or discouraged.

Defining community is difficult because the idea of a community lies in the subjective view of the members. Tönnies (cited in Sergiovani, 1994), a German sociologist born in 1855, developed the concept of Gemeinschaft. Gemeinschaft refers to the relationships of locale, kinships, and friendship and is loose, but tightly coupled. Social connections among family members are ancient taken-for-granted arrangements, involving choice among members. On the other end of the continuum is Gesellschaft,
meaning the world of commerce designed to meet the needs of the market place or in today’s vernacular—the global economy. For the concept of Gemeinschaft, in which rural becomes significant, Tönnies listed three types of community relationships: (a) blood—the strongest bond despite distance and time; (b) place—where one is born or the neighborhood; and (c) mental—adopted friendships arising from similar interests (Sergiovani, 1994).

Coleman (1987) discussed the ways in which community members become the gatekeepers of the community and its values. Coleman asserted that members lose their community if friends and relatives are dispersed throughout a large geographic area. Dewey (1976) noted humans as being the essential structure of community with a need to develop individually while among the social group. It is essential to understand the concept of community held by its members when researching interpretations of needed reform.

If rural school improvement is to be seriously pursued, particularly in depressed or isolated communities, more in-depth understandings of the cultural and social functions of schools in such places needs to be seen by those who would improve (not just reform) them. (DeYoung & Theobald, 1991, p. 12)

It is important to understand the community context when interpreting what rural teachers say about mathematics education during their careers.

Rural teachers may work in schools, which are the central focus of the surrounding community, with students who have lived in that region all their lives, as have their parents and grandparents. Nurturing the leaders in the school and in the community helps maintain local buy-in of reform and helps to sustain long-term efforts. (NCTM, 1997, p. 20)

Therefore, if rural teachers are part of a community viewing the national reform agenda as exploitive, as might be the case in an Appalachia community, they probably
have different voices from nonrural teachers. "Rural schools may be the last bastion of the traditional community and the only place that brings entire community together regardless of age or socioeconomic status" (Harmon, Henderson, & Royster, 2003, p. 54). Will it come as a surprise if they greet mathematics reform with suspicion when little effort is made to comprehend community concerns?

One factor contributing to community disruption and deeply affecting rural education has been consolidation. Following World War I, Conant argued that only high schools with at least 100 students in each senior class could offer enough college preparatory courses for advanced education. The pressure to consolidate small high schools reached a crescendo after Conant’s (1940) analysis of the ills of American secondary education. Significantly, Conant, who was then president of Harvard University and a spokesperson from both urban education and more prestigious higher education, articulated a different position from earlier rural viewpoints on the utility of advanced education (DeYoung & Theobald, 1991). The consolidation that followed Conant’s high school size recommendations played a major role in rural education.

*Rural Education in Appalachia*

Rural education experiences in the North Carolina mountains have historically been different from those in urban areas and have even differed from other rural places. Most early rural education research derived from writings of teachers who had the ability and time to write (DeYoung, 1995). In rural Appalachia, moral rather than logical ideology framed school reform until the 1950s (Blaug, 1985) when the national shift turned to reform for economic competition.
Porter (1997) noted that some cite patronage, incompetence, and politics as responsible for disabling Appalachian children and their quest for learning. Tales of confrontations between schools and supposedly ignorant parents and school board members are widely known (Porter, 1997). Several studies of these dilemmas exist. However, the explanation for poor schooling in Appalachia due to lack of resources is much less prevalent. Another reason acknowledged for marginal schools in rural places is that those persons in power are more interested in keeping their jobs or those of their kin than paying attention to quality education decisions (Woodrum, 2004). Nevertheless, seldom is distrust of outside interests given as a legitimate concern in the research.

The Appalachian community of Hewlett County is one where a history of unfulfilled promises by national agendas has created a community suspicious of reform. Pudup, Billings, and Waller in (1995) Appalachian in the Making outline numerous promises made to local Appalachian governments designed to elicit local support for change. An example of such promises came from the extractive industries that left many scars on both the mountains and the hearts of the locals. In a county adjacent to the location of this study, the government took over land in the 1940s to build a water reservoir with a promise that they would build a road for local families to have access to family cemeteries cut off by water. The Road to Nowhere, as the locals have referenced it since 1954, was never completed, and each year the government provides boat transportation across the water so that families can decorate the graves of friends and relatives (Asheville Citizen Times, July 14, 2005). Each year, the government offers to buy-out their agreement to build the road, which the locals reject. This part of Appalachia has a tremendous distrust of government promises of positive change.
Consolidation in Rural Education

Consolidation of schools in the research area resulted in the creation of one middle school and a single high school. In 1973, the high school incorporated 12 smaller schools (Oakton College Group, 1976). The single middle school opened in 1993. Each of the retired teachers in this study taught at both the consolidated high school and at one of the 12 smaller high schools that previously existed in the county. Teachers in the pilot studies conducted in neighboring counties mentioned changes that occurred in mathematics education because of consolidation. "Many rural communities, in losing their small school, have also lost one of the few practical venues for training citizens in democratic participation" (Theobald, 1997, p. 73).

Lyson (2002) found that both social and economic welfare were higher in rural places, if a school were located nearby. Lyson concluded, "The money that might be saved through consolidation could be forfeited in lost taxes, declining property values and lost businesses" (p. 135). Howley (1996) looked at the arguments in favor of consolidation in West Virginia ostensibly designed to help students prepare to be globally competitive in the 21st century. Data supported that school consolidations did not result in improved instruction, particularly in districts with a lower socio-economic status. Howley found the pattern most prevalent in higher grades.

If the "goal of consolidation is to improve the level of education that students receive, particularly in rural areas, then the results are far less clear" (A. Howley, 2002, p. 8). Assumptions behind consolidation are economic in nature, as Theobald and Nachtigal (1995) noted, "If our cities and factories are growing larger, so must our schools" (p. 135). Large consolidated high schools require a more specialized workforce, which
means the "decision-making power moves from the local and rests with professionals and the government as consolidation occurs" (Woodrum, 2004, p. 4).

Historically, only by placing local citizens in charge of local schools could "concerned state leaders insure any form of formal instruction in the countryside" (Tyack & Tobin, 1994, p. 457). However, consolidation often shifts control to the state. Cubberly (1914) warned that one should not underestimate the problem of school reform because the rural school is burdened by tradition and controlled by rural people. Consolidation has a significant impact on social context, often resulting in community resistance to school closings. (DeYoung & Howley, 1992; Gleason et al., 2008)

**Top-Down Reforms**

Theobald (1991) and DeYoung (1995) discussed issues of elitism that are implied in most secondary and university education reform plans as repelling many rural Americans. The elitism implied by Theobald and DeYoung connotes the idea of schools with more advantages and reputations that are more prestigious. The historical record suggests "greater acceptance of reforms that do not radically alter the prevailing cultural understandings of what schools do" (Brint, 1998, p. 56). Additionally, acceptance of reform is more likely if the major players are undisturbed (DeYoung, 1995). The major actor in rural schools is the community. "In some rural communities, poverty and isolation make school reform issues and concerns increasingly problematic" (DeYoung & Theobald, 1991, p. 8). Reformers encounter a host of conflicts in local communities (Lazerson, McLaughlin, & McPherson, 1984). In isolated rural areas, teachers and schools do not have access to enrichment and support for reform efforts (NCTM, 1997), which may lead to reluctance on the part of teachers to attempt reform implementation.
Each of the New Math era studies included in Table 2 (see Appendix A) mentioned resistance to reform. It is interesting that none of the studies set out to investigate this phenomenon. Bossé (1995) acknowledged in his study that his major mistake was in not recognizing local rigidity. Hjelle’s (2001) study of nonrural elementary teachers revealed,

Teachers perceived that school administrators and policy makers expected teachers blindly to accept change with little or no regard for their expertise or professional opinions. Further, when given opportunity to voice their opinions about curricular change, teachers cited overriding problems with the organizational structures in which they worked (p. 186).

Gitlin and Margonis (1995) argued that an "emphasis on promoting teacher engagement in reform endeavors obscured the political insights of those teachers who resist reform" (p. 11), revealing that school-change literature overlooked what they claimed was a precondition for reform—the restructuring of teachers’ work and culture. Both Schön (1987) and Lortie (1975) discussed this nature and culture of teachers’ work as playing a significant role in teacher change.

Silver and Castro (2002) suggested that mathematics reform was less likely to happen in rural classrooms. Cohen (1989) metaphorically argued that "an inch of reform floats on a mile deep of traditions that says truth is certain, not uncertain; that knowledge is discovered or constructed, not imparted; and that learning is definitive and not contingent" (p. 41). A missing step in the logic, then, maybe is that rural places typically honor tradition more than other places do. DeYoung (1991) provided some of the missing step with his work on rural places.

Consider where mathematics reform had it greatest impetus. Following the Second World War, when the country had insufficient and poorly prepared scientific
workers, the government role in education changed (Kilpatrick, 2006). With claims that the United States was producing fewer mathematicians than the Soviet Union, the U. S. government took a new role in the reform movement in mathematics. The New Math era was already underway, but Sputnik provided the catalyst to kick the movement into high gear (Klein, 2003), even though the leaders never intended for it to be a national movement (Fey & Graeber, 2003). Schön (1987) stated that "in our cyclical American way, we are in the midst of a new wave of school reform, and as usual are blaming the schools for issues that properly belong to society as a whole" (p. 112).

**Mathematics Education in Rural Communities**

Accountability testing often leads to "the potential for conflict between traditional and reform pedagogy" (A. Howley, 2002, p. 8). Even though this is an opinion, there is some evidence to support it. In an American Educational Research Association presentation, Howley, Howley, and Helms (2007) noted, "Little is known about the dynamics of standards-based reform of mathematics in rural schools' efforts on rural reform" (n.p.). A view of mathematics as merely arithmetic and skill, the more traditional view of stakeholders, might be hard to change in places where tradition is highly prized (A. Howley, 2003).

There are tensions in opinions between what mathematics is and how it should be taught. However, there is agreement from the previously mentioned NCTM *Task Force on Mathematics Teaching and Learning in Poor Communities* (Campbell & Silver, 1999) that all students, regardless of where they live, should have the same rigorous mathematical content. Without rural issues considered, NCTM's *Principles and Standards for School Mathematics* (2000) reaffirmed that all students should have
equitable and rigorous mathematical content. Campbell and Silver (1999) concluded that in poor communities, that was not the status of mathematics education. As in the New Math era, "high school students in rural schools and inner city are now less likely to be enrolled in Advanced Mathematics courses than students in other places, even after controlling for size of school" (NCES, 2007, p. 8). According to Bottoms and Carpenter (2005),

Some evidence suggests that at ‘higher mathematical levels’ (i.e., college preparatory high school mathematics), rural students achieve less well than other students, take fewer ‘rigorous’ high school math courses, and in general, experience instruction that places little emphasis on rich numeracy experiences in the curriculum. (p. 1)

Economic competition involved improving technology. Many view technology as lacking in the United States. In today's era, some consider technology as a panacea to make rural education equitable. Distance education, computers, and graphing calculators have entered mathematics classrooms, and some believe that the technology provides an education in rural places comparable to that existing in urban areas. However, a study of mathematics education perceptions conducted in the rural Midwest found that adults held a "basic perception that too much technology can have a significant negative impact on the developing minds of students" (Lucas & Fuggitt, 2007, p. 14). Do rural teachers hold this view? If so, their beliefs are in contrast to views that technology can fix rural education and will affect the learning of mathematics for children of western NC.

In an "analysis of the rhetorical literature," Howley, Howley, & Huber (2005), on prescriptions for rural mathematics education, suggested, "curricula should be grounded in the local culture as the main catalyst for improving the formal education system of rural schools" (p. 10). Howley and Gunn (2003) added, "Existing evidence suggests that
mathematics instruction in rural schools has changed little and that achievement overall is similar to national averages" (p. 89).

The NCTM Task Force on Mathematics Teaching and Learning in Poor Communities recommended that "more study is needed to characterize the nature and longevity of the implementation of mathematics reform efforts in classrooms serving poor communities, particularly in rural areas" (NCTM, 1997, p. 16). Campbell and Silver (1999) questioned whether NCTM was following their own recommendation. In addition, Howley, Howley, and Huber (2005) found that most mathematics education rural research contained a deficiency theory for rural education where rural seemed lacking: "It is our view that the rhetoric about rural mathematics education does tend to treat rural people as other" (p. 11). Do rural teachers have the belief they are treated as other?

Teacher Belief

Teachers’ beliefs are critical if reform implementations are to be successful (Drake & Sherin, 2006; Spillane, 2001). In most research, it is assumed that behavior will be consistent with teacher beliefs (Cooney, 2003; Pajares, 1992); thus, beliefs are critical to the reform of mathematics education (Battista, 1994; Cooney & Shealy, 1997). Ernest (1989) defined teacher belief as "[a] teacher’s view or conception of the nature of mathematics, model or view of the nature of mathematics teaching, [and] model or view of the process of learning mathematics" (p. 249). In attempting to develop a theory of mathematical thinking and problem solving, Schoenfeld (1992) listed belief as one of the five aspects of cognition. The "more important the belief, the more resistant it is to change" (Nespor, 1987, p. 314).
Adaptations to Reform

Teachers' beliefs are often incongruous with the underlying beliefs and assumptions of reform. This "incompatibility blocks reform and prolongs the use of a mathematics curriculum that is seriously damaging the mathematical health of our children" (Battista, 1994, p. 412). Relationships between teachers and mathematics curricula have been fraught with issues that need addressing by reformers (Ben-Peretz, 1990; Remillard, 1999, 2000).

In *How Teachers Taught*, Cuban (1993) examined descriptive data from over 1,200 classrooms between 1880 and 1990 to determine changes over time. Cuban found that highly teacher-centered teaching (e.g., lectures, board work, and seatwork, and desks in rows) was consistent with teaching a century earlier, especially at the secondary level. In Cuban’s view, the belief teachers held in maintaining teacher authority explained why student-centered reforms fell by the wayside.

More research on teacher belief exists for elementary school teachers than for secondary school teachers. In an urban study of elementary schools, teachers had individual patterns of adapting to curriculum reform related to their early "experiences with mathematics, their current perceptions of themselves as mathematics learners, and their mathematical interactions with family" (Drake & Sherin, 2006, p. 162). Lubienski (2004) questioned whether a "teacher’s beliefs about ‘good teaching’ permeate the teacher’s pedagogy regardless of curriculum used" (p. 339) and determined they did not.

Teachers say that their principle teacher has been their experiences; they learned to teach through trial and error in the classroom. They portray the process (of teaching) as the acquisition of personally tested practices, not as the refinement and application of generally valid principles of instruction. (Lortie, 1975, p. 83)
Schuck’s (1999) report on teacher education practices in relation to teacher belief noted that "teachers often held beliefs about mathematics teaching and learning that constrained their access to rich and powerful ways to learn" (p. 2). Cuban (1993) agreed that "substantial numbers of teachers, concerned with maintaining order and limiting classroom noise, yet attracted to the new ideas about children and their development, struck compromises between what they viewed as essential teacher prerogatives […] and the new beliefs" (p. 269). This view paralleled the previous discussion of Schön’s (1987) epistemology of schools as the key to predictability and control. According to Schuck (1999), teacher educators are "driving a mathematics reform bus with unwilling passengers" (p. 1), where teaching-as-telling keeps the driver in control, trying to read the road map. Schuck seemed to advocate the wisdom of reformers stopping the bus, analyzing the road map, and taking time to talk to the unwilling passengers.

Belief Impediments to Reform

What are the concerns about belief that impede reform? Lortie (1975) discussed four occupational characteristics that encouraged a common set of attitudes among teachers—defensiveness, conservatism, pragmatism, and elitism. Defensiveness implied teacher's defending what they currently do; conservatism denoted sticking to what they already have that works; pragmatism involved the teachers adapting within their own time and resource constraints; while elitism refers to teachers having a view that the reforms are designed with more advantaged schools in mind. Insecure people tend to be defensive about what they can control and either unwilling to try new ways or tend to overvalue signs of acceptance.
Without listening to teachers' belief voices, reformers have used incentives in attempts to alter teacher practice. Yet, people who enter teaching have less interest in making money or in working with ideas than those who go into science and medicine—instead, the most common characteristic among teachers is that they enjoy working with people (Lortie, 1975). Thus, reform efforts that rely on monetary incentives to entice teachers to change or improve often are not successful. A report from Kannapel, Coe, Aagaard, and Moore (1996), *I don’t give a hoot about their $3600*, summed up the anger and insult rural teachers felt in the early stages of the Kentucky Education Reform Acts. Many teachers said the promise of rewards was not an incentive, and they doubted the promises would actually happen.

Assessment, as another enticement incentive catalyst for reform, became common practice in the United States in the 1970s and 1980s (Linn, 1993) and permeates the current 2010 educational efforts of 'Race to the Top' policy. When high stakes are attached to norm-referenced tests, teachers often teach in ways that violate their own beliefs and values about how and what students should be taught (Hatch & Freeman, 1988; Urdan & Paris, 1994). How would rural retired teachers in this investigation perceive the assessment-based reforms they experienced during the 1970s and 1980s?

Teachers in solitary classrooms, seldom exposed to people with ideas different from their own, often remain conventional in their teaching. Teachers at the secondary level are often viewed as the single authority on their specific topics (Ball, 2001; Cohen, 1989; Cooney & Shealy, 1997; Cuban, 1986; Ernest, 1991). Teachers are essentially alone and rarely interact with their principal or other teachers on matters of practice (Brint, 1998). Of particular interest in the existing rural teacher belief research is that
contextual constraint has been recognized as exerting significant influence on beliefs (Cooney & Shealy, 1997; Pajares, 1992).

*Rural Teacher Voice*

Research that did address rural teacher belief frequently used opinion surveys. Pearson (1989) cited numerous opinion poll deficiencies, mistaken correlations, rural district cooperation, and insufficient evaluation data as serious issues in research when responding to a rural Minnesota report. Seldom did researchers interview teachers regarding their teacher beliefs. One rural study surveyed 182 recognized educators (those receiving awards in past 20 years), 55 superintendents, a random sample of 1,000 teachers, and 41 principals. Of those, 384 participants returned surveys, and the researcher conducted follow-up interviews with 60 of them. Overall, the study revealed that the educators believed that teacher quality should be the top priority of educational reform (Crone-Koshel & Margolin, 1997). However, none of the research dealt directly with rural teacher belief that might influence reforms.

Teacher commitment is a critical factor contributing to teacher performance (Firestone, 1996; Graham, 1996; Louis, 1998). According to Huberman (1993), teachers’ positive attitudes and commitment decreased over time. He discussed three stages of a teaching career: commitment, experimentation, and conservatism, which he claimed led to eventual disengagement. Boylan and McSwan (1998) found in Australia "that teachers who served in rural schools for more than six years reported high levels of commitment to teaching which appeared to increase over time" (p. 63). Belief in community and in contributing to that community aided the rural teachers in becoming what Boylan and
McSwan referred to as long-staying rural teachers. This contrasts with urban and suburban findings.

Terry (1997) investigated student retention in an indigenous community school in Manitoba and noted that successful programs involved teacher belief in the local language and culture. A study of social studies teachers in Pennsylvania found that rural teachers' belief that conditions would not improve and that reform would not occur (Ashley, 1983) contributed to reform failure.

Martin (1990) surveyed 81 teachers in five rural counties in Tennessee. The primary focus of the study was school leaders, but three efficacy measures were imbedded within the survey questions: (a) teachers' belief in their knowledge and skills affecting student learning; (b) teachers' perceived that they could be leaders; and (c) the teachers’ believed that they could make instructional decisions. An ethnographic study that explored belief systems of diversity as related to the identity of preservice science teachers included a rural Appalachian case but the majority of research dealt with urban and cultural differences (Brand & Glasson, 2004). None of the studies mentioned above regarding rural teacher belief dealt with mathematics.

United States Secondary Mathematics Reform

In the United States, there is extant research on mathematics reform and teacher belief in nonrural places. Cooney (1997) and his collaborator characterized the belief structure of secondary mathematics teachers. The partial scheme included isolationist, naïve idealist, naïve connectionist, and reflective connectionist (Cooney & Shealy, 1997). Teachers’ mathematical view or their beliefs about students influenced reform implementation (Ball, 1991; Drake & Sherin, 2006; Spillane, 2001).
Wasley, Donmoyer, and Maxwell (1995) studied the process of teacher change among high school mathematics and science teachers. In their study, most of the teachers were unopposed to advocated changes, but they lacked knowledge of methods to implement reforms.

Most of the teachers, quite simply, had trouble figuring out what to do and where to start. The images provided in the reform reports were not specific enough to help teachers know how to begin, much less to sustain, the process of change. (p. 54)

This led Wasley et al to conclude that a "knowledge of specific strategies appears to be a necessary, albeit not necessarily sufficient, precondition for reform" (p. 54).

Classroom teachers play a significant role in reform. This was certainly evident in New Math era research studies (see Table 2 in Appendix A). A study in 1977 (Price, Kelly, & Jonathan) randomly selected 800 mathematics supervisors to distribute 10 questionnaires each to 10 teachers. They concluded that teachers teach the way they were taught. In these self-reported responses to classroom practices, few taught the concepts or major ideas of the New Math reform (Price, Kelley, & Jonathan, 1977). One flaw in their method concerned the selection of respondents by supervisors because it introduced bias. Not all districts have supervisors; for example, only one district in the Appalachia region of North Carolina has a mathematics supervisor and that district is an urban setting (NCREC, 2002).

Stake and Easley (1978) found little evidence of use of New Math materials in 11 district case studies. This was evident from self-reporting survey results and site visits to the district classrooms. Lectures and pencil-and-paper computations occurred in most classrooms the majority of the time. Bossé (1995) conducted telephone interviews with
seven seminal participants in the New Math movement. Six of the seven were involved
in New Math and four with the NCTM standards, three with both of the reform efforts,
three with New Math only, and one with NCTM standards only. Bossé concluded that,
when others perceived teachers as followers and, therefore, paraprofessionals,
educational reforms fail.

*International Mathematics Reform*

A European study of New Math programs found that in all seven countries that
were investigated (Moon, 1986), reforms failed when teachers believed they were
expected to follow a prepared script. Several other international studies offered insight
into teacher beliefs. Barkatas and Malone (2005) studied veteran secondary mathematics
teachers in Greece, and found that prior school experiences, personal worldviews, and
ideologies were the primary influences on teacher beliefs about mathematics. However,
the teachers' personal and teaching experiences strongly influenced their belief about
learning and assessment.

In the early 1990s, Gooya (2007) studied new reform teacher belief about high
school geometry in Iran. Gooya suggested that participating teachers fell into three belief
categories: traditionalists, incrementalists, and innovators. The study involved 480
mathematics teachers participating in professional development. The data collected
included reflective writing, trainer notes, project works, discussions, open-ended
questionnaires, and oral communications.

Beswick (2005) observed a connection between beliefs of secondary mathematics
teachers and their classroom practices in Tasmania. Dunn (2000) in a Namibian study
found that the beliefs of the mathematics teachers were "powerful determinants of the ways in which change was interpreted and implemented in the classroom" (p. 504).

**Teacher Perception of Curricular Reform**

Cohen (1994) related that, when she presented the ordeal of a reform program at a conference,

> College reformers, like so many ancient mariners, swarmed the podium to exchange desperate tales. There is a great thirst for real and compelling cases of struggle in school change efforts—not prescription or advice, but rather a consoling and confirming eye. (p. 151)

To quench this thirst for compelling cases, we must understand how teachers, especially experienced teachers, interpret reform curricula change, if in fact they do change (Drake & Sherin, 2006).

Some of the teacher views found in the literature included belief in the following three statements: (a) "The selection of appropriate curriculum materials and identification of the best (most carefully aligned) curricular sequence will improve student performance; (b) A provision of one-on-one tutoring will result in higher test scores" (A. Howley, 2002, p. 21); and (c) "Teachers’ identities and prior experiences as learners and teachers of mathematics is the key to both facilitating and understanding the implementation of reform materials" (Drake & Sherin, 2006, p. 156). Mathematics teacher beliefs are central to successful reform (Ball, 2001; Cooney & Shealy, 1997). Consequently, it is imperative to focus on teacher perceptions when implementing reforms.

When reforms fail, teachers perceive reforms as passing fads (Ballone & Czerniak, 2001), which result in little hope that future reforms, regardless of reform
merits, will succeed. This trend is pervasive in the history of reforms. Many experienced rural and nonrural teachers have a wealth of experience with unsuccessful reform efforts (Cuban, 1994), often resulting in pessimistic reform perceptions. Teacher reform beliefs need exploration if reform efforts are to succeed. Without inclusion of teacher voice, reform efforts seem guaranteed to failure.

Competing opinions over what teachers should teach has produced another source of tension in curriculum reform. Historically, this tension created resistance to change at the local level and, especially, in rural places (DeYoung, 1991). What kinds of reforms are less likely to be met with resistance, and therefore more likely to succeed? According to Tyack and Cuban (1995), school reforms are more likely to be adopted when they:

(a) "create more efficient organization for administrators" (p. 112); (b) "permit teachers to use more creative instruction (provided reforms do not threaten to replace teachers or create burdensome time demands)" (p. 86); (c) "give students more incentive to attend school (p. 45); (d) "pose no threat to important political constituencies" (p. 108); and (e) "have backing through mandate of law, particularly if compliance can be monitored" (p. 131).

Rural Mathematics Reform and Teacher Belief

Rural mathematics teachers and administrators hang onto conventional practices largely to avoid faddism. Some rural education writers (A. Howley, 2002; Porter, 1997) posit that all reform is local. Rural instructional reform may involve only "incremental expansion and modification of traditional and culturally resonant methods" (Porter, 1997, p. 212). Little research exists on how teachers in rural settings, such as Appalachia, understand reform efforts and how they make sense of those reforms. There is no research on teachers’ rationale for the hybrid models of the reform they create. Teacher voice is clearly lacking regardless of locale.
The current research base for both mathematics and science education in rural contexts is extremely limited. In short, it is largely unknown "whether ‘what works’ in urban schools works in rural schools" (Harmon, Henderson, & Royster, 2003, p. 57). Even less information is available about what teachers believe works in rural schools for mathematics education because seldom does anyone ask the teachers how they perceive reform. Teachers need a voice included in reform efforts. Their inclusion is imperative from the initial prescription for changes through both implementations of reform and reform evaluation. Perhaps, their "hanging tough with conventional practices" involves a lot more than the "avoidance of faddism" (C. Howley, 2003, p. 5). How are we to know the rationale for teacher resistance to reform unless teachers are interviewed regarding their perceptions and beliefs concerning past reform efforts? 'Long-staying' ((Boylan & McSwan, 1998) teachers who have experienced past reform efforts from multiple perspectives seem an obvious source of information needed for future reform attempts.

Summary

The New Math era was a distinctive period in the history of mathematics education that bears striking similarities to the reforms of the 1980s, the standard reforms of the 1990s, and the more recent Common Core standards impetus. Although one is supposed to learn from the past, the lessons are often only partially learned. There are serious implications from the lessons learned during past reform efforts, which mathematics educators should consider when doing research about reforms. The lessons include: (a) Teachers must be included on a professional level with researchers, mathematicians, and mathematics educators in any reform efforts because teachers are the key to change; (b). Reform from the top-down does not reach the students and
teachers in the form intended by reformers must include practitioners in their reform efforts; (c). Teacher beliefs, attitudes, and practices must be considered in all research where reform is expected; and (d) Local school districts should understand educational reform in the context of local cultural community norms. Evidence suggests that teacher voice is missing. Kirkpatrick (2006) found that teachers forced to use materials in which they held little ownership seldom adopted the intended reforms. Ball (2000) acknowledged that the top-down mode of delivery impeded implementation of her work. The cyclical nature of alternating periods of liberal, more child-centered, and conservative, involving more teacher autocracy, views in mathematics education assures that reform issues will return. Will reformers continue to ignore the voices of teachers?
CHAPTER THREE: METHODOLOGY

This chapter describes the methodology used in the study, and details three phases of data collection. Individual interviews were the primary technique used to collect data, which included descriptions of choices and rationale for analysis. The research compared and contrasted emergent themes toward implementation and the effects of secondary mathematics reform in a single rural district. The study employed a constant-comparative method to generate and verify themes, which were "discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon" (Strauss & Corbin, 1990, p. 87). The method was particularly well suited to this study because there was little existing research about teacher and curricular changes at the secondary level from the perspective of retired rural teachers. In-depth qualitative interviewing aided in understanding the experiences of people who gained those experiences from having lived them (Patton, 2002; Spradley, 1979; Weiss, 1994).

Theoretical Rationale

The purpose of this study was to understand the perspective of rural secondary mathematics teachers regarding changes that occurred in mathematics curricula and instruction during their careers. Qualitative research methods elicit the views of the participants and interpret their perspectives (Hatch, 2002). The purpose of using a "qualitative mode of inquiry is to facilitate the study of issues and events in-depth and detail" (Patton, 2002, p.33). An assumption upon which all types of qualitative research is based is "the view that individuals interacting with their social worlds construct meaning" (Merriam, 1998, p. 118). Qualitative research is "primarily concerned with human
understanding, interpretation, intersubjectivity, and lived truth" (Ernest, 1989, p. 250). This study is about the lived truth of mathematics reform in one rural setting.

A qualitative interview study may well be the method of choice if the aim is to describe how a system works or fails to work (Weiss, 1994). Qualitative interviewing enables learning about the perceptions, feelings, and reactions known only to those to whom they occurred. Not only are the feelings of the participants exposed through qualitative work but also is the depth of those feelings expressed in their own words. "To capture participants in their own terms one must learn their categories for rendering explicable and coherent flux of raw reality" (Lofland, 1971). In the current study, the semi-structured nature of the interviews enabled teachers to select what they perceived as most relevant. The essence of interviewing is having an interest in other people’s stories because they have value (Seidman, 2006). Interviewing affords a window on the past (Weiss, 1994).

One of the primary aims of the Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics (ACCLAIM) (2002) is to "understand the rural context as it pertains to the learning and teaching of mathematics" (p. 2). Few researchers have taken the advice of Bush (2005), who recommended studies that considered what Appalachian community members and teachers believed about the teaching and learning of mathematics. Thus, a qualitative approach could address the how and what questions of researchers.

In reviewing approaches to rural research, C. B. Howley (2003) favored a post positivist view, which never quite defined reality. The goal of a post positivist researcher
is to maintain an objective position while seeking close approximations of reality by capturing participant perspectives on lived experience.

Social issues like education are best understood through the experiences of the individuals who work in and live in the situations (Lortie, 1975). Although a great deal of research takes place in United States schools, it seldom considers the perspectives of teachers (Seidman, 2006). Seidman revealed an argument between Becker and Geer in 1957 on whether participant observation was the single best way to gather data about people in society. Participant observation affirms the importance of the individual without denigrating the possibility of community and collaboration (Seidman, 2006). Since community is such a large part of rural life, interviewing is an obvious preferred choice to affirm the teachers’ views and the rural perspective.

The constant-comparative method aided in gaining teacher perspective. According to Strauss and Corbin (1998), the constant-comparative method generated themes "derived from data, systematically gathered and analyzed through the research process" (p. 214). Because those themes "are drawn from data, [they] are likely to offer insight, enhance understanding and provide a meaningful guide to action" (Strauss & Corbin, p. 86). What differentiates this method from other qualitative approaches is the focus on theme and pattern development (Strauss & Corban, 1998). The substantive patterns developed using the constant-comparative methods have as their referent specific everyday world situations. They apply to practice more frequently than global concerns (Merriam, 1998).

Even though the primary characteristic of this method is the grounding of ideas and themes in the data, one cannot dismiss the researcher's creativity as tantamount to
quality work. Patton (1990) stated, "Qualitative evaluation inquiry draws on both critical and creative thinking—both the science and the art of analysis" (p. 434). The analysis is the interplay between researcher and the data that leads to knowing about the research.

The Researcher

The caliber of qualitative research data depends largely "on the methodological skill, sensitivity, and integrity of the researcher" (Patton, 2002, p. 168). The researcher becomes the "primary instrument for data collection and analysis" (Merriam, 1998, p. 45). Patton (2002) provided the following characteristics, which he found useful to promote creative thinking when analyzing data:

(a) willingness to see multiple possibilities; (b) ability to generate a list of options; (c) desire to explore various possibilities before choosing one; (d) use of a variety of expressions such as art, music and metaphors to simulate thinking; (e) use of nonlinear forms of thinking to get a fresh perspective; (f) divergence from one’s usual ways of thinking and working; (g) trust of the process and not holding back; (h) desire not to take shortcuts or to put energy and effort into the work; and (i) willingness to have fun with it. (pp. 434 - 435)

The researcher as constructor of knowledge has to be included in the discussion of research. The researcher cannot be external in this type of research in mathematics education (Ernest, 1998).

Personal Background

A researcher’s background influences observations and interpretations (Peshkin, 1978; Spradley, 1979; Vygotsky, 1978; Wolcott, 1994). To minimize this influence and prevent distortion, I consulted with my dissertation committee when collecting and analyzing data. My background gave me a strong basis for viewing the teachers’
perspectives. I shared their European heritage. My great-grandparents on both sides of my family settled in the Appalachia Mountains and were of Irish and English descent.

My socioeconomic status varied from very poor to wealthy, which was an asset in interpreting teacher reflections based on multiple views of various socioeconomic perspectives. As a child, I was unaware that we were poor because others had similar surroundings. Being from an alcoholic home meant that there were things to hide from outsiders. I made no connection between our financial situation and the alcoholism of my father. After my parents divorced and my mother remarried into some wealth, it became obvious that being poor was different. It also seemed that being poor was synonymous with living in a rural place because our times of wealth were associated with urban life. Alcoholism remained a factor, however, and the alcoholism of both my stepfather and my father took a financial toll on the family. During my last years of high school, we were again a poor, rural Appalachian family.

In college, I tried to hide my poor family background so that I would fit in with the wealth I had previously known. Prior to my stepfather's escalating alcoholism, wealth meant flying home in our private plane and keeping up the façade. When I returned home for visits, I was careful not to show too much of my education because I did not want anyone to say that education had changed me or to come across as living above my raising. This dichotomous socioeconomic lifestyle provided insight into the research analysis for this study.

Moving from a 2,700-student high school in the metropolitan area of Washington, DC, to a 500 student consolidated rural high school in central North Carolina created culture shock at the end of my junior year. The consolidation in that locale was primarily
for integration and not school size or efficacy; thus, it differed from what occurred in Appalachia where this study took place. The new rural school had few choices of course selection and limited resources compared to those provided in the large city. When I became the best mathematics student in the school because I had already learned the material at my metropolitan school, my love of mathematics blossomed. Tutoring fellow students was a dream realization for someone who was born to be a mathematics teacher.

In my younger years, my maternal grandparents lived in a medium-sized city while my paternal grandparents resided 15 miles (24 km) away in a farming community. Therefore, at an early age, I experienced the contrast between rural and urban life. I grew up in a city but my fondest memories are of living on a farm and attending rural schools. My paternal grandparents raised seven children of their own, and two of my cousins and I lived with them on the farm for two years.

I am a 27-year veteran teacher of secondary mathematics who taught in and attended both rural and urban secondary schools. My favorite schools have been small and rural. However, the higher salary and the greater resources were in the urban schools. I live in a rural community; my youngest son graduated from Hewlett High School, where most of the teachers in this study taught. My older son attended Greenwood High School, a more urban high school where one of the participants taught. My oldest son went to what some consider a prestigious state-supported school for the gifted in a large North Carolina city. My experiences with my own children have been ones of urban contrast between urban and rural environments.

My teaching circumstances at the time of this study also reflect this rural-urban contrast; I live in a rural community but retired from a high school in the largest nearby
city. There was never a day during my last seven years of teaching that I did not walk up the large steps of the three-story urban high school building sitting among eight other buildings on campus, and think of the lack of resources thirty miles away at my son’s small school. Yet, I felt that my son was receiving more than academic training; he was gaining an education about community and a sense of place, which was not the result of material resources.

*Professional Experiences*

Because I taught in eastern, central, and western North Carolina in nine high schools, each in its own school system, I experienced local, state, and national reform efforts in mathematics in a multitude of ways. It was interesting to note the ways in which different systems and schools interpreted the same policies. It was also interesting to hear how resistances to reform efforts manifested in classrooms. My diverse teaching background illuminated this research through the lens of these experiences.

With such a dichotomy of rural and urban experiences, I provide balance for any bias toward rural or urban education. Having been a secondary mathematics teacher allowed me a lens through which to understand the teachers’ perspectives that often is missing in educational research. Nevertheless, I needed to be continuously on guard against failure to question comments I perceived as normal and understood by mathematics teachers. I participated in reform during the same years as the participants and this allowed me to relate to their stories from a personal perspective. In addition, the participants read and discussed my views of their perceptions in later interviews, which provided a check for biases that may have occurred. A review of the work by local administrators, mathematics specialists, or other persons occurred if the perceptions of
researcher and the participants differed substantially. Historical records and accounts confirmed some perceptions.

**Personal Epistemology**

The goal of U. S. secondary mathematics education seems to be teaching students to compete in the global economy. This was not the implied or intended goal of the past and, when juxtaposed with my own teaching philosophy, created tension. I think mathematics is about helping students to think and be creative. It is not about simply doing a problem or applying it to a real-world situation. Seeing logic and structure in mathematics creates analytical thinking applicable to many life world situations. This philosophy of mathematics teaching affects decisions about what to teach and how to teach for concepts and understanding. In earlier days of teaching, I made those decisions. The accountability movements, where skill-based assessments became the norm, conflicted somewhat with my view of education as one of training the mind. The tension caused my teaching to lose its spontaneity and innovation. Would this be true of other secondary mathematics teachers as well? Would there be a realization of the conflict from other teachers? Would teachers with an epistemology of teaching to compete in the global economy have a different view?

Realizing that teacher belief systems about mathematics teaching affect their decisions in the classroom, I wished to ensure that interviews revealed these teacher beliefs. One of the main purposes of the first interviews was to ascertain the teacher’s epistemology of mathematics teaching. The research analysis considered each teacher’s view of teaching. This enabled interpreting the perspectives from the vantage of the individual teacher's epistemology, which sometimes differed from mine.
Summary of Researcher

Strauss and Corbin (1998) outlined the characteristics of a comparative-contrast theorist:

(a) the ability to step back and critically analyze situations; (b) the ability to recognize the tendency to bias; (c) the ability to think abstractly; (d) the ability to be flexible and open to helpful criticism; (e) sensitivity to the words and actions of respondents and (f) a sense of absorption and devotion to the work process. (p. 156)

Rather than decrying the "fact that the instrument [researcher] used to gather data affects the process, we say the human interviewer can be a marvelously smart, adaptable, flexible instrument who can respond to situations with skill, tact and understanding" (Lincoln & Guba, 1985, p. 43). Both my personal and professional life prepared me for this work, and I met the six characteristics of a comparative-contrast theorist enumerated by Strauss and Corbin as well as the Lincoln and Guba criteria. As a mathematics teacher thrust into a multitude of circumstances, my ability to remain flexible and sensitive has prevailed, frequently noted by others.

I had to be careful not to go native when listening to rural secondary mathematics teachers telling their stories of change. I was cautious of appearing empathetic to their views. I continually had to think about whether researchers who do not share my background would question my comments. My 27 years of teaching at the secondary school level was an asset through which to view the responses but also brought with it the baggage of experience. Wolcott (1994) said a researcher must suspend judgment and possess a genuine interest in learning about the culture. I have moved and changed jobs enough to know that I am one of the others, and this fact balanced my analysis. Having another retired person, a colleague with a Ph.D. in mathematics education from another
state, read the transcripts and my analysis increased objectivity, provided balance, and decreased bias.

A transcriptionist unfamiliar with rural experiences sometimes spontaneously commented on rural life as she typed the interview data. Her comments often engendered reflection on how outsiders perceive rural situations through a different lens. The transcriptionist had limited mathematics and educational background.

Participants and Place

Participants

The basis of selection of participant teachers in this study was on the following criteria: (a) They were retired and no longer teaching; (b) They were involved in education for a minimum of 20 years; (c) They taught mathematics at the secondary level; and (d) They taught at least ten years at the secondary level in the rural county selected for study. The most significant reason for selection was due to the richness of information that retired teachers would have reflected on following their retirement. Participants tell their own stories and only they can articulate from the point of view of one who has lived experience. Those most knowledgeable and best able to perceive changes are these retired experienced teachers who value their legacy. Since teaching is a complex endeavor, learning to teach is a career-long process of exploration and education. As previously explained all teachers interviewed for this study were native to the area and except in a few instances for initial years of teaching taught their entire career here. Prior to the 1990s, the school board seldom hired teachers without connections to the community, which meant the population for this study offered a genuinely local perspective. Since there is a finite list of secondary mathematics teachers
in the school system, I included all teachers meeting the criteria. This non-restrictive selection, although small, encompassed the entire rural retired secondary mathematics teachers in the setting. It certainly added to statistical credibility to have data from an entire population as sampling error becomes nonexistent. The isolation of secondary teachers in their classrooms also provided a unique perspective from which to view the reforms and changes over a lifetime career.

Not being native to the area as well as experiencing health issues made it difficult for me to have personal relationships with students and teachers. I had just moved to the county and was hired by a new superintendent who happened to be my next-door neighbor. Because of a difficult maternity situation, I was actually home more than I was at school and eventually resigned to stay home with my children. Thus, my knowledge of the participants was limited. My initial perception was they treated me with guarded courtesy. It was only after living in the county for 20 years that I realized, echoed by James Adams, that they "let those outside teachers do their thing as long as they aren’t doing anything that hurts the kids or the families."

Setting

Hewlett County, located in Western North Carolina, borders East Tennessee and is very mountainous. The terrain is often steep and there are many winding roads and coves. The winters can create snow- and ice-covered roads. The county averages over twelve missed school days a year but students have often missed as many as 20-seven. Even when the roads seem clear, snowplows pile up the snow at the end of the coves and buses cannot turn around. There are emergency snow plans in place for parents to meet the bus on a main road. However, too many parents have no transportation and the
emergency plans are seldom used. These interruptions in schedule result in a discontinuity in teacher planning during the winter. It also means that the end of year schedule is tenuous because the state requires the buses to run one hundred eighty days. Due to the excessive average number of missed school days, Hewlett County is eligible for a waiver of the state law requiring students to start no earlier than August 25. Hewlett typically starts school around August 5, which can interrupt farming schedules. The August heat sometimes results in early dismissal of schools because some buildings are not air conditioned, although the high school does have cooling units. Due to childcare concerns, all schools follow the same schedule to allow older siblings to be at home with younger ones. The area is also prone to flooding because waters flow quickly off several mountains and converge in lower streams, washing out bridges. The water standing in roadways and the inaccessibility of bridges means that schools close when this occurs. Thus, teachers in the system often do not have adequate sustained instructional time and have uncertainty in planning for their lessons.

Rural students in Western North Carolina lead the state in end-of-grade (EOG) test results and have improving SAT scores (Joyner, 2007). However, the SAT average for mathematics is well below the national average (NCDPI, 2006). A majority of the rural students do not take the SAT (Joyner, 2007). Hewlett County, where this study occurred, is one of nine of the top ten counties in the state whose students passed both state End of Grade and End of Course reading and math tests (Joyner, 2007). All mountain counties have pass rates exceeding 80%. Issues of reform, based on national standards, emerge from the state and have revisions approximately every five years. The teachers in the first
pilot study said state test scores did not mean much since the students did so poorly on national norm-referenced tests.

Not all of rural North Carolina is like the Appalachia Mountain region. North Carolina is one of only two states to rank in the highest quartile on both rural student population and overall percentage of persons from rural populations (NCES, 2007b). Nearly 40% of all North Carolina students attend rural schools, however, less than 10% attend small rural schools, and the overall organizational scale of rural schooling is the highest in the nation (NCREC, 2007). Although rural Western North Carolina students do better than the state average in testing, four-year graduation rates are among the lowest in the nation. The percentage of money spent on instruction, NAEP scores, and student-teacher ratios are all worse than the national median (Rural School and Community Trust, 2005).

In the 2000 census, Hewlett County had a population of 19,635 with forty-three persons per square mile. Hewlett County residents and those in neighboring counties concurred with the rural designation given to Hewlett County in the census. Hewlett County is unique because teachers without local connections to the community were seldom hired. Therefore, the teacher participants offered a local perspective unique to most rural education. Thirty-one percent of the adult population in Hewlett County does not have a high school diploma and 16% has a four-year college degree (NCES, 2007a). The county has a small private local college where many of the teachers received their undergraduate degrees and teacher training. Hewlett County formerly had as many as fifteen high schools, even though the population was much smaller prior to the consolidations in the 1970s. The area had community-based schools throughout the
county, consolidated over time into a countywide system over objections of the local residents. At the time of this study, there was one high school and one middle school for the entire county. The high school houses Grades 9 through 12 with approximately 800 students. The restructuring brought about a lack of meaningful relationships between the community and the schools that serve the community. The perspectives of the retired mathematics teachers in Hewlett County noted the ways in which this influenced the mathematics curriculum and instruction in this rural North Carolina system.

**Procedures**

The section below details the initial selection process. Prior to discussion of the researcher’s initial contacts with participants is an explanation of the two pilot studies that guided the work. The section includes descriptions of confidentiality measures as well as information regarding participant journals and researcher field notes.

**Participant Selection Process**

This study focused on the perceptions of retired rural secondary mathematics teachers with numerous experiences over time in a single district. The notion of retired incorporates teacher legacy and past reflections on their teaching careers. Every teacher meeting the selection criteria was included in the study. Initially, local residents provided names of those fitting the criteria. Local yearbooks for the past thirty years confirmed the totality of the list. The local school system and the North Carolina State Department of Public Instruction verified the list. All retirees still living and residing in the area were available to participate. No retirees fitting the criteria lived outside the region. One person meeting the criteria chose not to participate and another suffered from dementia. For contrast, the researcher added one teacher who met all criteria, except not teaching in
Hewlett County, because several participants had close ties to her. Considering every teacher in the category created a small sample size of eight. However, qualitative studies often rely on small samples, in part because each informant typically provides extensive information (Merriam, 1998). In addition, three in-depth interviews of each person were extremely time-consuming, making a larger sample size impossible (Seidman, 2006). Since the intent was to gain teacher perspective, no students, community members, or other educators were included in the interviews. However, conversations did occur with outside sources. Administrators and math supervisors clarified information as needed but they were not privy to information that would violate participant confidentiality. The researcher utilized historical archives at a local college in the county and school records of prior board meetings as deemed necessary. Local newspaper accounts provided explanations of events when warranted.

Pilot Studies

Two small pilot studies contributed to the development of the study. The first occurred in September 2006 and had three purposes: (a) to build the interview skills of the researcher; (b) to test the audio equipment and computer technology for transcription; and (c) to note the ways in which participants responded to reform movements over the past 50 years. Two teachers from a neighboring county with similar demographics to the district studied participated in the pilot. In the initial pilot, questions of reform eras in mathematics education elicited minimal response; rather, the teachers focused on their interpretation of changes, which had little to do with reform efforts initiated by state and national efforts. Probing participants for details of specific mathematical reform eras resulted in long periods of silence and eventual participant change of subject. Responses
only dealt with specific changes that were local. It seemed evident that teachers had limited knowledge of specifics to reform initiatives. Even when specific examples of reform efforts were presented, the teachers in the pilot avoided answering directed questions. It was unclear if the teachers lacked knowledge of reforms or if the reform efforts had little meaning to them. After consulting with the dissertation chair in December 2006, we determined that, rather than forcing the rural secondary mathematics teachers to talk about a particular reform in which they may have lacked clear knowledge, more might be learned by allowing the teachers to select what they perceived as significant.

The second pilot study occurred in January 2007 and involved one retiree from a second similar rural county in the area and another teacher who was ready to retire from the same county. Again, other teachers in the district recommended the participants. In the second pilot study, the retired teacher was not from the area and perceived no issues with consolidation affecting change, while the teacher near retirement stressed consolidation as one of the most significant issues. The second study synthesized the research question, developed interview techniques, and confirmed that mathematics teachers in both of the rural Appalachian areas had similar responses regarding reform. It was also evident from the responses in both pilot studies that actual changes occurring were not those intended by the reformers. The pilot studies did not reveal the reasons for the significant departures and the modified hybrids of the reforms. Due to the limited nature of the pilot studies, there was no indication of possible themes regarding change.
Initial Contacts

Several participants knew the researcher from professional meetings. None knew the researcher personally. Several participants taught with the researcher for one year but that involved only casual contact. Initially, if contacts at football games or other community events did not occur, phone calls set up the first interviews. Participants shared names in a quasi-snowballing process, where those who had agreed to take part mentioned other possible participants. Additionally, local church members made introductions and referrals. In this community, people were reluctant to meet and talk to strangers about local community matters; therefore, it was important to have local introductions. Interviews were in participant homes if possible, which provided an atmosphere more conducive to the culture. Otherwise, a mutually agreed upon community meeting place provided the interview location. It was important to discover connections that allowed inroads into relationships. As a resident of the community, I was able to contact all persons meeting the selection criteria prior to interviewing. Even though I lived there, I was considered an outsider by the participants since my family has no generational roots there. Therefore, it was important that communication bridges were created.

Confidentiality

Written permission for all participants in the study happened as part of the Protection of Human Subjects Involved in Research Activities process at Ohio University. Copies of the permissions forms are included in Appendix G. Because the data collected were contextual, the researcher created and used carefully chosen pseudonyms for the participants in the study to protect anonymity. In addition, the place
and location of the study have fictitious names since the study included the entire retired teacher population, which is rather small. The researcher assured participants that all data collected would have no public exposure, and school system employees would have no access to interview information.

**Interview Schedule**

Data collection included a series of three separate interviews with each participant. The three-interview structure utilizes qualities that "enhance the accomplishment of validity" (Merriam, 1998, p. 119) or in qualitative work what Lincoln and Guba (1985) referred to as trustworthiness. It places participants’ comments in context. "People’s behavior becomes meaningful and understandable when placed in the context of their lives and in the lives of those around them" (Seidman, 2006, p. 112). This context is especially necessary to understand rural community. Dolbeare and Schuman (1982) designed the series of three interviews characterizing this approach: the "first interview established the context; the second allowed the participants to reconstruct the details of their experience within the context; and the third encouraged the participants to reflect on the meaning their experience held" (p. 48).

The interviews occurred over a three or four week period for each teacher, except in the case of one participant where scheduling conflicts and illness necessitated a longer period. The completion of transcripts prior to additional interviews also interrupted the schedule at times but allowed for more reflection. Each interview was approximately 60 to 90 minutes in length. In order for planning and reflection to occur for both researcher and participants, types of interviews among participants did not overlap. For example, no second interviews occurred prior to completion of all first interviews. This allowed the
researcher adequate time to research unanticipated topics and categories and to consider possible themes and patterns as well as allowing the participant time to reflect and complete journal entries. The interviews were semi-structured with specific questions, allowing participants to elaborate on what they saw as significant (see Appendix B).

The first interview focused on the context of the participant’s experience. It involved establishing rapport and gathering a life history of experiences. The life history involved family, friends, school, community, and work that related to their views. Data collection regarding educational attainment, school performance and teaching experience occurred during the first interview. During Interview 1, the researcher asked participants to keep a journal to reflect on the research question between interviews. The second interview, at least several days or weeks later, concentrated on the concrete details of experiences involving change in mathematics curriculum and instruction. The third interviews asked the teachers to reflect on their experiences with change and reform. The process of putting experience into language is meaningful (Vygotsky, 1987). When teachers selected past events, they added meaning and significance to them, which required exploration. Participants also had an opportunity to review researcher comments on Interview 2 responses. Participants were to review copies of each transcript prior to the next interview and allowed to amend or clarify their previous comments. Notes in the researcher’s field journal noted any elaborations participants made to their interview transcript. Because the data acquisition was over a sustained period, it made it more powerful than a one-stop photo of a single moment.
Field Journals

Participant Journals. The researcher provided journals for the participants at the beginning of the first interview. The journals were small, in order to prevent overwhelming the participants with expectations of excessive writing. The interviews would provide the substantial data and the journals would serve as reminders and verification. The main research question was included on the opening page of each journal in order to stress the focus of rural mathematics education reform for participant writings. Participants were encouraged to reflect and jot down thoughts during the week prior to the second interview. The researcher collected the journals, if available, at the end of the third interview, although only four journals had any writing and the writing was in the form of a single list on only the opening page. Two participants had lost their journal and the other two were blank.

Researcher Journal. During and prior to the collection of data and fieldwork, I kept a journal. The journal provided details, dates, and reflections as they occurred. The notes taken and the sequential nature of the writing assisted in discovering emergent themes and patterns. The journal, along with transcripts to develop the protocol for follow-up interviews, allowed better analysis. Wolcott (1994) explained that qualitative researchers often discover their focus in fieldwork. Keeping a journal aided in finding this focus. This grounding of the work in data and the constant comparative-contrast methodology lent credibility to the findings. I shared my field notes and journal with dissertation committee members as needed.

Definitions

The study employed the following definitions:
The United States Department of Education (2004) defined rural as "areas with small town centers under 2500 or open countryside" (p. 4). However, the definition of rural involves much more. What does it mean to call a place, a school, or a system a rural one? What differentiates a rural school or school system from a nonrural one? There is a need for a clear understanding of what rural means to synthesize rural research and apply it to educational reform. In Whitaker’s (1983) sociological perspective on the need to create this conceptualization, he found the "lack of a common definition within social work and education unfortunate" (p. 22). Whitaker claimed, "The description of rural eccentricities, which constitutes much of the literature, fails to provide the conceptual foundation required for theory and practice" (p. 22).

Rurality is also a relative term. Rural in Appalachia can vary and is not the same as rural in Australia, Hawaii, or Alaska. One cannot ignore the diversity inherent in defining rural or that generalizing research results becomes a common occurrence. Whitaker (1983) distinguished between rural and urban rurality, occupational rurality, socio-cultural rurality, ecological rurality, and multi-dimensional rurality. Hewlett County is in the less urbanized and isolated category. The idea of urban, suburban, and rural as three distinct categories evolved over time. One group in Maine chose twelve indicators related to community type and three related to policy. The twelve indicators of community included: number of year-round residents, percent of housing located in dense settlements, percent of residents involved in fishing or farming, degree to which jobs were concentrated in a few industries, number of jobs per resident worker, diversity of trade and services. The three policy-relevant indicators were ratio of peak seasonal population to year-round residents, percent of year-
round residents living in group quarters, and percent of housing built prior to 1940. (Whitaker, 1983, p. 12)

Whitaker asserted the indicators helped to distinguish historical rural populations from those with a more recent influx of residents who were seasonal.

Nachtigal (1982) posited that isolation should be a characteristic included in rural definitions, which certainly fit the county included in this study. Rural areas are often geographically isolated, which can lead to distinct community ideology and to possible social stigma. In addition, isolation limits the types of economic opportunities available (Duncan, 1999; Porter, 1997). Poverty in rural settings may marginalize residents and limit their access to mainstream resources (Duncan, 1999). The literature contained numerous definitions of what constitutes rural. Howley (2002) based his definition on the community and its inhabitants’ self-perception as rural. In other words, if a community said it was rural, then it was rural. In this work, not only do the participants state they are rural but also those living outside the area referred to Hewlett County as rural.

Reform

The study used Tyack’s and Cuban’s (1995) definition of reform. "When we speak of educational reforms, we mean planned efforts to change schools in order to correct perceived social and educational problems” (p. 4). Throughout the study, when the terms reform or change are used, they are intended to convey the notion of planned efforts to correct perceived social and educational woes, denoting a prescriptive approach to school change.

Retired Secondary Mathematics Teacher

To qualify for participation in the study, teachers were retired or no longer
teaching, they taught for a minimum of ten years, and involved in education for a minimum of 20 years prior to retiring. In order to be included in the sample as a participant, teachers must have taught mathematics at the secondary level. The definition refers to the concept of an experienced teacher rather than one at a novice level. In addition, the connotation of retired deals with a legacy of accomplishments along with the time needed to reflect on past experiences and their meanings. Because teaching is a complex endeavor, it is not surprising that learning to teach is a career-long process of exploration and education. Interestingly, all retired teachers from Hewlett County not only fit the definition, but also each included participant taught much longer in Hewlett County than the definition chosen.

Teacher Perspective

Insiders often have a quite different view of the findings than does the observer or outside researcher. The mathematics teachers in this study offered perspective based on their experiences as teachers. It is this insider or emic view that defined the teacher perspective. The teacher perspective in this work was the description given by the informants regarding everything teachers did that contributed to their teaching as well as everything teachers thought, knew, and believed about what they did. In addition, teacher intuitions, skills, values, and feelings about what they did are part of their perspective.

Teasing out the teacher’s perspective from that of the researcher involves a "subtle but important distinction" (Simon & Tzur, 1999, p. 258). An attempt to understand and articulate teachers’ practice approaches included how and what the teachers perceived and how they made sense of, thought about, and responded to situations as they perceived them. The perspective of the researcher-teacher in the study
assumed she could think productively about the mathematics teacher perspective and could learn from engaging in efforts to foster understanding. The researcher served as a teacher-educator to identify and conceptualize key teaching issues shared by the teachers; these issues may not have been clear to a non-teacher researcher. There was an inherent danger that the researcher-teacher might lead the interviewees or might not question comments that required addressing. The researcher attempted to avoid manipulation.

Curriculum and Instruction

The idea of curriculum and instruction has changed over time with the meaning still undecided (Kelly, 1999). Kelly defined curriculum as "all the learning which is planned and guided by the school, whether it is carried on in groups or individually, inside or outside the school" (p. 56).

John Dewey (1938) referred to the "collateral learning of attitudes that occur in schools and these may well be of more long-range importance than the explicit intended curriculum" (p. 81). When teachers refer to curriculum and instruction, they may or may not distinguish between the actual and intended curriculum. For the purposes of this study, the working definition of curriculum included the set of courses and their content offered by the school or proposed in reform and instruction referred to the way in which teachers or others delivered curriculum to students.

Data Analysis

As data collection and analysis occurred, reviews of relevant literature guided the emergence of themes, which refined the interview process in the field. Using the constant-comparative method, the investigator assumed an inductive stance and strove to derive meaning from the data. The results of this type of qualitative research included the
themes and patterns emerging from or *grounded* in the data. The substantive themes consisted of categories, properties, and hypotheses. The hypotheses were tentative and derived from the data collected in the study. The constant-comparative method of data analysis involved "comparing one segment of data with another to determine similarities and differences" (Lincoln & Guba, 1985).

Initially, data with similar qualities created a category. Patterns in the data emerged by analyzing relationships among categories using the constant-comparative method. The researcher dealt with outliers that did not fit the patterns in two ways: determining whether (a) the patterns were accurate and (b) whether the outliers offered meaning and illumination. Triangulation occurred through researcher and participant reflection by creating an audit, but not a mechanical audit trail (Lincoln & Guba, 1985). Rather, the researcher employed the more personal and intuitive common-sense approach to validity advocated by Maxwell (2005) and Wolcott (1994).

Initially, a microanalysis generated categories by searching line-by-line in the transcribed interviews as well as participant journals. Theoretical sampling continued based on the emerging concepts until saturation of categories occurred. Theme building involved making sense of the data, writing descriptive accounts, and constructing categories. To generate themes and patterns, the categories needed inferential connections to explain the data. Axial coding techniques were used to relate categories and their sub-categories discovered during the open-coding phase (Strauss & Corbin, 1998). It was necessary to examine what the data did not reveal and to consider properties and hypotheses for those categories. Each hypothesis linked the categories to its properties. The data produced either support or refutation of the hypothesis. After constructing
themes, it was necessary to consider the reality of their application. This involved an inductive process that built the patterns as well as a deductive process that tested and applied the themes. A timeline of data analysis is included in Appendix F.

The researcher also considered the variation among ideas and generated new coding when needed. Although computer programs for qualitative analysis, such as NUDIST and In Vivo, allow the researcher to maintain closeness to the data, those programs were not used due to the desire of the researcher to grasp and understand the data in a more concrete manner, which Seidman (2006) recommended for novice researchers. It was critical that contrasts were viewed as not fitting the categories (Spradley, 1979). Glaser (2000) states that the constant-comparative method "unabashedly admonishes the researcher to strive for objectivity" (p. 145) even though a state of complete objectivity was impossible.

Credibility of Research

Reducing threats to reliability and validity of the data collection and data analysis methods establishes credibility in qualitative research. Minimizing those threats occurred as follows.

Reliability

The reliability of a study relates to its replicability. Since qualitative studies are highly contextual, "this poses a Herculean problem for researchers concerned with naturalistic behavior or unique phenomenon" (Goetz & LeCompte, 1984, p. 201). Goetz and LeCompte further argued, "No study can be exactly duplicated because human behavior is not static" (p. 212). Further complicating the process of establishing
reliability in qualitative work is the fact that no investigator conducts research like another. There are two types of reliability: external and internal.

**External Reliability.** Because replication is inexact due to differing contexts, Goetz and LeCompte (1984) maintained that the researcher could minimize this threat to external validity if "research reports clearly identify the researcher’s role and status within the group investigated" (p. 214). The researcher in this study described her role and status and attempted to be as transparent as possible.

Another threat to external reliability is finding data sources that match those in the original study. Goetz and LeCompte claimed one could minimize this threat by "careful delineation both of the types of people who serve as participants and the decision process invoked in their choice" (p. 215). Earlier in this study, there was a detailed description of the participants and the rationale used in the selection process.

Two other threats to external reliability include a lack of clear definitions of terms pertinent to the study and a failure to clearly state one’s research methodology. One can overcome these threats, in part, by clearly defining the relevant terms and by "an explicit description of the techniques used to acquire data" (Goetz & LeCompte, p. 205). This study defined the terms used, delineated the data collection process, included detailed procedures as they occurred, and clarified definitions as warranted through emerging themes and data.

**Internal Reliability.** Internal reliability is the extent to which there is "agreement on the description or composition of events" (Goetz & LeCompte, 1984, p. 211). Efforts to reduce this threat included the inclusion of direct citations, the use of audio recording devices, and the scrutiny of professionals in the field. Descriptions of events and
corroborating evidence came from archival records, board meeting notes, and newspaper accounts. The study includes extensive carefully transcribed raw data to reduce reliability threats. Using the three-interview process allowed for both participant and researcher change in interpretation to occur over time. Participants reviewing transcripts and researcher comments further addressed issues of internal reliability. Discrepancies in interpretation lead to consultations with committee members, and informal interviews with supervisors and administrators to clarify analysis as needed.

**Validity**

Validity in qualitative work refers to the trustworthiness (Lincoln & Guba, 1985) of the study. Goetz and LeCompte (1984) claimed, "Validity may be its [qualitative] greatest strength" (p. 221). Two major issues relate to the validity of a qualitative study: external and internal.

*External Validity.* External validity refers to the degree to which the "abstract constructs and postulates generated, refined, or tested by scientific researchers are applicable across groups" (Goetz & LeCompte, 1984, p. 221). In other words, to what extent can we generalize the findings? The purpose of this study was to provide an in-depth understanding of the perspectives that teachers have on change. The researcher makes no claims that the study is generalizable but notes possible implications.

*Internal Validity.* Internal validity relates the extent to which "researchers actually observe and measure what they think they are measuring" (Goetz & LeCompte, 1984, p. 221; Patton, 2002). Goetz and Lecompte posited that, in general, qualitative research laid claim to high internal validity due primarily to the research methods employed. According to Maxwell (2005), follow-up contacts (e.g., second and third interviews) are
member checks that increase internal validity. To increase validity, participants in the current study read the draft analysis and amended or offered suggestions for interpretation. Their confidentiality agreement protected them and participants did not seem to have anxiety about being open and honest.

**Summary**

Data from a set of specific retired secondary mathematics teachers in a specific rural district furnished the research for the study. This chapter explained the theoretical rationale for carrying out the study and offered descriptions of the researcher, subjects, procedures, and analysis. The chapter also documented the three-interview process and addressed threats to validity and reliability to establish credibility of the work. Research-based procedures in qualitative work include the constant-comparative method as a recognized method of building substantive theory. The emergent themes and patterns dealt with the ways in which retired rural secondary mathematics teachers understood changes that occurred in mathematics curriculum and instruction during their careers.
CHAPTER FOUR: VOICES OF EXPERIENCE

Using a qualitative mode of inquiry, this study examined the way in which retired rural secondary mathematics teachers understood changes that occurred in mathematics curriculum and instruction during their career. The research question evolved from two pilot studies, a literature review, and personal experience. The data are from three 90-minute interviews with each participant, school board minutes, researcher journal entries, limited participant journal entries, historical archives and newspaper accounts. This chapter presents the data that emerged related to the research question and the process followed during interviews.

Data sources, such as school board notes, newspaper articles, interview transcripts and archived historical documents, provided the possibility for triangulation of the data but did not provide a complete picture of the analytical techniques. Therefore, an audit trail established credibility and trustworthiness of the work.

The focus is on the participants’ stories of change and their sense making of change. In order to understand their sense making of change, one must first know who they are, the land to which they are attached, and the underlying beliefs that affected their perceptions of the changes through which they lived. Using their own words when possible to provide a context for these findings, the chapter includes descriptions of the eight interviewees and descriptions of the place. The discussion of context includes the relationship between the researcher and the informants. Emergent beliefs that underlie their decisions and perceptions of educational change are presented.

The participants’ views of change that affected mathematics curricula and instruction revealed that their views were shaped, not by the resistance to change
mentioned in the literature but rather from beliefs that seemed inherent in their responses. The first view was that all change was seen through a lens of what I labeled as a *homeland defense*. Because the significance of the participants' defense of their homeland is such a contributing factor in the teacher voices, I felt it was important to label this view with a term that evokes a response. This term is analogous to the idea of a homeland needing protecting to defend against the intrusion of outsiders that created the Department of Homeland Security following the World Trade Center bombing in 2001. The second view, though not entirely separate from the first, was that change should occur when it was best for all and not when only a few benefit, which I labeled the *common good*. The second view was necessary to preserve the community and further supported the defense of the homeland. In addition, it was necessary to understand their perspective of the nature of mathematics prior to an analysis of emergent themes. This chapter offers the data that supported the themes and beliefs.

The themes that emerged from the data follow the belief sections. The major themes involving change included Consolidation, Teaching and Instruction, Politics and Policy, and Technology. Because these were not mutually exclusive ideas and were interspersed with views regarding change, the interplay is included when relevant. Also, inherent in the discussions are community issues and views about mathematics education. Additional findings of interest include their views on new teachers, retirement, and the ideal school. A summary concludes the chapter.

**Validation of the Method**

During the interview process, I maintained a journal, which included notes and possible themes. Each interview was transcribed and reviewed prior to the next
participant interview, with research notes and questions recorded in the final transcript. During subsequent interviews, each participant received a copy of a previous interview for his or her review. The time between interviews varied depending on transcription and reviews as well as scheduling. This additional time allowed more reflection than anticipated. Following the advice of Dolbeare and Schuman (1982), every effort was made not to search for themes until all data were collected. This method worked in considering beliefs that motivated participant responses but it was impossible to ignore changes considered significant by the participants.

Participants maintained a journal related to the research question. Journal entries were never in essay form. The participant entries were lists and outlines of changes they thought most significant. It was impossible to ignore themes of change. However, there was no attempt during interviews to analyze the underlying rationale of emergent themes. Participants reviewing the transcripts elaborated on issues from both their teaching experiences and their pre-college attendance in the Hewlett County school system.

Seidman’s (2006) approach to connect method and technique using a phenomenological approach to in-depth interviewing occurred following data collection. It should be noted that all names of places and persons are pseudonyms designed to protect confidentiality.

Initially, I coded the raw data in the transcripts based on the participants’ lists. However, as initial sorting began, themes that are more comprehensive evolved. Participants often described changes that seemed different to them but with corroboration from other data sources, some categories merged or suffered elimination. Additionally, axial coding analysis looking for relationships between themes provided overarching
categories and established connections. Passages were marked in the transcripts as occurring in first, second or third interviews to distinguish between participant introductions of themes and follow-up by the researcher. Eight documents (one per person), as well as a document of historical context, were created. I printed the nine documents on different colored paper to distinguish between gender, age, and length of teaching in the coding and sorting process. Colors also provided evidence from multiple sources within categories. Coding all passages, I began with codes based on their recollections of the most significant changes. There were additional codes for views of change and codes for their beliefs about teaching, students, rurality and community.

To avoid the problem of anecdotalism, referred to by Silverman (1993), only themes occurring multiple times and validated by other sources were included. To facilitate this process, I undertook a constant comparison and contrast against the data and other sources and included rich descriptions of the findings and participant voice. I maintained field notes and memos to compare to emerging themes. The iterative process of the researcher interpreting and the participants reviewing helped to maintain trustworthiness. When participants offered corrections or amended statements, they were interpreted and compared against previous data analysis.

Whenever possible, I attempted to immerse myself in the participants’ world to gain understanding of their lens. Conversations with fellow researchers aided analytical focus. An unexpected contribution included a few comments and questions the transcriptionist noted in emails. The transcriptionist had no real experience with rural life and the comments she made aided the researcher's view of outsider perception. These notes enabled the researcher to clarify issues. During this process, I placed special
emphasis on not allowing empathetic analysis to occur. Repeated reading of interview transcripts and comparative contrast techniques lessened this form of bias.

A conscious awareness of factors, such as age, gender, experience, and teaching locations, for each participant established the rationale for themes. Appendix C shows the matrix analysis for these. In the matrices, males were in the first four columns and females comprised the last four. The far right of each matrix contained information on Betty, who taught outside the county and Sallie Ann, who had a supervisory role at the end of her career to provide contrast. Years at the top of the columns denoted historical context. A historical time line (see Appendix D) supported or contradicted findings during the analysis phase. The timeline also served as a measure of comparison to state and national issues, providing context to the emergent themes. An explanation of context follows.

Context

This section describes the place, considers the relevant heritage, and introduces the people who settled the place. To comprehend that change occurs due to participant belief in a homeland defense and that the common good has an impact on teachers’ decisions, one must first be familiar with the concept of defending the homeland. The Hewlett County homeland in this study consists of heritage, place, and peoples. Following this background of place, individual descriptions of research participants add personal dimensions.

After describing the homeland and the participants, the remaining sections provide analysis of the perspectives of rural secondary mathematics teachers in Hewlett County and their views of educational changes within the context of their homeland.
Relevant historical events influencing change and the respondent perspectives are included in the categorical analysis.

**The Place**

Each participant was raised in the homeland and, in all but one case, by parents native to the area with families going back five to nine generations. All participants married someone native to the area and all settled in the area for almost all their teaching career. The participants attended colleges within four driving hours and most within an hour away. Their statements revealed their belief that the homeland was worth defending.

As the voices of the people will show, the homeland designation emerged from the data and I created the term *homeland defense* to describe what I perceived as an underlying belief behind their views regarding change. The descriptions of insiders and outsiders to the county provided an initial basis for this interpretation.

Hewlett County is located in the heart of the Appalachian Mountains. It is one of seventeen counties that make up the North Carolina Highlands. The main floor of the county is about 2000 feet above sea level, but a number of peaks climb to more than 4000 feet. A river cuts its way through the mountains, leaving one of the largest mountain gorges in Eastern America. Other streams joining the river divide the county into numerous valleys, coves and ridges. With stately mountains and hidden valleys traversed by lovely streams, the county is an area of unsurpassed scenic beauty and magnificent distances (p. 2).

The passage above came from an unpublished book "commemorating the bicentennial celebration of the Declaration of Independence and dedicated to the great and beloved nation of the United States of America" (p. ii). A research seminar group at local Oakton College [pseudonym] compiled the book under the direction of a resident history professor.
The participants interviewed for this study often spoke of the unique qualities of the county and the terrain. The North Carolina Census Data (see Appendix E), released in 1980, showed one hundred percent of the county identified as rural. Federal census data since then revealed no change in rural status. There are three prominent rural towns in the county—Oakton, Cedarville and Ashton (pseudonyms). Oakton contains a small private college. Cedarville is located on the river, is the county seat, and the location of all school administrative offices. Ashton is the most remote town and the most scenic.

Five community high schools previously existed: Crest Branch, Jaspar, Dawson Springs, Poplar, and Lower Valley, as well as some earlier schools. It takes over two hours to drive between the two most distant points of the county. A statement in the commemorative book mentioned earlier captures the vastness of the land and elaborates on an issue that consistently occurred in the comments made regarding consolidation:

Hewlett County’s ‘magnificent distances’ have been mainly a liability in the past. They have made transportation difficult and expensive. For example, the total mileage of the school buses for a nine-month term would take one well on the way round the world at the equator. (p. 33)

This statement echoed the hope that changes in nearby interstates and roads would bring prosperity and better education to the people of the county. The interviews revealed that these distances greatly affected consolidation of the schools and transportation remained a liability for education in the county. Consolidation issues and participant comments occur later in the analysis.

To know a place is to know her people. A description of the people who settled the county, found in the January 26, 1969 Centennial Edition of the Carsonville Citizen [fictitious name] provided a description of the mountains in a somewhat different light.
This portrayal from those outside the county summarized the nature of the Hewlett County people of Scotch-Irish descent:

They came into this tangled land of mountains, not so much to begin a new life as to continue the old one without interference. A difficult people, neither Kings nor Presidents ruled them. To a hard land came a hearty race. Fierce people, their spirit was of eagles. They cleared their land and worked it and each generation grew more lost and ignorant of the world outside, but they never lost their mother wit, nor courage, nor obstinacy. No! Never! Their wild highland spirit remained. (p. 6)

The contrast between the insider view and the outsider portrayal is striking. Clearly, the newspaper did not see the significance of the mountains in the lives of people who view the mountains as neither tangled nor tortuous. Would anyone want to defend a homeland described as tortuous and tangled?

The participant view of homeland goes much deeper than merely a physical description of the land. They must also defend their people from the labels difficult, fierce, obstinate, and ignorant. Hewlett County’s Greatest Asset is its People reads the subheading to the unpublished commemorative work referred to above. As the participants provided their voice in the analysis that follows, it became clear they saw the people as far from ignorant even though, historically, education was difficult with the magnificent distances.

A local newspaper editor advocated for the final consolidation of all the high schools and assumed that better roads would alleviate the issue of distances.

Weather and distances made it difficult in the past to have schools and teachers. So, illiteracy became the pattern. Thanks to several national leaders such as the late President John F. Kennedy, the frontier in the Southern Appalachians is being opened for development. This means a new day for Hewlett County. The isolation of earlier days will disappear as new highways link the Appalachian area to the rest of the nation. Industry will be seeking the talents and artistry of Hewlett County people,
so they must become trained. The new consolidated high school can provide
the facilities for this training. (Cedarville Gazette (pseudonym), Editorial,
1970)

The participants in the next section illustrate that their homeland does not contain
mathematical illiteracy. From their perspective: schools are not solely about training for
jobs, their place is not an isolated frontier, consolidation cannot change the distances and
the weather, and that, if changes occur in their homeland, a defense of their past
homeland is in order.

The People—Group Profile

A list of participants by age situates their reported experiences within the
historical evolution of mathematics education (see Appendix D for the relevant
chronology). The teachers interviewed were Ray Smathers, Betty Buckner, Bill
Chambers, Sallie Ann Medford, John Hillmon, Cassie Rhodes, Doris Tisdale, and James
Adams.

Collectively, these teachers worked during the years 1948 through 2002. With the
exception of Betty Buckner, all lived in the county and their children attended Hewlett
County schools. Betty lived outside the county, and although her children did not attend
school in Hewlett County, her grandchildren did. The participants had a history of
honoring commitments, and they tended to conform to social norms. None of the
participants, for instance, had ever directly experienced divorce in their marriages or in
those of their parents.

All participants attended colleges within three hours of their home and all
experienced school consolidations, both as students and as teachers. After high school
graduation, all females and John Hillmon remained at home and attended Oakton College
for at least two years. Ray, Betty, and Sallie earned advanced degrees. All had some
teaching experience outside the county. Betty’s experience was exclusively in a
neighboring county. The teachers retired from 1980 to 2002. Betty taught high school for
forty-three years, the longest period of involvement, and Sallie with ten years had the
shortest tenure in high school. All, except Bill, invested over thirty years in education
prior to their retirement.

Two participants had direct involvement with the National Council of Teachers of
Mathematics and three others indicated awareness of NCTM during interviews. James’s
sister obtained a doctorate in mathematics education. She worked and published with a
past NCTM president. Betty was a founding member of a state mathematics organization,
and was the student teaching supervising teacher for Sallie Medford and Doris Tisdale.
Two of the participants were siblings.

*The People—Participant Individual Profiles*

Each participant description includes their educational background, teaching
experience, and family history as well as my initial relationship. I included relevant data
that have bearing on the interpretations. For ease of reference, the profiles are
alphabetical. All names and places are fictitious. The descriptions establish ties to their
homeland place and note the secondary mathematics teachers as part of the homeland
people. Being forthcoming with prior researcher-participant relationships acknowledges
the potential for bias.

James Adams

James graduated from high school in the small college town of Oakton in 1965,
the year the Federal Elementary and Secondary Education Act (ESEA) provided money
for schools. He remembers the student walkout of 1961, and "regrets that he was unable to have the best mathematics teacher ever" because she left due to the walkout conflict. Bill Chambers, another participant, was one of his math teachers and coaches. "Leaving home to attend a public university two and half hours away was a big step," but he could not afford the local private college. He became a teacher "because all of the Adams were teachers." James’s dad was a teacher and his mom worked at "the most popular soda shop in the county."

Raising his sons kept him in teaching longer than he planned. When his younger son said, "Dad, I don’t like what teaching is doing to you [his health and disposition were declining], it’s okay with me if you don’t continue until I graduate," he decided to retire after his thirtieth year. His sons graduated from colleges nearby and two of them live in the county and work for the school system. His grandchildren attend nearby Oakton elementary school and he and his wife pick them up after school. His wife taught middle school mathematics at Oakton School (K - 8) for many years and, eventually, taught at the consolidated middle school. James had relatives in Charlotte, NC where he did his student teaching during the summer. He had students from all over the county in the same class, and commented, "You could really tell the country kids from the city kids in a heartbeat [because] the country kids were so much more polite and well-mannered."

Completing student teaching led to a job in the Charlotte suburbs. James investigated returning home to teach but no jobs were available. He stated, "I knew that Hewlett was consolidating and I wanted to be part of that so I tried to come home as quick as I could." The local committee called him the next year, offering him a job in the remote area of Dawson Springs "until somethin’ came up in my old school." He was able
to move after one year to his alma mater of Oakton, and eventually to the consolidated high school in 1974, where he was excited about the "possibilities of creating powerhouse sports teams." He was part of the first faculty at the new school and "it was exciting, but the kids didn’t mix well at all." He coached for almost his entire teaching career and it was "frustrating that so many kids could not play since they lived so far from the consolidated school." James retired in 1999 but continued to coach the high school team, in which his youngest son was a member, until 2001.

When I taught at Hewlett High School, James was the mathematics department chair. Ray Smathers and another long-term math teacher retired the year before I came and James became the new mathematics department chair. He was not involved in hiring or evaluating me. His classroom was in another wing of the building and I seldom saw him. He was very helpful in answering questions when I asked. I also taught his oldest son in Advanced Math but we never had parent conferences.

Betty Buckner

At the age of fifteen, Betty graduated from Oakton High School in 1947. She graduated a year early after obtaining special permission from the state because she "wanted to graduate with her older sister and go off to college with her." Bill Chambers is her brother and one of six children in the family who obtained a mathematics degree. Betty explained, "My dad just thought we all should be able to do math in our lives so we all were expected to do it." Betty attended a state college, known for its teaching program for women, for one year following two years at Oakton College. She eventually obtained her masters by taking classes at night in a program supported by an adjoining county school system where she taught. Her youngest brother was student body president during
the 1961 walkout and a leader in opposing the views of her uncle who was on the school board at the time. She remembers a walkout prior to the 1949 consolidation of Lower Valley, Poplar, and Oakton into Oakton School. Since "the politics were controversial," she did not seek employment in her home county. Her different experiences and perspective provided some balance and contrast to the data.

Betty met and married her husband while in high school. She has three children who attended the high school where she taught. Her two sons graduated from large state universities and do not live in the area. Her daughter and her three grandchildren live in Hewlett County and attend the local schools.

Betty was one of the founding members of the state math organization. She keeps in touch with the organization and recently "spoke out at one of the NC legislative meetings about this crazy idea that everyone should be college prep when they complete high school." She said people questioned why she was getting involved with that since she no longer taught. Betty taught the longest of any of the participants, 43 years, and was the student teaching supervisor for Sallie Ann Medford and Doris Tisdale. She taught night courses for many years at Oakton College and provided training for teachers in New Math and computer technology.

The county in which Betty taught had smaller acreage than Hewlett County but was heavily populated and contained a large city. She started her career in a small city high school, which later consolidated into one of the six high schools in Greenwood County. All six of the high schools are larger than the lone high school in Hewlett County. She remembers the consolidation experience as "really awful and we no longer knew everyone and no longer visited in their homes." The consolidation of the high
school from which she graduated and her consolidation experience as a teacher made her "sad when Hewlett High became the single county school in my home place because I knew what we lost."

Since I first attended state meetings in 1974, I have known Betty Buckner by name only. I remember her receiving one of the first state organization awards. For the past eighteen years, we have attended the same church. Because she was a native of the area, is related to one of the participants, taught in an adjoining system with more resources, and several of the participants had worked with her or been trained by her, she joined the participant list to provide balance and contrast.

Bill Chambers

Bill is Betty Buckner’s younger brother. Bill attended school at Oakton. He started school later and Betty graduated early. Although they are only one year apart in age, his high school graduation date was four years after his sister’s in 1951. He attended a regional college eighty miles from home on a football scholarship, which he lost when he was injured. Realizing that he was about to be drafted, he dropped out and enlisted in the Army. After his service experience in the Korean War, he played football at Oakton College but was injured again. The private school was too expensive without an athletic scholarship, thus he transferred to a state college where he double majored in mathematics and geography.

His family farming experience, combined with his college experiences, "made me a little more concerned about other people getting an education than most." Bill coached during his teaching career and he said everyone remembered him "as the man who bought shoes, uniforms, meals for kids and saw that they had a place to stay so they could
play sports if they wanted to." At the time of this study, his daughter taught math at Hewlett High School and his grandchild lived close by and frequently dropped in for homework help in math.

When Bill taught and coached at Ashton, he built a winning sports program. The new consolidated high school hired him to coach in 1973 before there was a building or students. He recalled, "practicing at Cedarville and playing all over the county to try and make everyone see this was ‘their’ school." Nevertheless, too many kids did not play "because it was too far and their parents were opposed to losin’ their school." He taught his last few years in neighboring Greenwood County with his sister Betty who "promised that I would not have to teach any ninth graders." After 20-two years in education, Bill resigned (in 1980) because of "politics being too big a part of the schools."

I had not met Bill Chambers prior to our first interview. His commentary during the interviews was the most colorful of any participant. His storytelling abilities and anecdotes were captivating. Bill is presently farming. Frequently, the transcriptionist commented on his interesting recall of life in Hewlett County.

John Hillmon

John graduated from Oakton High in 1961. His family farmed about four miles outside of Oakton. Although accepted at the state’s largest university and at an engineering school in another state, he attended college near home to please his parents. Although he wanted to join the army rather than attend school, he decided to stay near home and attended Oakton College where he received a degree in mathematics in 1965. He felt he "was a little too ‘back woodsy’ to understand how to make it in a bigger place."
He had no interest in teaching but "some people we knew over in Savon county [the neighboring county to the north] wanted me to come over there and coach at East Savon High School, so I did that." Then, the Hewlett County Board of Education asked him to come to Jaspar and "straighten out a situation they had over there."

Eventually, he would teach at Dawson Springs in grades seven and eight before taking the job of vocational supervisor. According to John, this position was to keep him from leaving and going to the neighboring county, which "had more resources and was not as politically controlled." It also meant that career explorations classes would involve a teacher with a science background rather than a vocational one, which the board preferred. When the consolidated high school opened in 1974, he returned to teaching mathematics and finished his thirty-two year career there.

Farming was also part of John’s life and he continues to live on the family farm. His family "has been here since just after the Revolution." He was an only child so "more was required of me in keeping up the farm than other kids in school." He has one son who attended Hewlett High School and later graduated from engineering school. He has been married for forty-five years and his wife works in the county. He used many of his farming experiences as applications in his mathematics classes. John "regrets not going away to mining school" and becoming an engineer. He thought, "Politics played a big part of the decline of Hewlett schools" and seemed cynical about the decisions made.

When I taught at Hewlett High School, John was teaching both mathematics classes and mathematics applications combined with vocational programs. He also taught computer technology courses and spent time building a computer with the Physics teacher in those classes. He spoke of "telephone calls in the late sixties and early
seventies to a kid named Bill Gates," who helped them with computer design questions. John and I were on opposite ends of the hall and we spoke in passing but he seldom mixed with other faculty members.

Sallie Ann Medford

Sallie Ann had a long and varied career in Hewlett County education. The high school principal was also one of her mathematics teachers, "but he was gone to his farm or doing school stuff most of the time and was seldom there." Following high school, she lived at home for two years and attended Oakton College, which was then a two-year school. After only one year at a state teachers college about three hours away, she obtained her degree in mathematics. She completed her masters and doctorate while working full time. She stated, "I was the first woman [at a university in a neighboring state] to obtain a doctorate."

Sallie Ann’s and her husband’s families are native to the county. Her father had a fourth grade education and was a farmer. He dropped out of school to help with the family needs. Her mother did not attend college. She has one son who is developmentally disabled whom she home-schooled following some unpleasant experiences at Oakton Elementary during his fifth grade year. Her husband was the driver's education teacher in Hewlett County prior to becoming the vocational director.

Sallie Ann student taught under Betty Buckner. She began her career with seventh graders at Dawson Springs because her relative on the school board "said I was too young to be teaching at a high school." During her year at Dawson Springs, she remembers "the men in overalls with guns in their pockets lining the walk everyday to protest the closing of Dawson High and consolidating it with Cedarville." The consolidation forced her to
teach at Cedarville High School the following year. She left for a post at the school where she did her student teaching "because I wanted to teach only math and not physics." After ten years in the classroom, she joined the faculty at Oakton College and served on the Hewlett County school board, the only woman ever to serve on the board. The superintendent asked if she would join the school system in administration and she resigned her school board position. She retired as an administrator following the statewide implementation of testing and accountability. In post-retirement, she served one year as the first director of the local community and technical college campus. She was also on several Southern Association Committees for Accreditation.

Sallie Ann grew up in a part of the county where a school no longer exists. The previous school was one of the first to consolidate and later demolished. Her perspectives as a teacher and as an administrator provided context and balance in the data. She was on the school board when the high school consolidated and was "surprised that she never received one phone call or bad comment" during the time. She favored the consolidation "as we had to provide the same education for all the students and there was money from the state to build the buildings." She also provided training for teachers in New Math and Effective Teacher Training.

I met Sallie Ann Medford in a curriculum meeting during my first year of teaching at Hewlett High School. I did not see her often because her focus at the time was on improving mathematics at the elementary level. I have seldom seen her since leaving the county school system.

Cassie Rhodes

Cassie graduated from Cedarville High School, located in one of the three towns
in the county, in 1963. The town had a single school containing grades 1-12 and served as the county seat from which the county government and school board operated. She attended the only local college in the county, located fifteen miles from her home in the small town of Oakton. At the time of this study, the college had approximately 1300 students, but was half that size when Cassie graduated. She regrets not having a master's degree but said, "There just wasn’t time and it was too far away." She spent her entire teaching career in the county and retired from the single consolidated high school. Cassie continued to tutor for three years after her retirement.

Her two children attended the county schools and both graduated from the school where she taught. They graduated from college and returned to the county in non-educational professions. Her two grandchildren attend Oakton Elementary School; she takes them home following the tutoring she does three days a week at their school. Her husband of thirty-five years died of a heart attack three years prior to her retirement and her "math teaching and the community is what kept me sane." Friends introduced her to her second husband and she "is trying to make him into a local boy—but he is from Florida." They are selling the house they purchased and remodeling a place "closer to town and less in the resort area where outsiders have moved." Two of the three interviews were at the old house and one at the new one located outside of Oakton.

Cassie began her teaching career in Ashton, the most remote of the three county towns because "there wasn’t a job anywhere else in the county and they promised me they’d try their best to find me something closer to home as soon as they could." Cassie’s father died when she was young and her mother supported the family by working in local government offices. All of the local politicians and leaders knew her mother, which
helped her obtain a job closer to home. After one year in Ashton, she moved to Cedarville and began teaching both mathematics and English. She was one of two math teachers until the consolidation in 1974 created the single high school where she was part of the original faculty. Cassie stated, "To us [those in Cedarville], consolidation was no big deal since they built the new school just up the hill but still in our town. We were just getting a new building and some new students were coming." She also liked consolidation since it "allowed me to teach only math."

When I taught at the local consolidated high school, Cassie was teaching mathematics, teacher academy, and the S.A.T. preparation class. Our classrooms were located in separate wings and I seldom saw her. I did teach her daughter in Advanced Mathematics. Cassie’s daughter was an excellent mathematics student and there were no parent conferences. Cassie had a reputation as extremely helpful to anyone when asked but she never imposed on others. The transcriber of her interviews commented about, "All the kids Cassie worried about who had to make up time they’d missed due to farming. She couldn’t just go home and forget their problems."

Ray Smathers

Ray was the oldest person interviewed. He began his teaching career in 1948, following an extended period of work after graduating from Jaspar High School in 1939. At the time of his high school graduation, the state requirement was only eleven years of schooling. Ray graduated at the age of fifteen. Due to his young age, the need for someone to help on the farm, and the fact that two of his sisters were in college, he postponed entry into higher education. He retired from teaching at the consolidated Hewlett High School after thirty-eight years and stated, "If I had it to do over, I’d have
taught five more years." He continued to substitute for several years "as long as I could still answer their questions."

A local private North Carolina college invited his father to the county in 1917 to lead a mission project in the Appalachian Mountains. Responding to the call, his father left a position with a college in Kansas and his Presbyterian ministry to move his family to the North Carolina Mountains, where they settled in Jaspar, which included the smallest school in the system. Ray was born into a large family, and had seven children of his own that attended school in the county system. His oldest daughter retired from the central office and, at the time of this study, one of his sons still taught in the system. Two of his other children taught in the system prior to moving to other teaching jobs in the state. Locals considered his family "a staple to the area."

Ray attended two local colleges and began his teaching career in his home community school. Two years later, he accepted a position as principal in another area 1-12 school, Crest Branch, approximately forty miles from his home. The principal job involved teaching half time. Deciding that administration was "not stable since it depended on the local committees," and having "wanderlust," Ray moved to other states to take jobs in manufacturing and engineering. His wife finally convinced him to return home, where he taught in a school in the adjoining county while consolidation was in progress. He remembers his principal, who later joined a federal education program, bringing "all the students in the gym and giving them a two hour talk about getting along with other citizens in this country," and explaining they had a choice about whether they were going to improve their school. The next year he went to another 1-12 school, Dawson Springs in Hewlett County. Completing his master’s degree "assured me of a
little more security." Ray remembered the consolidation of Dawson Springs and Cedarville in 1961, as "the worst thing that ever happened to education." It was not handled well, according to him, and he "never forgot the impression made by the speech of the principal [his former principal in the neighboring county] and how he handled those kids." In 1974, he was involved in the final consolidation of five schools into the current single county high school. He was "appointed the first chairman of the mathematics department." He resigned the chair position four years later to drive a bus before and after school each day.

As the oldest person interviewed, Ray spoke of times early in the system of which others had no knowledge. He also was concerned about the accuracy of his memory. Interviews often consisted of repetition of questions due to his hearing disability. The employees at the local bank where we met for interviews greeted him by his first name and spent considerable time talking to him about community events. He requested this meeting place because, "I live so far out for you to come and I try to go to town once a week anyway." The bank is about 20-five miles from his home in Cedarville.

Ray retired several years prior to my teaching in the system. He was still involved in substitute work and actually covered my classes during my extended maternity leave. There was limited contact at that time. He said he would do it his way. He was unable to teach calculus to the single transfer student assigned to me during my planning period, thus the student came to my house in the evenings for instruction. The student carried messages if needed into school and did her homework during Ray’s planning time but he did not help her because "calculus was not his thing."
Doris Tisdale

Doris "was born a half mile from this house right here," referring to her home where we interviewed, and graduated from Oakton High School in 1964. She lived at home and spent summers earning a degree from Oakton College. She did her student teaching under Sallie Ann Medford in an adjoining county.

Both of Doris’s parents and her siblings attended Oakton High School. Her siblings are ten years older than she is. Her sister and her husband’s mother were "two of the teachers not hired back after the 1961 walkout. If you were not Democrat or you did not pay as much money as they thought you should, then you did not keep your job." Her sister retired after thirty-five years in the county where Doris did her student teaching. Doris was in the ninth grade during the walkouts and "remembers making posters in class and being part of the walkout to keep the principal."

Because "my family wasn’t the right ones to get hired in Hewlett County," she "doesn’t even remember applying" and worked in the school where she student taught. Her husband’s job took her to a town outside of Charlotte and she taught three years in a middle school, while raising her son and daughter. When they returned home to Hewlett County, she returned to her former job in the system where she student taught. She reflected on differences in living within the school district where employed and teaching in other places. Eventually, Hewlett High School hired her and she worked there until retirement. However, she left for a year when she moved to teaching fourth grade. She said, "I was the newest math teacher so I was the one to go" when enrollment dropped. She "wished I had not gotten the certification [elementary teaching] because then they could not have moved me." Doris taught Algebra 1 and Geometry at Hewlett High.
Doris was in favor of the consolidated high school because

My kids had gone to Oakton and James Adams’ wife there wanted to teach Algebra 1 and was very qualified to do that. But, because no one at the other schools would do it or was qualified, they wouldn’t let Ms. Adams. So, I hoped that consolidating all the schools would mean all the kids got the same things […] but it didn’t.

Doris’s children attended large universities. Her son enrolled with a baseball scholarship and her daughter received the most prestigious scholarship offered by the University of North Carolina. Neither of her children resided in the state; at the time of the study, both lived in large cities.

Doris came to Hewlett High School during the year I was hospitalized and bedridden during a difficult pregnancy. Consequently, I did not know her very well prior to our first interview.

Interactions with Participants

The Home Interviews

Of 24 interviews, 19 were in participant homes. Six participants requested home interviews for all three visits and another requested a home interview for our last visit. As previously noted, Ray Smathers was the only home I did not visit because he "lived so far away and that he was coming into the bank anyway and needed to kill time while his wife had her hair done." The visits were informal with other family members often in the house or stopping by with information. Phone calls during the interviews were common. Participants apologized for interruptions of our 90-minute sessions, and it was clear that home, community, and family were significant parts of their lives.

All the homes I visited in Hewlett County were included in the conversations as "being just up the road from where I was raised." The homes were middle income and
nicely cared for with well-maintained yards for the winter season. Various
decorations from the Christmas season emerged over the course of our three interviews
with explanations, such as "the grandchildren always are here" or "my family all comes
every year and our house is the closest to the home place." Participants left doors
unlocked and notes for me to "come on in and make yourself at home—I’ll be right
back." Sometimes, they were at the barn or had driven to the store. It was evident that
they trusted me. They always offered iced tea or coffee and treated me with hospitality.

In five of the homes I visited, they pointed to places in the home as they talked,
commenting that, "two of my students made that for me" or "I can remember when a
bunch of seniors came over to study and it was snowing so bad that they all stayed the
night in that bedroom there. That was seven boys in that room and six girls slept in the
living room." It was evident that the teachers saw themselves as doing more than just
teaching students in a mathematics classroom.

*The Public Interviews*

When scheduling interviews, I offered to meet wherever participants were most
comfortable and in locations convenient for them. Mr. Smathers insisted that I call to
arrange our local bank interview room, although he stated, "No one will ever mind and I
am sure no one will be wantin’ to use it." There were never interruptions but the ceilings
were very high and sound tended to echo. Mr. Smathers, the oldest of the participants,
has difficulty hearing and I frequently repeated questions. In some ways, this caused
hesitations and train-of-thought lapses in his responses. He was also concerned that
someone could hear us outside the door, especially if he offered information on what he
considered community dissension.
Two interviews with Betty Buckner were on the campus of Oakton College located in the center of Oakton. Betty dropped off her grandchild at the preschool and picked up another from the local elementary school in the afternoons. Thus, the town location was convenient for her. Our first meeting was in a classroom in the media building and our second was in the hall outside the auditorium. We did not have any interruptions. Since Betty attended college at Oakton, she seemed comfortable in those surroundings. Our final interview was in her home located outside the county. Her grandchildren were on Christmas break by the time we were able to do the final interview and her home was more convenient.

Additional contact with three of the participants occurred during two bi-monthly meetings of the Hewlett County Retired Teachers Association. At the suggestion of the participants, I attended to gather information about schools and mathematics teachers in the counties remotest areas. Other teachers in attendance confirmed information. Meetings were at a locally owned restaurant approximately one-half mile from the current county high school. After a short educational program, members socialized over Dutch treat meals. During these meetings, I learned the extent to which teachers in all disciplines typically taught multiple subjects prior to consolidation, and gathered a variety of demographic information.

My Perceptions of the Participants

Having taught with several of the participants in 1990 and having knowledge of the others [with one exception], I had prior knowledge of their teaching reputations. I perceived the Hewlett school system as one lacking in resources. I was concerned that all of the teachers being from the county and attending local colleges limited diversity in
their teaching. When I taught there, I found the system to be unwilling or unable to try new things. Technology was limited and I remember the principal telling me that "our students cannot afford those graphing calculators" and "we will never have enough students here to have calculus." I wrongfully assumed that the administration spoke for the teachers. I borrowed calculators to use in my classroom from other schools and from a national calculator company while I taught at Hewlett High School.

Having moved numerous times and having grown been a child of divorce, the defense of homeland was a different concept for me. The preservation of the common good for the sake of the community was in the literature regarding rural. Only through participant voices did the strength of their beliefs emerge, including the passion with which secondary mathematics teachers in rural place held those views.

**Participant Perceptions of the Researcher**

The participants assumed that I knew their views in some areas but not in others. Participants frequently made comments in the interviews such as, "you know what I mean" or "you probably won’t agree with this, but …" They assumed that I knew about teaching in general. They assumed that my views on education of gifted students were different from theirs. This may have been from an awareness of my certification in gifted education and a long history of teaching Advanced Placement® Calculus. They assumed that I was opposed to heterogeneous grouping of students or that I would want all students taking the same subjects.

Participants were frank in providing personal information in the interviews and stated they "like to do this because I can really say what I think." Part of this response might have been the nature of being retired and no longer tied to the school system. It is
also possible they felt comfortable talking to me or because I had no ties to the school system.

The first interviews were to gather demographic information and to establish a relationship. However, at the end of all the first interviews, when I reminded them there would be a second interview to discuss the "most important changes that you think affected mathematics curriculum and instruction," they proceeded to tell me some of their ideas immediately. Ending the first interviews at ninety-minutes was difficult. It was clear following the first interviews that themes were emerging. I decided that if time allowed during the second interviews, I would ask for their perceptions regarding changes mentioned by others. In most cases, this happened during the third interviews.

The participants were not inclined to write other than in list form for their journal entries. I attributed this to their mathematical nature being one of listing rather than extensive composition. Several participants confirmed this idea stating, "I'm not much of a writer." Some participants asked if it would be all right if they did not write in their journals at all. They would rather jot something down "since at my age, I might forget to tell you something I thought was important." They perceived me as being younger and explained age-related limitations.

By the final interviews, they frequently invited me to "come a little early" for a family get-together or to stay late and meet someone they knew. Several times, they called me to ask if I could change their interview time because "something has come up." This often meant that someone had dropped by unexpectedly or "the cows are out of the pasture." There is frequently laughter contained in their transcripts. Often, they told a long story or described a practical joke played on someone at school. Usually, there were
hints of sadness and loss when talking about rural places as well as when they talked about "the good old days." They often referred to someone as "bein’ sot in his ways." However, it was never in reference to their fellow math teachers.

Sallie Ann Medford was a supervisor and she frequently talked about getting a doctorate and her roles in administration. She enjoyed telling me stories of the old days of getting one's doctorate. Most participants related to my being one of them in the role of a teacher, rather than concentrating on my present research. They seemed honored that I had chosen them to tell the story of Hewlett County life. Their focus was often on community and rural education when discussing questions directed at mathematics education. In each subsequent interview, I brought a transcript of our prior session that contained the opening confidentiality statement. It was evident, upon handing them a transcript at the beginning of the final two interviews and asking them to read for errors, that trust was established. They corrected spellings and elaborated on comments. Their editorial work did not affect the meanings of their conversations.

There were times when participants were defensive of their teaching and offered explanations. This was especially true if they did not use groups or technology as much as they perceived I had. The participants were aware of the teaching awards and reputations of the other interviewees and me. It was not clear if they were explaining due to my having used a particular strategy or if they thought that was what best practices might be.

All of the participants encouraged me to include two teachers who fit the selection criteria but did not participate. They indicated that one probably had dementia and seemed paranoid the last time they saw him. Three of them phoned the second person
who declined to participate following the first interviews to express their feelings of how well it had gone and how nice it was for someone to be interested in the county schools. These calls did not result in a new interviewee.

People in the county provided relevant information once I explained my research. I had full access to school board minutes and, on two occasions, I was offered help in understanding the courthouse storage system for the older records. The county librarian provided full access to all microfiche newspaper articles not found at the local newspaper office. The librarian also gave me keys to the archival room where there were yearbooks and county historical documents. On one visit, she called friends who brought a missing 1957 yearbook.

Themes of Change

Homeland Defense

Until I understood the perspective of participant’s defense of their homeland, it was confusing to explain their responses regarding change. From the literature, I had a preconceived idea that their rationale for change was in the form of resistance and they were providing excuses. This section focuses on the mathematics teachers’ defense of homeland. I chose the term homeland defense in order to emphasize the strength of the teacher voice regarding the defense of their community. A later section describes three incidents involving student walkouts and parents’ protest of change affecting the homeland that reinforces the attachment to place so inherent in their voices.

As I listened to participants, it became evident that past literature was derived from researchers looking from the outside into their world without including the insider perspective. It was surprising that these retired rural teachers were more than willing to
change. In fact, they noted that change was easier in rural places. According to John Hillmon,

Rural kids are much more disciplined to start with and it is easier to try new things. Whenever it was the right thing to do, we changed. Schools in the mountains are the best place to be. If they didn’t grow up somewhere where their parents set certain standards that they had to accomplish, I think it cuts back on what the kids are capable of doing. Because kids who don’t have chores and things can’t organize their time to do anything. If you have a house on a lot or livin’ in an apartment somewhere, that chore list can’t be very long or involved

According to the teachers, the "families did not see any value in gettin’ an education" in the earlier years. "There had been a lot of farms and the education that was needed was to run the farm." They wanted the "children to do well […] to represent the community and family […] but they didn’t want them educated to be belittling of their roots." One of their biggest problems "was getting the rural kids to see that rural is okay. Can a teacher from another place do that?" one asked. "All of our teachers stayed here, they lived here, this was their home, they gave more than hundred percent." Teaching "is not just a job; it is about maintaining your community and your home." All of these comments were attempts to explain rural education to outsiders. Comments were frequently interspersed with these types of explanations.

The participants responded that math teachers were willing to change but because the subject matter was more structured, it inhibited the need for change. Doris Tisdale related the way "you decide how things should be done, and if someone is trying to change that, then you change, unless you don’t feel like that’s right. I think that might be the case." Betty Buckner who grew up in the county but taught in a neighboring county defended Hewlett County teachers by saying,
The Hewlett math teachers were very open to change but the way things were; the changes did not come to them quite the way it did to us. Resources were lacking, but just as soon as the organization of things allowed for the change, they did change.

Since students who left Hewlett County to further their education were successful, teachers felt changes they made were working well. They maintained contact with students and made changes to adapt to student needs. According to Cassie Rhodes,

> We have more Morehead scholars [major scholarship at University of North Carolina] from our school than any other around. The only thing they mentioned was that they were not prepared for technology in their math classes. So, we raised money to buy calculators and the school system provided us with training.

Ray Smathers commented that, in one of his Algebra 2 classes he "had four students who made 800 on their SAT math section." He explained, "Adapting to meet the needs of students happened all the time because we knew them so well." He saw his teaching as constantly changing as needed. James Adams related, "It was part of my job to keep up with changes and stay current so the county could look good." The teachers in this study appeared willing to change if the change did not have a perceived negative impact on the community/homeland and if the change was good for all students.

*The Common Good*

Teachers frequently laced their comments with references to changes that were good or bad for the whole school. Unity in supporting the common good was an issue.

Sallie Ann Medford in her role as a supervisor commented,

> I shouldn’t say this but I did not find math teachers in this county resistant at all. The problem was that for so many years they didn’t have anything new presented to them. I found teachers cooperative and eager to change if it was what was best for *all* involved.
The beliefs that change must be best for all emerged in initial conversations but the concept did not solidify until the third interviews in two follow-up questions. To empower the participants’ experiences, I asked questions regarding future changes they would recommend to improve education and questions to elicit their perspectives of changes that were occurring. Questions about differentiated pay for teachers and about student grouping resulted in unexpected responses such as "for the whole school to be successful there needs to be mutual respect among teachers and among students. They need to feel like they are one family. When individual family members are singled out for special treatment, the family often suffers."

Another response indicated that the addition of the exceptional children’s program negatively embodied the common good. Bill Chambers commented,

It was one of the most ridiculous things we ever did. I had to go and sit with a state consultant and draw up forms for exceptional children […] you know decide who was going in and what we would do […] This one nice fella from the state department went into our school and asked this little girl what a diamond was, and she told ‘em it was a ring. He marked her down and said he was looking for a baseball diamond […] they asked another kid to define ‘stamps’ and the little boy told about food stamps and they wanted him placed in special classes. Our kids have always been together and we tried to have all of them doing the same things. All the kids accepted their family members as they were.

In the following dialogue, the mathematics teacher’s perception of suggested changes was quite different from the visiting educator and the principal's perspective:

[Interviewer]: An education professor came from the university. What was your relationship with that person?
[Participant]: The principal was outraged [laughing]. I think he asked him not to come back. He was the only math educator who decided he could come out and go over our courses of study.
[Interviewer]: Do you know why he came?
[Participant]: Evidently, he was thinkin’ that everybody learned everything they were taught and there was no need to review. But, of
course, they didn’t. The math department felt it was good for them to take two years to complete Algebra 1 if they need to since we could reinforce what they knew and spend time delving further. He felt that everyone should go at the same pace and then all go to Algebra 2.

[Interviewer]: Did that bother you?
[Participant]: No, it didn’t bother me, but it sure bothered our principal that someone would know better than us what was good for our math department. It did bother me that maybe the state did not know what was best for all our students and thought everyone was the same in mathematics. They never asked us to put all the kids who could not play on the sports teams [an analogy to placing all kids in the same math classes].

The teachers eventually dropped the two-year Algebra 1 plan following state mandates.

Schools could offer two years of Algebra 1 but only allow one credit toward graduation.

Teachers suggested changes in mathematics in eighth grade because of the state mandates.

With a lens of maintaining the common good for everyone in order to preserve the community, the rural mathematics teachers’ views became more understandable. It was also important to understand their views on the teaching of mathematics.

*The Nature of Mathematics Teaching*

The interpretation of the emergent themes needed scrutiny based on the participants’ lens of the nature of mathematics teaching. To ascertain their underlying beliefs, I asked some initial questions in the first interviews and in the last interviews repeated some of the questions. The purpose of this questioning was to uncover underlying beliefs that might have relevancy to their responses regarding change. For example, if they viewed mathematics as skill and drill needed for use in the workplace, then their perceptions on offering algebra to all students might differ from someone who saw mathematics as an algebraic process.
What Does It Mean to Be a Mathematician? I tried to reveal whether, as teachers of mathematics, they saw themselves as mathematicians and questioned whether they made a distinction between the two. To them, being a mathematician meant, "that you do mathematics." There was no discussion of what types of mathematics one did. It seemed that once a person studied enough and learned how to do mathematics, he or she became a mathematician. The implication was that majoring in mathematics or doing math at a job made one a mathematician.

There was no distinction in the Hewlett teachers’ perspectives between being a mathematician and being a mathematics teacher. Doris Tisdale’s response clearly showed the lack of distinction: "being a mathematician to me means being able to help others learn mathematics and make it easier for others. Of course, carpenters use and know math so they are to some degree mathematicians." James Adams added an additional requirement for being a mathematician, "it means you love numbers. I just enjoy numbers and being able to figure out things. I love the challenge." He related that most people think if a person is intelligent that he is a mathematician; however, he provided a counterexample:

I’ve seen some pretty intelligent people […] I’ve got one working for me […] he was on the Pulitzer prize team up at Princeton and all, and he is extremely brilliant, but when it comes to math, I end up straightening his money count almost every time. I don’t hold it against him. He is extremely bright.

Dr. Medford recalled, "When I was teaching, everybody thought that you were really smart if you could do math, which isn’t necessarily true. I thought the only reason they thought that was because they had poor math teachers." She related that people assumed
if she could do math, she could do other subjects just as well. However, for her, it was not true.

Intelligence was not as significant as speed in Ray Smathers’ view of being a mathematician, "Well, it meant I could comprehend it faster than maybe someone else."

To Bill Chamber, it was a matter of pride.

There’s more pride in being a mathematician than there is anything else. Maybe pride’s not the right word, but a lot of [...] it’s like people find out you’re a math teacher and all, and they’ll ask you questions they wouldn’t ask anyone else. I guess it’s pride. Now my preacher says pride is the worst thing, but I disagree [...] but to me it’s where you go higher than an existing plane and you do the job better than anyone else.

Cassie also mentioned pride, "I’ve always been proud of the fact that I had a degree in math and that I taught math. I felt students had more respect for the math teachers that did a good job." John Hillmon said being a mathematician was "no different from being a historian. It just means you like math better than history." However, he added that math was better "since you can prove things to kids and you’re not just giving your opinion."

The only teacher not referring to herself as a mathematician did not teach in Hewlett County. "No, I’m not a mathematician, I use math, teach math, and do practical things with it, but the mathematics is not an end in itself like with a mathematician."

Betty Buckner viewed mathematics as more than its use and application. It was never apparent the Hewlett teachers made this distinction.

What Is Mathematics? This question was to ascertain their views on the nature of mathematics and to determine if those views affected their choices for significant change.

Betty, the out of county teacher, had the most to say regarding the nature of mathematics.

I love mathematics. I did from the time I was a child. So, I wanted other people to love it. In mathematics, if you can’t learn to count, then you
can’t do the next thing. It is sequential. If you don’t know one piece of math well, you can’t see how it relates to the other pieces. People try to learn math too fast but you have to grasp concepts to move on. And the most important part is that you have to convince yourself that what you are doing is correct […] Mathematics is all about the process.

I contrasted that view with the Hewlett County teachers. "It’s not always about yes or no, but for the most part that is it. You better be able to say yes or no whether you’re using it correct or not." A response in a later interview provided insight, "Algebra is just like mathematics. When you do written problems, you have to have reasoning behind it." It seemed clear that, to the Hewlett teachers, mathematics was not the overarching idea of the nature of mathematics but rather all maths prior to algebra. That realization was further confirmed when another teacher said, "It’s the foundation for all the other math and science courses." At times, they did not include algebra in their definition of mathematics. It was important in the analysis to understand when that was their perspective. Their comments often reflected mathematics as being arithmetic.

*Why Do We Teach Mathematics?* Logically, if one believed that mathematics included the skills needed to do a job or to do algebra, it would not be surprising that teachers teach mathematics to improve job skills and to allow their students to excel in algebra. This was exactly the view held by the Hewlett teachers. "Math is the root of all the other subjects. You have to get it to go on," and "They’ll use math everyday whether they are an engineer or not. It’s in construction, insurance, taxes. It’s a useful part of life." These comments reflected their perception of mathematics as the basic skill needed to continue. Ray Smathers’ belief that "teaching mathematics is just to offer them the next stepping stones in life" reflected the Hewlett County consensus.
Another view of why we teach mathematics paralleled the belief in the common good. Cassie Rhodes replied, "We teach math so that we can have citizens knowledgeable so they can be good citizens in the community," which revealed a perception of mathematics as a skill but also reflected math as a tool for decision-making. Part of the reason for citizens knowing mathematics was to be well rounded. "The country has to have people who can problem solve and know when they are presented with incorrect reasoning. Just figuring out the electoral system is a mathematical nightmare right now." This statement and similar ones implied that teaching mathematics included reasoning and not merely skill.

How Do We Learn Mathematics? To learn mathematics, the teacher "has to know how to do it themselves and the theory behind it," James Adams responded. He related stories of students learning mathematics by measuring land acreage and computing the heights of the light poles in front of the school for the principal.

Mr. White comes down to my room and wants to know if my kids can figure out if the truck with extension ladder is long enough to replace the bulbs in the parking lot lights. John and I took them out there and let ‘em work. They measured shadows and decided they need to know more. We taught them some trig and it was amazing how much they learned and how fast when they saw why.

He added they "learned more when we made learning fun. Sometimes, we played games like Bingo and they had a motivation to learn."

John Hillmon was concerned that everyone was required to learn the same mathematics but "everyone is not required to be able to dunk." His analogy revealed his view that not all students had the same ability levels in mathematics. All teachers reported that students should learn basic skills needed to "get along in life."
No one said there was a math gene but noted, "Some students are more predisposed to learn mathematics." Although they pointed out there were more male teachers in the math department than in other departments, they did not respond that males were better at math. Ray Smathers, the oldest teacher at age 84, described the changes in gender.

The males […], the percent of males, increased over the years. When I was first in school, there was a great drop out rate as young folks got jobs. The number of boys graduating was like one-third the number of girls so of course there were mostly girls in the upper math classes at my small school. Later after Sputnik and World War II, there seemed to be more males in the upper classes. When I left, it was equal numbers and maybe more girls.

As a teacher, a school board member, and a county supervisor, Dr. Medford had a broader view of learning mathematics. She said that some people were born to understand math better than were others, and that "not everybody can be a math teacher." She elaborated on her observations of teachers.

Ninety percent of students are turned off mathematics by the fourth grade. They will tell you that and I have seen it happen. There’s a teacher somewhere who turned ‘em off. It was probably because she didn’t like math. I think from kindergarten to third grade they enjoy it. Teachers in those early grades are afraid of mathematics. Because they don’t know it well, they teach it by rote and memorization. So, by the time they get to high school, it may be too late. But teachers at the high school don’t use enough hands-on to keep kids focused on concepts either.

The participants’ beliefs regarding homeland defense, the common good, and the teaching and nature of mathematics underscored the emergent themes of change and their response to those changes.
Emergent Patterns of Change

Four patterns of change emerged from the interviews. In general, the participants did not rank the patterns. Consolidation issues occurred in the data immediately in all interviews. Because consolidation produced a significant change over time, their responses may have reflected a chronological approach to voicing significant changes. The Teaching and Instruction category contained the largest amount of data, with emphasis placed on schedule changes, especially the implementation of the four-period day. However, the large amount of data may have resulted from the researcher providing such a broad label. The Politics and Policy pattern permeated all other categories and was mentioned late in the data collection. The males provided direct data on the specifics of policy, while the female comments intertwined with other discussions. In the final emerging pattern, teachers retiring in later years were more specific about certain types of Technology. Males focused on computers, while the female teachers mentioned graphing calculators as technology.

Consolidation

Consolidation in the schools was not without protest but teachers were more accepting than local community members were "I know the community was upset but it really was best that we consolidate." All of the teachers interviewed in this study were part of consolidations during their pre-college years as well as in their teaching. Their experiences with walkouts and protests are included in a later section. This backdrop of disharmony influenced their concept that "consolidation was inevitable." Not a single participant thought consolidation was the best approach but they responded, "It was needed so that everyone could have the same education." They liked that "I finally was
able to teach just math all day." The teacher with the least negative view attended high school in Cedarville. Consolidations at that end of the county involved schools closing in order for students to attend Cedarville. Cassie Rhodes commented,

We needed a new school soooo much [referring to when Dawson Springs was consolidated to Cedarville in 1960], and we needed a new building with rooms that were able to be cleaned, able to have a good temperature, and that didn’t have flooded math classes every time it rained hard […] we liked it because for the most part those of us at Cedarville just went up the hill. We had a nice new place that was very convenient for us […]. Now, the Dawson Springs kids had a terrible amount of bitterness, but we eventually smoothed it out. I am sure driving over 20-five miles to school was not easy on them. But they were finally able to have more math classes.

Ray Smathers, who was teaching at Dawson Springs, had a different perspective, "There liked to have been some killings over it." Historically, the first state bond program for building construction was introduced in 1949 but did not pass until 1953. However, it took several years for any of the $50 million to trickle down to Hewlett County. Consolidation came later in Hewlett than in some of the adjacent counties that could afford to start building without state funding.

In 1959, in another part of the county, two high schools closed, and the students were sent to Oakton. James Adams explained:

At first, the kids from the other schools would ride the bus to where we were, but they wouldn’t get off the bus. We were glad to have them. We had Algebra 2 and Advanced Math and they didn’t […] it made it difficult for them to play sports, and some of them slept at my house so they could go to practice. It was pretty hard to convince the community that the place was gonna be successful, and when I say ‘convince them,’ many of them are still not convinced. They have always thought of the Oakton people as ‘uppity.’ But, we had to do what was best for the education of all kids.

School consolidations in the county followed legislation in 1957 that provided some funding for building and legislation in 1955 giving local boards control over
student assignments. Betty Buckner explained that the adjacent county in which she taught used local funding to consolidate much earlier. The student teachers she supervised were accustomed to teaching mathematics all day.

School Board notes revealed numerous discussions regarding consolidation issues. One comment in the May 1959 board notes read, "We have been over and over this issue but the state doesn’t give us much choice." Sallie Ann Medford stated she "ran for the school board [1967] and was in favor of providing equal education for all students. There was money coming into the system at the time because of the ESEA [Federal Elementary and Secondary Education Act of 1965]." She was surprised that "not one person ever called me to disagree that we needed to consolidate." Others commented that, "the administration was not going to listen to concerns about consolidation. To them, it was what had to happen." When I asked about the two-hour bus ride from Crest Branch, she responded, "Those parents must have called someone else."

Following a 1973 bond referendum in the state, the final consolidated high school opened in 1974. It is interesting that all students in the county came to the building site in 1973 to graduate from Hewlett High without ever attending a single class in the uncompleted building. The sports programs consolidated in 1973. The comments below offered insight into the perceptions of the final high school consolidation:

They thought if we consolidated to a single school that we would be more competitive in sports. That didn’t work out as well as they thought because those that lived far away just didn’t play. Kids couldn’t stay after school and help raise tobacco at home. (James Adams)

The after-school activities became less because it was difficult to have transportation. Only those with cars and who lived nearby were able to participate. So, it divided the county even further. They offered math help
before and after school but it wasn’t fair to those who had long rides to school. (Cassie Rhodes)

When we moved to the big high school, we had algebra 1a and 1b. We taught it over a two-year period. Prior to that, everyone took it if your school was big enough or you didn’t have it all. (Ray Smathers)

Perhaps the moral that I got out of all the consolidations I encountered was when you are dealing with all the different areas, to not get involved in the frictions regardless of where they came from because as a teacher your job is to serve them all and do what is best for everyone. (Bill Chambers)

Consolidation went much better than anyone expected but it was hard… everyone lost their community and it took years to even come close to creating the community atmosphere at the new school and now with all those new people moving here, it is gone forever. (Doris Tisdale)

The feeling in the county was different depending on where you lived. Since the high school was built near Cedarville, they all thought it was a wonderful thing. Everyone else hated it but knew they had no choice. I think the math teachers consolidated better than the kids did. Math teachers were glad to be teaching math. (John Hillmon)

You know I have found that kids who really want to learn can excel no matter where they are at. The values they obtain from small schools are worth far more than whatever academics they receive. I think consolidation was the worst thing we ever did to ourselves. (Betty Buckner)

The mathematics teachers adapted well to consolidations in their jobs but regretted the lack of participation from families. It was difficult to create an "environment of ‘our school’ and ‘my school’ from the one they had of the consolidated school being ‘their school’ and belonging to someone else." Since the math teachers came from different schools to the new high school, they felt it was easier to merge the mathematics department. They noted, "Students were able to have good math teachers from their own area of the county; this was not true with some other subjects," and "It’s sort of funny that even though we all wanted to keep our schools, it was really all about numbers […]"
now math teachers understand those." Only one teacher mentioned the consolidation of all the middle schools in 1992 and referred to it as "inevitable."

Teaching and Instruction

Block Schedule. Consolidation was not the only thing that affected the mathematics teachers' days. When asked the most significant change, every teacher mentioned the change from a six/seven period day to a four-by-four block schedule, which became prevalent in North Carolina in 1998. All noted this "as the best thing we ever did." This schedule change occurred at the consolidated high school in 1996. Hewlett High School was one of the first schools in the state to switch to the block arrangement, although participants stated, "the state made us change as that was their going thing" or "it was dictated by the office." In fact, the state had no official position on the type of schedule schools chose. "Our initial reaction was opposition but we planned for it and visited other schools to see how they were doing it and it really worked for us in the mathematics department." Cassie Rhodes noted.

Since we were able to offer more math courses on the block, we quit teaching summer school altogether. Anything was better than the seven-period day we were on where we taught six classes. There was no way to keep up with calling parents for that many kids at one time. It also meant that most of the time we had ninety minutes to plan and grade papers. It has to be the best thing we ever did...and it was so good for the kids to be able to spend more time with concepts in math than rushing through a section a day.

John Hillmon explained, "Maybe we liked it so much because the seven-period day, where we taught six classes and had duties during the seventh class, was so awful." The state passed legislation in 1983 requiring the class of 1987 to have 20 units to graduate. In response, Hewlett High switched to the seven-period day to allow students
more opportunities for credits. The block schedule switch by some school systems was in anticipation of the additional required units in upcoming legislation.

Ray Smathers lamented that teachers no longer had study halls to give students time to do their work. Younger participants recalled having study hall when they were in high school and thought, "it was a good thing if the students wanted it and really studied. They felt the block schedule "gave us back some of the time in the day." Math supervisor Sallie Ann Medford explained, "I think we went to the block because a state math consultant showed us data that it improved the scores and our scores really did improve in math, but I never saw anything great about ninety minute blocks." The teachers who experienced it disagreed with their supervisor.

In order to teach on the block "you had to organize your class differently [...] you had to quit lecturing and work with groups [...] you had more time to have students put problems on the board and explain their work." Doris Tisdale related that she was "able to follow-up and reinforce what you were teachin’ before they walked out the door." Cassie added, "The block schedule fit in perfectly with the graphing calculators because it took time to learn the technology and use it for concepts and in geometry you had time to do proofs." James Adams pointed out that "the block allowed the low level kids to repeat a course and it allowed the upper level kids to take more vocational classes [...] it just worked well for everybody [...] once in a while the state department gets things right."

Textbooks. According to the teachers, state departments did not have as much say in textbook choices in their early years of teaching in the county. "We had a choice and could pick whatever we thought went best with what curriculum we wanted to teach,"
reflected Doris Tisdale on her first years in 1968. Betty Buckner who started teaching much earlier (in 1954) remembered, "Everybody had the same textbook that was teaching a course and maybe you didn’t like some area or you didn’t feel good about how they presented things [...] so you could do what you wanted." John Hillmon said they "chose mostly by the series and if someone wanted a different one, then you got that one [...] one year they picked a textbook that was erasable and the kids had fun with that [...] it made it impossible to teach for later kids."

At first, the textbooks in North Carolina changed every eight to ten years. School districts were free to use their own money to change more often or to use a book not on the state adoption list. According to Dr. Medford, Hewlett County never used additional funds to purchase books in the math department, but "we held on to outdated ones. I remember when I first came that I spent months in the old copula of the courthouse trying to find out what books had been stored there." The teachers were unaware that other books were an option. Ray Smathers used books by Houghton Mifflin and related,

I was prejudiced in favor of those books because of the way they presented the material. I chose those every time. The general way they presented from one edition to the next was always consistent. I had a teacher’s editions and could order pre-published tests in my later years of teaching. Over the years, they started including solutions and they would put solutions to every problem. It was not at all like that when I started teaching. The textbook was my lesson plan so it was important.

Betty Buckner, who taught in more affluent Greenwood County, said that solutions books were always available when she started in 1954 but she had to buy them. That might explain why the rural Hewlett teachers noted this as a change for them because extra money was seldom available. Sallie Ann recalled, "I would have been totally disgraced if I had had to ask someone how to do a problem." She often made up her own problems.
The type of problems in the texts changed as well. James reported "a big change in geometry books. The first ones had lots more proofs. But, then they wanted more applications. Later, they wanted to know why but it didn’t matter if it was a real proof." He also thought the word problems were more relevant to the real world in later years but "when I teach in a rural place, the problems relevant to my kids might not be the same as in other places. My students had never seen an elevator and we had problems like that. I made up ones on tobacco allotment." John had concerns about social context:

Over time, the books had more reading material and we were supposed to get them to read more instead of telling them how to do problems. But, we begin to wonder if the reading they were doing was contrary to what they learned at home. They added all this social commentary. I think two plus two is four and there is no need to make up a rubric for them getting a three for the answer or a five. That seems a little silly. The social commentary they gave about why a student might think about something differently like voting precincts and get a five should have been left out. Their applications got better but they often were not relevant to our county.

Bill Chambers began teaching in 1962 and had no concerns about textbook changes. He ended his teaching career in 1980 prior to the required state testing and related, he "taught what I thought was best for the kids and some days that was not mathematics." He used texts to teach the three or four students each year at Ashton who wanted Algebra 2 or higher math. These students were "taught in a closet at the same time I had a general math class in my classroom" and the Algebra 2 kids used the text to teach themselves. He laughingly commented, "The consolidation of all the high schools allowed some students to come out of the closet. But those kids in the closet learned the more valuable lesson of how to learn on your own."
Sallie Ann Medford thought the application problems allowed teachers to get away from lecturing. However, she worried that "they [application problems] took so long that teachers quit having students go to the board and explain their work." She remembered one of the first books with full explanations was her plane geometry book. I later learned that this reference to plane geometry was to distinguish it from a course called Solid Geometry that no longer existed.

Topics. Math requirements for graduation changed through the years. Ray Smathers graduated in 1939 at the age of fifteen after completing eleven years of school. The compulsory attendance age of sixteen and the addition of the twelfth grade were legislated in 1942, and applied to the class of 1947. He recalled that, "At the time of my graduation you were required to take one math class but those of us going to college took more." A joint commission of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM) in 1940 recommended both a college and vocational track. In 1942, the United States Commissioner of Education requested a curriculum for the World War II war effort. Though none of the teachers referred to tracks, they alluded to students who were going to college taking more math classes. They repeatedly emphasized that anyone could "chose to take whatever math they wanted. It was up to you to decide." Ray’s first year teaching at Jaspar in 1948 involved math, science, and history and he recalled, "you needed two maths to graduate."

Fewer required math credits for graduation resulted in fewer math classes taught. In addition, small rural schools with fewer students in some grades affected teacher schedules. Prior to the 1973 consolidation of the high school, the teachers recalled teaching multiple subjects. Sallie Ann Medford taught physics and remarked, "Whatever
they wanted you to teach, you taught. I didn’t care. But, I didn’t necessarily enjoy physics. I never liked physics. I just didn’t like science. See math people are supposed to like science." She later mentioned that she left the county to teach in neighboring Greenwood County with Betty Buckner to avoid teaching physics. Ray Smathers recalled his physics teaching experience:

I worked every problem in the physics book. And unlike the math books, they had answers in the physics book with their problems. And I didn’t get the answers, like a third of the time that they had in the book. And I finally wrote the publisher a letter sayin’ in effect, "Hey, I’m getting different answers from what you got." So, they sent me a little book about a half-inch thick called an Errata Book. And they said they showed me the right solution, and they said they’d gotten graduate students to work out the answers to the problems in the original book and they had about one third of ‘em wrong. But at least there were some answers.

Betty recalled her high school years prior to 1950 when every student at Oakton High took algebra and Geometry. She recounted that most students not going to college dropped out to work. Her first years of teaching at a small Greenwood County school included science, history, and math, and "there was no planning period." Betty’s brother, Bill Chambers, started in 1962, taught math, geography, and typing. James Adams’s first year teaching schedule included "general math, one other math, two PE classes and a world history." Bill Chambers commented, "There was a lot of teaching out of field and there were teachers on ‘B’ certificates but every math class was taught by someone with a math degree."

Betty Buckner taught a Solid Geometry course in the mid-1950s. She took the course as a high school student. Prior to the New Math era in the early sixties, university math departments complained about math college readiness. It is ironic that the schools eliminated the Solid Geometry course during this time. Betty remarked,
It was a wonderful course. It’s been lost. I give my opinions but it has been lost. I have taught classes for the college for people planning to teach in the seventh and eighth grade, they have no earthly knowledge about a relationship between the area of the base of one figure and [...] I mean, they don’t even understand what you’re talking about, ‘ the area of a base, what’s that?’ Taking Solid Geometry out was a terrible mistake in my mind cause they never got that anywhere in other classes. They don’t know what you mean by volume [...] it’s just common sense that the volume of a rectangular prism would be width times length times height. But they don’t understand that. I had to use little blocks with college students.

Sallie Ann recalled Solid Geometry as an extension of plane geometry, "We took all the theorems and postulates and axioms that’s in plane geometry and extended them to Solid Geometry models. It seemed a logical next step."

The participants were unaware there was a national move during this time to eliminate Solid Geometry courses, believing instead that the removal of the course was a local decision. The national impetus at the time focused on teaching mathematics as more theoretical in nature, wherein students could understand the workings of the mathematics structure.

Over time, other courses evolved or ceased to exist. Sometimes, the rationale for changes was not clear to the participants. "I guess the powers that be thought that math class was more important than this one," Cassie explained about the loss of consumer mathematics. The typical pattern of course offerings included a general math class for everyone, followed by Algebra 1, Algebra 2 and Geometry for those wanting additional math. They added Solid Geometry and often included a semester of trigonometry. Consumer math became a senior math class and, eventually, the larger schools offered business and technical math classes when the county followed the state’s mandate and established vocational tracking. Additions in the 1970s included algebra three and college
algebra. These followed Governor Moore’s "Blueprint for Education"
recommendations for improvements in the schools. In the nineties, with the mandate of
Algebra 1 for all students came honors classes, Algebra 1, Algebra 1 with parts A and B,
pre-calculus and AP® Calculus. The state later disallowed more than one credit for
Algebra 1 and Hewlett County dropped the part A and part B algebra classes.

The teachers had mixed feelings about some of the curricular changes. Betty was
"sorry they dropped technical math," and was "opposed, generally speaking, to level the
kids so much by the course offerings. There were not many students who were not able to
do math that needed special classes." John Hillmon added, "Most of the kids could get to
Algebra 2 when I first started teaching, even the ones that were a little backwards and
needed to take algebra over. They got algebra in tech math and could often catch back up
if they decided to." James Adams agreed, "There wasn’t even 10 per cent of the kids that
probably didn’t need Algebra 1 at all." Others expressed variations of this view:

I remember that this college person came to visit and met with all our
teachers. He wanted to know why we taught algebra three and college
algebra. He said you could learn all the algebra in two years you needed.
And, you know, we said well, you might be able to, but our students need
that. Some of it was the same but it’s just like makin’ biscuits, you know,
as you keep making ‘em that kinda becomes second nature to you. And
they didn’t know that. We added conic sections and trig in too and finally
did away with all that. (Doris Tisdale)

Used to you’d take trig and Solid Geometry. Because of the graphing
calculators and all, the low-level kids could eventually do all that. The
things they were doin’ with surveying and stuff, where they had to survey
the tobacco crops, it wasn’t based on poundage, it was based on acreage.
And you had to be able to measure your acreage twice a year and if they
caught you with too much, they stood there ‘til you cut it down and
destroyed it. So a lot of high school boys got jobs, especially in the
summer, measuring the farmer’s acreage. It was critical that you knew all
about geometry and trig, But when everything was calculated by those
little boxes [surveying tools], then it was very important to know trig for those kids. (James Adams)

Although males and females differed in their types of illustrations in teaching math, the idea that applications should involve community activities was universal.

The four eldest participants had strong feelings about a consumer math class previously required of all students:

Students need a serious course on financial management. An awful lot of young folks don’t have a proper picture of the world of finance. They bite off more debt than they can handle. It is by far the worst I have ever seen. This whole business of the sub-prime mortgage meltdown is everybody’s fault. But I am not sure the kids will believe it […] here’s this teacher up there saying one thing and they can go swipe a card and it spits out money. That’s unreal and we need education in consumer affairs. (Ray Smathers)

The kids’ knowledge in the consumer area is so limited. I mean, most of them couldn’t write a check. And, they don’t understand taxes, social security, banking, investing, and things like that. In consumer math class, we did all that. But the college prep kids would say, ‘where are we supposed to learn all that?’ Consumer math was an extremely good course—we really taught it well. We had life insurance people come and talk about all the types of insurance and how to plan for your future. I used to laugh and tell my kids ‘ya’ll need to learn all this so you can get a good job and pay my social security. (Betty Buckner)

We started working with the business world toward the end of my teaching in 1980. We had them do home loans and car loans and profit and loss margins. The business people wanted to come […] really made a difference with kids. They learned if they could see why you needed it. (Bill Chambers)

You go into a store now and get so frustrated. For example, I went to the bank and got a check cashed and this was a little girl who I knew. She counts my money out wrong […] gave me more than I was supposed to have. Then I told her it was wrong and she counts again and gives me even more money. They think making mistakes is okay cause you can just say "My bad," whatever that means. My father can do mental math better than anyone. We’re just totally missing the boat. Students know stuff but not how or why. (Sallie Ann Medford)
Another area of change noted as not improving over time was interdisciplinary teaching and planning. "The biggest thing that changed regarding subject matter was how we taught things and how we made decisions." In the early years, students were seldom grouped by ability. "The entire faculty would sit down and work on what courses and when they were taught and how we would work together." Technical math was in conjunction with the vocational department, and business math taught with the business department. "We even had reading across all subjects where we took a day or two a week at the beginning of each class and wrote about what we read." The teachers agreed that many viewed every course as a separate entity.

Teaching methods did improve, according to the perspectives of the teachers. "Instead of repeat, repeat, repeat, they got to where they wanted us to do a lot of applications, which made teaching harder." Dr. Medford, as curriculum supervisor, said, "I never really liked the state curriculum. I don’t know that I like it even today. It is not presented well but it was better. There are ways to work around it." When I asked how she might change the state curriculum, she replied, "Make the concepts simpler and don’t be so stringent of the math topics. We lose the teachable moments when you do that."

Ray reported that his methods evolved following consolidations.

Up at Hewlett in particular…we put those problems on the board. Especially the ones they had difficulty with. Step-by-step, ’til they could see what was going on […] see how the process evolved and what they should and should not do. I thought that was the way to cover the material en masse, rather than individual one-on-one like I did before.

Although No Child Left Behind legislation was not in effect until after most of these teachers retired, Doris Tisdale, one of the last to retire, explained the more recent changes:
When NCLB came in, we put all students, when we were scheduling, all children, even the low-levels and very low levels were mixed in with each other. We had to, as we were accountable for every child. So, now it is more integrated. But, you still had to individualize homework and instruction. It didn’t make sense to me.

**Homework.** The male teachers and two of the females mentioned homework. Both John Hillmon and Ray Smathers always required a homework notebook. They both expressed concern that "over the years less and less homework was done at home." John gave the higher-level kids more homework at the end because "our state tests were geared to those higher level courses." When I asked why he did not give the lower level kids more homework as well, he laughingly replied, "What’s the point of beating a dead horse?"

Ray’s notebooks served a different purpose over the years. At first, he only spot-checked them at the end of the grading period but eventually he felt he needed to check them every day or "they wouldn’t do the work." James Adams found the same problem but said he was "not surprised since kids pretty well depended on their parents. If their parents didn’t have a clue, then their kids didn’t either." He said when he first started teaching all students took classes like consumer and general math. Parents were able to help with homework in those courses. Bill Chambers explained his unusual homework policy.

I’d never get away with that today but the kids loved it. All those extra good kids I had before we consolidated loved it when I created an A row and a B row and a C row and a D row. They competed for their seats and sometimes all the rows were A rows. They’d almost fight over those seats and I got more independent work out of them that way. But, no one was allowed to feel bad so if someone made the D or F row on homework, I’d let them get on the A row by doing some problem right on the board. Then, if someone always stayed on the A row, I’d get them moved to the F
row by making them do problems I knew they could not do. It would have been devastating if everyone didn’t feel they were the same.

The female teachers were concerned with community issues. They felt that, in earlier years, "Students need to do school work at school and save their time at home for doing work around the house or farm." Doris Tisdale stated, "They have seven hours of school and they need to enjoy life. The community activities are ones where they need to have time to be involved." Both felt they had to give more homework in their later years due to state testing. The next section shows how the teachers perceived changes in what they called their 'additional homework.'

Extra Duties and After School Work. Surprisingly, none of the teachers thought that extra duties should not occur. They felt like "it was part of my job" and "any time you do things with the kids outside of school, it helps you get to know them better. It makes them see that school is like a family where you "share responsibility for keeping the family intact." The teachers in Hewlett County were unpaid for additional duties, unlike the neighboring county where Betty Buckner taught. Betty explained that the pay occurred in her last 20 years of teaching and that there were "still unpaid duties for everyone like hall duty and parking lot duty." The teachers remembered the days when only the male teachers had gate duty at sporting events and outside duties. Ray Smathers gave an account of the changing football duties.

The cars would line up to go and park and we would collect the money right there. There were no tickets. If you knew a family was having money troubles, you’d just charge for the car and not count all the people. There was no fence. Every man had a handful of money. The women sometimes did the basketball duty inside but never the football duty. But every time the kids drove by, they’d wave, ask you a math question or just tell you about some problem they had—most of the time they weren’t math problems.
Once the system eliminated summer school, the after-school program evolved, following the implementation of the block schedule. Possibly, the after-school program and not the block schedule change influenced the improved End-Of-Course mathematics test scores in Hewlett County. Included with the after-school program was a "late bus system that allowed students to stay for extra help and ride back to the nearest town. Some students still had rides of 20-five miles or more after they were let off the late bus."

The math teachers took turns serving in the after-school room to cover Monday through Thursday. "It was really good for make-up work and test re-takes that we never did before."

Their view of tutoring was one of remediation or learning to get all students to the same place "even if it took you longer, everyone could eventually do it."

John Hillmon offered an example of getting extra help:

What I mean about after-school is this: I got this teacher, professor, tried to get me to change my major to business. He says ‘majoring in math is a waste of time, the only thing you can be is a teacher. So he talks me into taking this course. I signed up and bought the book called *The 1962 US Tax Code*. Well, I go to class and listen to what he has to say and I didn’t know what the hell he was talking about. After two more classes, I go up to him and say ‘Professor Woods, I need this class […] I don’t know all these terms and business jargon. So he says, ‘Oh, come to my office. And every time I went, he’d explain to me what I was going to be doing in the next class […] and before long, I caught on. It wasn’t remediation, it was figuring out what we are going to do so when he gets to it, you’ve got the feelin’ of déjà vu, of already been there, it works pretty well.

John expressed his belief that every student could learn but maybe not in the same way or at the same pace. No one seemed to regard after-school as an extra duty. It was just part of the job.
Coaches received pay for that role and the pay increased over time. Two of the coaches indicated "when the pay increased, then so did the expectations to win. Measuring things by wins and losses can divide a community." When I asked how coaching affected their mathematics teaching over the years, it was unanimous that "coaching kids always helps you get to know them better, which means they will try harder for you in class." Bill Chambers loved coaching but "left the county because it was so political and they lied to me about my coaching salary […] promised me that if I went to the new consolidated school that I would be the highest paid coach […] but I found out I wasn’t."

*Politics and Policy*

Politics affected a lot more than sports in the county. Political decisions affected mathematics in more ways than losing a teacher who coached. Hewlett County had a reputation for political decisions that affected educational issues. The timeline of educational events in Appendix D is replete with policy at the local, state, and national levels. The State of North Carolina has a history of promoting public education, dating back to 1868 with eventual school funding in 1901. When Ray Smathers graduated high school in 1939, there were eleven years of school required for graduation from high school in the state. As was typical of the era, students who were not going to college often dropped out as soon as work became accessible. During one of my classes, my professor, Dr. Alan DeYoung, talked about the need for high schools during the depression and in the early war years to keep young people in schools so men with families had opportunity for jobs. Things were no different in Hewlett County during Ray’s early school years.
In North Carolina, elected local committees in each school community made decisions and recommended approval to an appointed school board. The politics of the school board controlled appointments in the state and region. Study participants noted that local committees hired teachers or assigned teachers to the two most remote schools until there was an opening in a more favorable location. James Adams explained,

Yeah, you had your school boards and your local committees […] and those pretty well ran the schools in their area […] they had five members. The board usually took the recommendation of the school committee. When we consolidated, the local committees pretty much fell by the wayside.

There was an expectation that teachers would support the political party, which for Hewlett County was the Democratic Party. Politicians came to the schools and teachers signed a form stating how much they would contribute. The teachers understood this was expected behavior to keep their job out of jeopardy. Bill Chambers related his experience.

Well, it used to be pretty bad. I mean super bad. It’s like the first year I taught at Ashton, one of the teacher's wives was on the school board, the local committee board. And whenever they’d [politicians running for office] come by your classroom, they’d hand you a note in the door, and her name [the teacher's wife] was always on there you know [as a donor to the Democratic Party] with about $500 listed. And they made me mad that year, and I wrote right on the front o’ mine [envelope], "I don’t have to buy my damn job," and I liked to have got fired. But now that was me, I did those things. Also the women [teachers] would give me their envelopes cause they didn’t ever want to say anything but they wanted me to handle it. I’m a Democrat and I’m proud to be a Democrat, and don’t care what you are, but it shouldn’t have been like that.

Female teachers confirmed Bill’s assertions and Cassie Rhodes’s comment was typical.

"You know, I was one of those people that never paid that stuff much attention. I keep a very, very low profile. That was my nature. I was raised to do the best job I could."
Along with the county board of education was a superintendent and county office staff that oversaw the daily operations of the system. The teachers referred to decisions emanating from "up there" as if it were a place far removed. "I never did pay much attention to who was up there at county office anyway, but maybe those in Hewlett County did," commented Betty Buckner. Hewlett County teachers had a similar view of "up there." Two of the Hewlett County teachers recalled sitting in on interviews to hire the math teachers once the high schools consolidated in 1974. "That didn’t always work cause I know lots of times people who sat on the interviews said that person hired was not their choice. There was no say-so in the final decision." However, it was clear that the teachers felt that "administrators should have sense enough to do what they’d been hired to do and let you do what affected the math department." They wanted the math department to hire its own teachers and explained, "No one ‘up there’ knew anything about math […] and they never asked them anything about math or the math curriculum or how best to teach math […] just stupid questions like, ‘what kinda car do you drive?’"

The State Department of Education maintained control over areas of education, such as the licensing of teachers. However, there were ways around that and for a number of years teachers had wide latitude in meeting licensing requirements. Several of the teachers in the study had no teaching credentials but taught on a B certification. "The B certification meant you were working on it and that the local school system was involved in seeing that you got it."

"Well, the curriculum changes came mostly from the state and not the math supervisors up there," commented Betty Buckner who, unlike the Hewlett teachers, was well acquainted with the state math coordinators. Betty related that her school requested,
"Raleigh [state capitol where the department of public instruction is housed] come down and helped us figure out what we are to do about this change or that one." Betty was familiar with state mandates as early as her high school years. "I got permission from the state department to graduate from high school in three years; our principal worked it out with them." In Hewlett County, the sentiment was "if we were able to send someone down to the state meeting, then they would come back and tell us." Doris Tisdale, who was still teaching in the 20-first century, remarked, "I really felt that most of the changes over time were more geared to the choices that the state wanted us to make, or at least that what we were told by central office." Universally, they noted, "lack of money is a problem and the state does try to equalize. There are few local funds here like in Greenwood County. I feel it is important for the state to set the curriculum so all kids get the same material."

The federal government’s role in secondary education in Hewlett County became more significant in the mid-sixties following the passage of the Elementary and Secondary School Act (ESEA). According to John Hillmon,

Well, I was in teachin’ before the federal government got involved in public education. They got involved [...] I think about 1966. Before that, the community raised the money for schools. The federal money in public education started reachin’ us in 1966, as I remember it. Well, it gave more money to pursue things to help teachers present materials to the students and it was supposed to supplement. Then it’s like everything else the government sponsors. There’s probably a better way for them to approach it. Now look, we have gone from no federal influence to No Child Left Behind.

Following the federal government’s involvement with money, the teachers recalled what they considered the "boom years" for Hewlett County education. James Adams explained,
You got federal dollars on a per-pupil basis. Why, Hewlett spent more of the local tax money on public education than any other county had. And there was a horrifying screech from the people in neighboring counties about that. And they stepped up to the plate and did better than here and we didn’t continue to commit. The federal money was allocated evenly per student, no matter what. Do you think they took into account, like if it was a poor school? Eventually, they did do that but then those schools down east and inner city schools got all that money, but here it was pretty homogeneous, you know, all white, non-racial, and so forth.

The majority noted that specific programs implemented, regardless of local, state or national origin, were not very effective. The teachers seemed willing to change but quickly became disillusioned with generic programs that were not math specific. There was an attempt to use the new knowledge but with a guarded concern for "how this might play out in our area. You better not go against parent values for their children." In chronological order, the next section addresses the specific programs as recalled by the teachers of Hewlett County. Mentions of these programs occurred in the interview responses but never as a major change by the participants. The third and final interview involved direct questions to all participants that had not previously expressed a view about the programs.

*New Math (1960s).* The two youngest teachers, Cassie and Doris, recalled little of the national New Math era, which started around 1957 (Hayden, 1981), though Cassie remembered the name and idea, "I can remember hearing about it but I think it just involved more algebra skills, it wasn’t new." The oldest teachers recalled significantly more details. Ray Smathers reflected on the cynicism of the comments when he had long discussions on just the empty set. "People poked fun at it." The majority of the comments came from Betty Buckner who taught in the neighboring county and from Dr. Medford
who taught with Betty before becoming the Hewlett math supervisor. Both taught New Math to teachers. Betty Buckner relates,

The math was the same but the vocabulary was real different. I remember one of my teachers said, ‘I graduated from state college and I can’t even read these textbooks.’ They talked about associative and commutative and we had never taught those words. I did think it emphasized why you did stuff more than before. But I felt I already did that anyway. All that regrouping helped children to understand why they did what they did. I actually taught the Hewlett County teachers about New Math. (Betty) Well, number one it scared the teachers to death and I think they got closed minds. I did staff development for other counties and the same thing happened so Hewlett was no different. It really frightened the elementary teachers. I loved it […] it made good sense. The New Math thing […] but it wasn’t new, just new names. They were afraid just like the parents because they couldn’t help their students and that bothered them. Most people don’t want to help with math anyway so New Math made it worse at home. They did do more proofs. But most of us tried to keep our old concepts and that may have been our problem, we tried to do both […] merging everything. I think the students enjoyed it more than the teachers. I hated the proofs just as much as the teachers did. (Sallie Ann Medford)

Betty’s brother, Bill Chambers, had similar experiences but commented that, "parents closed their mind to it. It was the first time that parents were tellin’ us that we cain’t help our kids, so you’ll have to, which meant that teachers and parents were not working together as much anymore." The insight behind this statement clearly shows a focus change and a conflict between education as a community endeavor and education as the responsibility of the schools. To these teachers, New Math appeared as the first threat to the homeland. The literature confirmed that New Math as a threat (Bossé, 1995; Klein, 2003) was not unique to Hewlett County but perhaps the impact on rural places, which was not included in the literature, is of greater concern.

John Hillmon referred to New Math as a textbook, "if you mean New Math as the Dolciani book, we started using that after the first year or two I started [1966] teachin’…
all that stuff about sets. Every book started with sets." New Math was initially designed as a college program following professors’ complaints regarding poorly prepared incoming freshmen ((Battista, 1994). Eventually, though authors never intended the program to be a national one, New Math topics appeared in high school texts. Trying to define the movement by topics is problematic (Fey & Graeber, 2003). Algebra of Sets and Inequalities are the only common topics appearing in all New Math texts (Roberts & Walmsley, 2003). The eleventh grade New Math texts had similar diversity issues. The Dolciani (1963) text did not include natural logarithms or groups but the School Mathematics Study Group (1961) text did; however, it omitted matrices, probability or functions as a set of ordered pairs (R. Hayden, 1981). James Adams stated, "When I came out of college [1969], the New Math was in and I never understood what was new about it cause I didn’t know what the old looked like."

*Back to Basics (1970s and 1980s).* The back to basics movement was a call to return to the ‘old math’ where students knew the facts and basic skills of arithmetic. The teachers interviewed misinterpreted the meaning of this movement. "As far as I am concerned, every class ought to go back to the basics and then teach to catch the kids up" was one response. Three others did not recall any mention of the movement. Another expressed concern, "parents were afraid and so was I that all this technology [not included in the Back to Basics movement but computers arrived in schools about the same time as the Back to Basics impetus] would mean that no one could do simple math like multiplication tables." Dr. Medford noted, "That mainly came about when we got the state curriculum. Someone finally realized you also had to know basic math skills […] for this country anyway." John Hillmon who was a little skeptical of state and national
interventions summarized his feelings about the movement as "another catch word to
give somebody a job tourin’ around deliverin’ workshops to those of us less fortunates."

_Effective Teacher Training (ETT, 1985)._ Participants when commenting on other changes frequently referred to ETT. Effective Teacher Training was required of all teachers by the state prior to the beginning of the 1986 school year. All teachers coming from pre-service college programs had ETT included in their syllabus, and all school systems were required to train current teachers. Many systems required teachers to come to work four or five days early that year for training. Others incorporated ETT in staff development all year long. It involved forty hours of classroom instruction with manuals provided by the state. Activities provided by the state were followed exactly as prescribed in generic settings for all teachers. The individual teacher had to discern specific content and grade level ideas. The primary purpose of the training was to present best practices for student learning so that teachers were more effective in their teaching and discipline. ETT immediately preceded state accountability programs for students, teachers, schools, and school systems. Bill Chambers retired prior to ETT and subsequent programs and offered no opinion, however the teachers who experienced this statewide initiative had strong feelings. John Hillmon responded,

_That was a wonderful [sarcastic] experience. We all went to several workshops that took days to go through. And that made lots of work for experts […] an expert is a person with a briefcase more than 20 miles from home. It was a negative experience for everybody. You had to listen to a bunch a people that don’t know beans, and I’m being very kind here, tell you what’s wrong and what you need to do to make it right. It was just stupid and an assault on our intelligence._

"It was clear that this was from some researcher who had never been in a classroom. It looked good on paper," James added. He also confessed that he slept through most of it.
Dr. Medford, as supervisor, taught the course, but had concerns, "Every teacher didn’t need that. It should have been for teachers having problems and our substitutes." It is interesting that Effective Teacher Training is still presented today in North Carolina’s pre-service education and is required of all North Carolina teachers and substitutes. Doris related, "It wasn’t bad but it didn’t address the issue of how to motivate them in the first place." For Cassie, the ETT program had meaning but not in the way it was intended, "I was bored and I spent most of my time trying to adapt it to ways that helped with discipline. Their idea to have a check system for behavior was a little silly for high school." She tried some of the ideas in her lower-level classes with some success. She liked the idea of improving the teacher’s "wait time" [time waiting for a student to respond], which gave the students more time to think. Betty Buckner in the neighboring county concurred with the majority of Hewlett teachers, "I don’t think it affected our math teaching one bit."

*Senate Bill 2 (SB2, 1989).* Of even less consequence to the rural secondary mathematics teachers was Senate Bill 2, state legislation that allowed schools to create their own plans if they were not in alignment with state mandates. Each system could apply for waivers of state policy if they could verify that the change was in the best interest of the students. Dr. Medford observed, "It wasn’t worth the time to fill out all the forms and paperwork." Few of the teachers could recall whether they had heard of it and some had heard the name but knew little else. The only one to remember anything significant was Hewlett High math department chair James Adams, who said, "It reminds me of No Child Left Behind. Everybody wants a quick solution." When I asked why that reminded him of Senate Bill 2, he responded, "We were all trying to make sure that every
child maintained and made progress, but they will never progress at the same rate. So, Senate Bill 2 gave them an out to be able to say you could do what you wanted to."

The state implemented a pilot career-ladder program, where teachers could receive extra pay for moving up a performance and evaluation ladder. Hewlett was not involved as a pilot system and, eventually, the state dropped the plan due to funding and evaluation concerns. Each pilot site designed its own method of recognizing teachers who would receive additional pay. It was the intent of the plan that the individual methods deemed successful would have statewide implementation. With the theme of the common good theme running through the data, I was interested in how the teachers in Hewlett County would perceive a plan that focused on individual teachers.

In discussing Senate Bill 2 and reflecting on the ways in which teachers were treated differently, Ray recalled that he "rejoiced when teachers were able to get tenure [early in his career] so you couldn’t lose your job over politics, but it divides the faculty if some are paid more than others." John Hillmon said, "If you want to be a teacher you want to do that, no one does it for the money" and then added, "Would everyone feel of equal value?" He conceded that teachers in all systems should make the same or the system would risk losing them to other places. Having new teachers become certified teachers was a concern. Cassie Rhodes mentioned,

I saw so many of them struggling with their jobs under all the extra paperwork and some quit. They spent four or five years getting a degree and then we require more and more. It is like they are not the same as other teachers. So, if then we turn around and say you can become better than everyone else, I’m not sure that is good for the community.

The underlying value of the common good permeated their views when recognizing teachers at different levels.
State Testing (SIA and ABC, 1989). The state testing program that followed Senate Bill 2 elicited some interesting perspectives. The state field-tested End-Of-Grade (EOG) tests in the K-8 grades along with End-Of-Course (EOC) tests in certain high school subjects. In mathematics, tests were given in Algebra 1, Algebra 2, and Geometry. The high school basic skills test required of all to graduate was also 50 percent mathematics. Thus, math teachers felt, "A good majority of the school evaluation was restin’ on our shoulders." School and school system report cards based on testing results were released to the media. With this bill, schools and systems not meeting expectations and showing growth would be taken over by the state. In Hewlett County, the entire high school evaluation rested on the single high school and this meant the mathematics department carried a significant part of the burden to "prove to the world that our kids were as good as anybody else’s." Comments by the teachers were numerous and involved considerable passion.

The understanding had to be let go with the testing. That was the biggest thing. There was not extra time for concepts. (Sallie Ann Medford)

See now you’ve got to teach for a test. All we did was teach the test and practice the sample tests and questions we had. Our kids were great at doing that if you drilled them enough. But I wanted the kids to be well rounded in math and be able to measure land and figure out investments. (James Adams)

Constructions [geometric] went out the window. I tried to include them at first but there just wasn’t time if you wanted to cover all they said you needed to. It was a shame because it went along so well with our drafting program and the kids liked it. Proofs of any quality went out the window. At first the state included proofs if they were how to prove two triangles congruent by SAS and in two-columns. But, that was too expensive to grade so they even dropped those proofs. (Doris Tisdale)

Because everyone had to take Algebra 1, they kept moving things out of there and adding it to Algebra 2. Then, they decided the Algebra 2 was too
weak for when they got to college so they added more things to Algebra 2. It became impossible to teach it all unless you just went over test questions all the time and that is all you did. You had to cover everything in the texts. In all my years of teaching, I had never covered everything in the text. By the end, you had to be on the ball and you sure couldn’t be no slacker but neither the kids nor the teachers enjoyed school much anymore. (Cassie Rhodes)

When I questioned whether people went beyond assessed material, Cassie Rhodes stated, "I think you could but I didn’t see a whole lot of that. I’d like to think I did some of that. But, if you are a person raised to follow the rules, then it is hard to get out of that little niche." I asked if she saw barriers and restrictions that might inhibit teachers from going beyond. She replied, "Teaching to the test is the biggest barrier. Kids today don’t enjoy mathematics like back when you could tell the kids really liked something and go spend more time on that […] each class was different so you did different things." Doris Tisdale, another of the more recent retirees, also felt that students did not enjoy school as much as they had before and commented, "When you only teach the test and kids feel stressed, then why are we surprised that the dropout rate is increasing?"

The four eldest teachers responded there should never be a state test. To them, testing should be about "measuring progress and comprehension and never about judging." Ray, Sallie Ann, and Betty, three of the oldest, were the only participants with advanced degrees, which might imply that more education equates to a belief in less state testing. In reporting why the brightest teachers leave the profession, Darling Hammond (1999) claimed they were the least willing to deal with bureaucracy. The rural teachers did not leave but they seemed less likely to want testing in place.

Those that supported testing programs offered comments on needed changes. They suggested, "The testing should go along with but not drive the curriculum," and
"Make it my testing, include teachers more and only use state tests for half of the year’s work and let the teacher decide testing for the remainder." John Hillmon noted that state testing was "the single biggest change in my teaching career." He said if there had to be tests, we should use them where "not everyone is above average. I think every student ought to flunk a test or course once in their life. Failures often teach us more than successes."

With so many voices opposed to state testing or offering suggestions for change, national standards and possible testing might not be the best subject to address. Chronologically, national math standards occurred in 1989, but the rural teachers of Hewlett County were unaware of the NCTM standards until 1993.

*NCTM Standards (1993).* The National Council of Teachers of Mathematics released Standards for Teaching in 1991. In most cases, Hewlett County teachers were unaware of what the standards entailed. The earliest remembrance of any mention of standards was 1993. John Hillmon "was a member of it [NCTM]. I received the high school version of their magazine but most of the articles were not useful to my teaching. Didn’t they promote quote-unquote Modern Math?" He did not mention the actual standards. Not only the teachers but also the math supervisor was confused about the difference between the state organization NCCTM and the national NCTM, even though I followed up with referrals to the national standards. Dr. Medford stated, "We sent teachers at times to those meetings in Greensboro and it was very helpful when we were dealing with Southern Association" [SACS Accreditation Board]. Betty Buckner was a charter member of the state organization formed in 1971 and she related,
"All our teachers went to the state meeting and we were always pushin’ the superintendent to go with us." I probed for further details of this.

[Interviewer] Your superintendent went to NCCTM meetings?
[Betty] Well, some more than others but FM went a lot. Because we’d tell him ‘that’s important and it shows you are supporting your program.
[Interviewer] Was he a math major?
[Betty] Oh, goodness, noooo! We just convinced him it was a good thing to do and once he went, he was convinced. He wanted our teachers running for office and being involved. At first he said, just let one of you go and come back and tell the rest. But, I told him, it don’t work like that. You can tell them what you learned, but they have to go and learn it for themselves.

None of the Hewlett teachers remembered a superintendent or even a supervisor going to state meetings and "often there was no funding for anyone to go unless you paid your own way." Four of the seven Hewlett teachers never attended the state meeting and they were unfamiliar with the national organization or its standards. James Adams recalled "discussin’ ‘em at the state meetings and the two state math supervisors, Bob Jones and Cleo Meek, were always sending stuff to us. They were great to work with."

**Outcome Based Education (OBE, 1995)**: The implementation of OBE in Hewlett County followed a superintendent’s request to write a grant to implement the program. He heard of the program at a meeting, and traveled to New York to see the program in action. The program set up objectives for each student individually and teachers created means by which the students could achieve those objectives. Dr. Medford wrote the grant as directed, and related the following:

The grant for OBE basically did the same thing as NCLB. We had Al Mamary come down and do a workshop. He thought all children could learn. He and his teachers came and did lots of staff development with our teachers. I totally and completely believed what he said and still do. But teachers had a real hard time with all the special ed kids back in the classrooms. Somehow, when teachers saw all that was required in writing,
they were scared to death. They felt like it was impossible to meet all the objectives. We were one of only four places in the state given the grant and I missed church to finish up the grant on a Sunday.

The teachers involved in OBE either didn’t remember it or they had opposing views to the grant writer. John, with his sarcastic wit, provided his analysis:

Oh, that was a lovely one. We spent hundreds and some thousands of dollars to hiring people from New York to tell us how to do things in NC […] One of the things I remember best was this guy that kept talking about the conflict between himself and his father and I thought Mark Twain had already covered that well enough. I wondered what we paid the bozo. [Interviewer] Did it create changes? [John] Maybe chaos is a better word for what it created.

In Greenwood County where Betty Buckner taught, OBE was not initiated but she recalled, "We did behavioral objectives. For each course we had to write down what a child would know at the end of the course they didn’t know at the beginning." She said that was a good plan but addressed the problems:

We had to also specify to what degree they would know and we had to predict with accuracy whether they would learn the concept. Like, we had to say 85% of the kids will be able to do this. Our superintendent was really sold on that. We spent the entire year doing that […] meeting every week for months.

[Interviewer] How did you measure? [Betty] Well, we didn’t! We just wrote that. We spent the whole year writing that, then the next year the new superintendent, he could have cared less about it and we never mentioned it again. And that’s the truth!

The teachers in both counties seemed willing to make the desired changes but did not believe in the program.

*No Child Left Behind (NCLB, 2001).* Half of the respondents mentioned No Child Left Behind. Perhaps this was because most of them retired prior to its implementation. Betty Buckner said she "wasn’t impressed by what she had heard but added she "didn’t know enough about it to make a judgment." The last teacher to retire wondered about "all
the kids taking algebra and she thought the program was more for elementary students." It was clear there was confusion about which policies were state and which were federal. She further remarked, "The one thing that bothered me was that we were singling out groups to look at and I’m not for that." To Doris Tisdale, who retired a year after the advent of NCLB, the problem was that "we had an advantage because we didn’t have too many groups anyway so it really didn’t affect us much. All children can learn but I don’t believe and will never believe that they learn exactly the same way or the same things." James Adams retired before NCLB and laughingly said, "I don’t know who they thought was gonna get left behind. The kids in my room were right with me." I was thinking, perhaps, they were left behind in technology use.

Technology

"No, I never had enough resources the entire time I taught," was the sentiment of several of the participants. There was fundraising for extracurricular needs but technology purchases were dependent on policy decisions. Bill Chambers relates his first encounter with technology:

I had this closet that had three overheads in their original boxes. I didn’t want to use it and nobody ever even asked me. They’d look in my room and see that I wasn’t using it and bring me another one. I just stacked ‘em in the closet. Some teachers are slaves to using technology.

Another of the older participants, Ray Smathers, said he had some "regret that students don’t learn [...] you know letting their brain be the calculator rather than some electronic device. But there is no way to keep that from happening." He had virtually no technology when he started and said there was not much when he retired in 1989. Sallie Ann remembered the county buying calculators for elementary students and said it was fine
with her to use technology because "she didn’t want kids memorizing facts." She also felt that the high school teachers needed technology to do more real world applications.

Doris Tisdale recalls the graphing calculators in the late eighties and early nineties.

I was excited to see how they could be used to teach concepts rather than facts. I had to change my way of doing things when we were able to have calculators for all the students in every math class. I took lots of classes on those myself along with the entire department. We asked for as much training as possible. I read lots of research that said calculators helped students with concepts and our state testing required the kids to use them. I do hate to say this but I found that in my last few years of teaching that students were worse at doing math in their heads.

Several of the teachers commented on the way in which parents and administrators reacted to technology changes in teaching. One noted how interesting it was that "parents in low level classes would go out and buy the most expensive calculator they could find and think they had sacrificed for their child’s education […] when the kid was never going to use half of the buttons."

To these teachers, the technology that most affected their teaching was the overhead projector. "It was great because you never had your back to anyone." Of special note were the male teachers’ discussions of computers in the classroom. James Adams was department chair when computers were offered to each teacher, and "John, Ray and I were the only ones interested. John actually built one with the students and called Bill Gates and everything. It really worked." He lamented the fact that students did not have home access; thus, investing in graphing calculators was "a way for everyone to have technology in their hands, but kids couldn’t afford their own so we only used them in school." He recalled that teachers would come into his room and use his computers for computing grades but no one used them for instruction.
John Hillmon used his own money to purchase calculators "about five years before the school ever bought any." He expressed concern that they "were only used in Algebra 2 and above so the lower level classes did not have access until much later." Some of his students bought their own as well, but "it was a disaster trying to teach when some kids had Reverse Polish notation on theirs and other kids didn’t." He talked about his slide rule collection that he "hopes will be worth a museum exhibit someday." Betty Buckner summarized the views on technology, "Technology made teachers change and it was something we all need to do. It wasn’t easy for those of us who were older, but we could see how our kids deserved the best." Because several participants mentioned age, there needed to be an analysis of the ways in which age and other factors contributed to their views regarding change.

Understanding Teacher Voices Regarding Change

Following the first and second interviews when participants discussed the changes they thought most significant, I attempted to understand their views of change. To do so, I posed questions regarding their perspectives on whether age, gender, or other attributes affected changes over time. I added questions about whom they thought benefited from the changes. For each participant in interview three, I made a list of the themes of change and asked for reflection on who benefited most and who benefited least. I also asked if they had opinions on themes others mentioned as their most significant.

Also included in third interviews were elaborations on reactions to change in the community, which they had previously mentioned when describing changes. Community reaction comments occurred in multiple interviews with the majority having no single reaction but everyone mentioning at least one. It was clear there was a historical pattern
of reaction to change by the community that contrasted with the teacher perspective.

*Change and Voice*

They agreed, "You could voice it, but a lot of times it went through one ear and out the other." Any voice the teachers had pertaining to changes came in the later years. "As time went on, some voices were louder than others and my voice was often little."

Most of the time teachers were told what to do and tried to accomplish their charge.

The changes over time mirrored societal changes. Ray Smathers summarized,

*I would sum up the changes […] that the changes in the school and changes in the ways of teaching are reflective of the cultural changes that have gone on in our society. The bigger part of the cultural changes started at about the end of World War II, 1950, but they really accelerated in 1960. From my perspective, the bigger changes occurred as the family structures broke down. We were slow to change here because our family structures stayed in place. Students have lost respect for rules because they don’t apply anymore to everyone the same. Teachers have to compromise to get along with students or they don’t keep their job long.*

Cassie Rhodes and Doris Tisdale said they had always been happy to change because it made life interesting. James Adams made a similar comment but had misgivings about how seldom changes lasted. As department chair, he reported the changes made were for the good. "Change can be good and if you are flexible enough to adapt it or to go back to how it was if it turns out wrong, then it works out. It works out better if you have a part in the decision." The teachers seemed willing to change, appreciated change, and accepted that things did change.

*Factors Affecting Change*

Several questions from the third interviews offered insight into certain factors contributing to change more than others did. When I asked whether they thought some people thrived on change, they unanimously agreed. When I asked who those people
were that thrived on change, two people jokingly responded, "administrators at central office" and two others commented that they were the "highly intelligent people such as the brightest teachers and the top-level students." Dr. Medford, one of the central office administrators, offered, "Everyone can thrive on change but some are afraid." Ray Chambers thought it had more to do with personality.

When I queried about factors that made change most likely to happen, a resounding response from all was that "teachers have to believe it will work and that it is what is best for students." They also thought there must be a good leader that is "gung-ho and has confidence in their purpose" along with "resources to do the job effectively." They offered that change might be more difficult today because "everyone can go on-line now and see if what you are saying is correct. They can do the research themselves, so you better have all your ducks in a row if you want change or have some political power to force it."

Betty and Bill had similar responses, "If you are not grounded in what you believe or you weren’t doing it right to start with, then you need to change." Betty’s comment implied that everyone sought the best way to teach and those who searched for it by changing thrived. It is possible the older teachers were more grounded and less willing to change. Bill echoed this sentiment.

Gender and Age. One female participant felt women were a little more likely to change than males were, while the rest felt that gender played little part in change for teachers. All of the Hewlett teachers felt younger teachers were more likely to change than older teachers were, while Dr. Medford and Greenwood County teacher, Betty Buckner, noted that age did not matter. Those who agreed that youth was more likely to
change had similar reasons. They said that "youth needed to change more," were "searching more for things that worked," and had the "fearless attitude that all things work out okay." Four of the six Hewlett teachers used an identical phrase to explain that more experienced teachers become "sot in their ways," know what works, and wonder why they should change. "They have the background, confidence and experience to challenge what is presented if that is needed." As Doris Tisdale exclaimed, "There’s nothing like gray hairs to make teaching easier." Cassie Rhodes voiced support for all experienced teachers.

More experienced is better no matter what age you are. I became a better teacher as I got older. Experience in a classroom is wonderful thing. But sometimes as you get older, your energy level is not the same, but I was doing the best job I had ever done my last several years of teaching. Sometimes you need a push to change and see what you are capable of—but you have to make sure it is best for all the kids.

High School Mathematics Teachers. I wondered what their reaction would be to prior research regarding mathematics teachers, particularly rural ones, being more resistant to change (Schuck, 1999). In order not to prejudice their thinking, I waited until the final interview questions to gain their perspective. The respondents reported their experience was contrary to the research involving high school math teachers as more resistant to change. In contrast, the math departments in which they were involved had not led the charge for change but, compared to other departments, effective changes occurred more often. James Adams related,

Mathematics, itself, doesn’t change much. So maybe when it comes to curriculum, math teachers don’t change. But the math department always had an easier time figuring out what we were going to change, how we were going to do it and coming to agreement. Other departments drove themselves crazy trying to get everyone on board and it was always a mishmash of what the intended change was supposed to be about. The
block schedule about threw other teachers for a loop [...] ‘what are we going to do for an hour and a half?’ they asked. It was easy for us to decide.

Rural Appalachia. Separating the terms rural and Appalachian in the minds of the participants was impossible. Only once or twice did anyone mention that another place could also be rural. Perhaps, they assumed my notion of rural implied Hewlett County or that the intent of the research was only for this particular county. They explained why rural was more resistant to change.

If you mean the people that are really native to the area and not the ones who just live here, then I would agree they are more resistant and for good reason. Their homeland is very precious to them and it is a tie to their heritage. They are good people, they often don’t value education much because they have seen what it has done and they kinda feel inferior to city folk. That’s changed over the years. (Betty Buckner)

If their daddy and their granddaddy did it that way and their life turned out okay, it was good enough for them. God intended for man to remain close to nature to cherish our families and friends and what was important. Change to some means getting away from God. (James Adams)

Mountain people will change in a heartbeat if they see some way to make a profit. They’re not greedy, they just want to be left alone and make a living. They can see where the city folks are today with all their problems and they don’t want that. Now, they’ll let you change all you want to and they’ll watch and won’t say much, and let you change. Then if it worked okay for you, they might change. I don’t like the work I’m fixin’ to use but they are a little "backward" or "back woodsy." It comes from being raised to be independent. (Bill Chambers)

Who Benefits?

The opinions on who benefited most from changes over the years were either impartial or varied according to how long they taught in Hewlett County. Those in the classroom longer and those who taught in Hewlett County longer said the upper level students benefited most because the focus of change was for those going to college. Betty Buckner, with over forty years of teaching, summarized this position:
I think it was best for the better students. I think it was not best for the other students. Those students who are gung-ho on math and want to get as much as they can, and who are [...] I’m not going to say college-preparatory, ‘cause a lot of people go to college just to keep from workin’, but those who really want to prepare for college, they have what they need. And that’s good. But they are not meeting the needs of the middle students. We meet the lower level students needs pretty well too if they qualify for identification.

James Adams who taught thirty years in Hewlett but retired much later commented the "tide was turning when I left and I think because of testing, the upper level kids were starting to be ignored." He reported technology and the applications were better for low-level students. Doris Tisdale said that placing the low-level students with the high-level students when everyone was required to take Algebra 1 made the low-level students feel "put down" and the high-level students "held back."

Bill Chambers, John Hillmon, and Dr. Medford did not think anyone benefited because "everyone was all worse off than in their first years of teaching." Dr. Medford commented, "As I have previously mentioned, I grew up in a very small community, in a very small school and we didn’t have much, no library, very few materials, hardly any. And I did fine." Bill Chambers’ sentiments paralleled hers; "Anyone who wants an education can get it if that is why they are in school."

None of the Hewlett teachers felt that the policy of letting students retake tests benefited anyone. Until I addressed benefits, no one mentioned this policy. Implemented at Hewlett High School in the late 1990s at the same time as Outcome Based education, test retaking for higher grades was the only specific policy they mentioned when queried about benefits. Except for this policy, their perspective seemed to be on the large scale of who benefited over time. Additionally, they frequently agreed, "Changes that do not
benefit everybody need to be reconsidered. Once you start singling out groups, it destroys the atmosphere of the place."

*Community Reaction to Change*

Maintaining the community seemed a priority. Teachers did not seem resistant to change but they were acutely aware of the community reaction to change. They were conscious of damage to the homeland and the community that had occurred in the past and wanted to avoid future incidents. In their view, the common good needed preservation and each had first-hand knowledge of educational disruptions. They repeatedly mentioned three specific instances and established a pattern of protest of courtesy (DeYoung, 1995). It is interesting that, in all three situations, "the teachers were not involved. They didn’t encourage or discourage anyone, but the school board said they did. Teachers were always responsible for what the kids did in the eyes of the administration."

*Boycott of 1946-47*. The teachers’ recollections were limited on the children’s boycotts of the Poplar and Lower Valley schools when consolidation resulted in the closing of these schools and everyone moving to Oakton. Many participants were students when that boycott occurred and only two were from that particular end of the county. Historical records in the county archives provided more information. Newspaper accounts were sparse and there were no records in school board notes.

"Parents were unaware their children were riding the bus to Oakton school and being let off in downtown Oakton," noted the newspaper account. Apparently, once the parents found out, the children’s actions stopped. The students, especially in the upper grades, from Poplar and Lower were unhappy that they would not be attending their own
schools. They would ride the bus into Oakton but, instead of attending school, they spent the day exploring town or finding something to do in the neighboring woods.

*Consolidation Pickets of 1959.* Parents at the other end of the county protested the consolidation of Dawson Springs and Cedarville, following the announcement that Dawson Springs would lose its high school. Students and teachers attended school but they had to pass through a gauntlet of male parents who lined the walkways. Sallie Ann Medford was a new teacher at the time and she recalled,

> Oh, they had their overalls on, they didn’t harm you or anything […] were very respectful, but you knew they had guns in their pockets. I wasn’t scared […] it was just their way of letting you know they were not happy and didn’t think it was right.

The location of the county seat created a long running battle between the two towns for over 50 years. "The railroad and the river were the two deciding factors to have the county government in Cedarville," stated the 1974 book, *This is Hewlett* County (*name changed for confidentiality*). The fact that the school in Cedarville* had flooded many times did not deter the decision makers about which school to close. "There were numerous meetings held. I was the high school principal at the time and had to leave the county to get a teaching job. I couldn’t blame the parents so I never made ‘em leave," recounted Ray Smathers. He returned to teaching because he realized, "administration jobs were too political and tenuous."

According to newspaper accounts, the community also refused to allow educational materials at Dawson Springs* to transfer to Cedarville. The middle and elementary grades gained all desks and classroom materials, except texts, that were not
stored for future use. One parent recalled, "We might not be able to keep our kids here but we can keep the things we bought here."

*Walkouts of 1961-62.* Since the walkouts at Oakton made local, state, and national news, a plethora of media information accompanied the teachers’ recollections. However, the teachers in areas other than Oakton recalled little of the event despite involvement by state legislative action and North Carolina’s governor, who served as a mediator. High school students walked out when the school board, over the objections of the local committee, called for the termination of the principal who had denied campus entrance to any politician collecting campaign contributions. It is interesting to note that the community resented the principal when the board first assigned him to Oakton because of the closing at Dawson Springs.

"Fifteen hundred persons who turned out for mass protest meeting have their way," read the headline in the local paper. They agreed to wire Gov. Terry Sanford and Charles Carroll, State Superintendent of Public Instruction. The meeting was in the football stadium to accommodate the crowd. The high school band played while everyone gathered and the pastor of Oakton Baptist gave the invocation. The local doctor acted as master of ceremonies. The president of Oakton College spoke, called it a "wonderful demonstration of good citizenship," and pledged to

> link my mind, spirit and efforts for the students and the welfare of the community at large. Graduates of this school do above average work and are among the best-trained math and science students we get. *(Hewlett News, April 1961, p. 5)*

One school board member known to run the county with an iron-fist remarked,

> For the ten dollars I get a month for serving on school board, I can’t afford to act as baby sitter to three men with master’s degrees who cannot work
this out [referring to the superintendent and principals at Oakton and Cedarville]. I am not un-American and I don’t appreciate any child or teacher drawing a sign making an analogy between me and Castro [referring to picture in the paper of the walkout parade]. (Hewlett News, May 1961, p. 1)

Protesters burned a cross in the superintendent’s yard and threw trash in several school board members’ yards and offices.

In state senate committee hearings, the pleas of the eleven-member Oakton delegation sent to the state capitol resonated with senators who had similar disputes in their districts (Hewlett News, August 1961, p. 5). Senator Whitmire said there was a bill presently considered in which a special act, rather than the county board, would appoint district school committees. Senator Archie Davis of Forsyth questioned, "Where you have a situation, local in authority and local in nature, how long can the state tolerate it when state money is going to the support of schools not adequately managed? Can it go on indefinitely?" (Carsonville Citizen, September, 1961, p. 4). Senator Miller replied the "law is silent on how long a school board can leave open a post it has capriciously vacated"(Cedarville Gazette, October, 1961, p. 3).

Further newspaper accounts revealed, "All thirty-five teachers at Oakton agreed that the work of years is being destroyed" by what they referred to as ‘ambitious politicians’ but they did not agree on whom they were. "We have the right to question anything that isn’t fair," (Carsonville Citizen, August, 1962, p. 3) one said. A local history teacher reported, "North Carolina wouldn’t ratify the Constitution until the Bill of Rights was added […] it has always been a tradition of people in this area to stand up for what is right." Although the governor’s decision stated, "Force is not a proper method of relief" and criticized the teachers for not getting involved to end the dispute, he ruled in
favor of the students to retain the principal. He said he was "imploring you teachers to
give your full devotion to this all-out effort for quality education. I am asking you
teachers for quality teaching, I am demanding of you more preparation, more study, more
teaching and more work" (*Greensboro New Record*, August 1961, p. 1). In March 1962, a
three-foot high red, white and blue banner proclaiming, "You are now in OAKTON
where conniving Politicians crippled our Public School" greeted the Governor and the
200 teachers attending a local NCEA meeting in Oakton.

Even if the teachers interviewed were not part of the walkouts and protests, they
recalled relatives or friends who were. Of primary concern were the 20 teachers who left
the county following the year of turmoil. Everyone remembered the "best math teacher
who ever taught at Oakton left to teach elsewhere even though she lived less than a mile
away from Oakton school for the rest of her life." The teachers wanted to "just teach our
classes and do what was best for the kids and not have all the politics."

Additional Findings

Issues other than change emerged. The participants often had advice on how to
improve education and what their life was like now that they were no longer directly
involved with the school system.

*New Teachers*

Knowing mathematical content was not the number one characteristic of what
new teachers needed to be a good teacher. The majority of the participants opined that a
"good all around person who can handle discipline" was whom they would require if
hiring a new teacher. Dr. Medford stated, "If they are reasonably bright and majored in
math, then we can teach them content. However, teachers are born. You cannot teach
them how to get along with high school students. It is a passion." It was interesting that Betty Buckner, who never taught in Hewlett County, was the only one with a contrasting view. She commented, "The more mathematics a new teacher knows, the more likely they will be to plan in the classroom. If you know mathematics, discipline issues can be avoided."

Retirement

Out of curiosity, I asked each participant at the end of the interviews why they retired when they did and what they might have done differently. Only one told me that it was because he or she had thirty years. Bill Chambers who retired the earliest did so due to what he felt was political pressures. James Adams retired two years earlier than planned at 32 years due to "a very bad group of kids. It wasn’t worth the stress." Betty Buckner who taught the longest stated she would have "never retired if they hadn’t promised me I could work part-time and then after I did retire, they found out that they couldn’t pay me all the money I would need to be paid due to all my years teaching." Ray Smathers said, "I wished I’d taught five more years. That would have made a big difference in my retirement checks." Dr. Medford left the classroom "because I was asked to teach at the college and run for school board. I retired from being the assistant superintendent to allow the new superintendent they hired to select her own assistant. It was just my time." None would have selected a different profession. All said they loved retirement and were too busy to consider returning but would like to tutor.

The Ideal School

In relating historical information on consolidation issues, four of the participants offered advice for where a high school should be located in the community. It was
fascinating that they recommended, "The school be away from the people and the businesses." One related a story of a county commissioner suggesting building a school on property near a sewer plant. Reasons given for the location away from towns was that students would have the experience of riding a bus and that they would be contained and unable to leave. One sarcastically suggested building on any of his "land where they would pay me ten times the worth of it like they did the commissioner’s brother when they built our middle school." One recalled a trip to Switzerland "where the little girls were standing right outside the school smokin’ and the school was located between a department store and a grocery store."

Class and school size for the high school also provided some interesting thoughts from the female teachers. They expressed concern that the thirty-three to forty students they had in classes were too large and that this happened too frequently in rural schools "where we only had one section of some math classes." On the other hand, they considered five or six students too small for a class because it meant, "someone else was overloaded." The general feeling was that math classes should have between 15 and 25 students, with possibly lower numbers in the lower ability classes. The ideal school size mentioned was from one hundred to one thousand. All commented that schools could be too large and that the "family feeling is not possible in larger schools."

Each participant wanted at least three mathematics courses required for all students where "each kid would have to take a consumer mathematics class where they learned how to do checking, savings, loans and investments […] especially how to buy a car or a house." They thought every child should have some "exposure to Algebra 1 but not necessarily required to master all the concepts."
Their ideal would have state regulations offering everyone the same opportunities but they advocated for "local committees to make school decisions […] and the mathematics teachers need to be hired by the mathematics department." Two persons recommended certified mathematics teaching assistants for individual teachers or the department. All the teachers from Hewlett County commented, "The teacher should live in the community so they will know the kids and their parents." The only teacher outside the county, Betty Buckner, said that was "not as important but over the years that had changed for the worse when they hired teachers from outside the area." They should hire "a teacher who cares about our kids and it doesn’t matter how much math they know."

Betty Buckner disagreed and felt that "knowing the mathematics content was the most significant thing when hiring a teacher."

Summary

Rural retired secondary mathematics teachers’ perceptions of change depended on their underlying belief in the community. Defending the homeland involved a preservation of what remained good in the community. Making decisions based on what benefited everyone rather than what might benefit a few maintained the common good. In order to realize what role mathematical education changes play in maintaining the common good and the homeland defense, one must also be aware of the underlying beliefs in the nature and teaching of mathematics.

This chapter revealed the data and analysis phase in determining emergent themes of educational change that were significant during the careers of retired secondary mathematics teachers. The four most significant changes, according to participants, were Consolidation, Teaching and Instruction, Politics and Policy, and Technology. In
addition, the chapter presented the research methods and their descriptions in a transparent fashion, which lends credibility to the interpretations and implications presented in the next chapter.
CHAPTER FIVE: SUMMARY, INTERPRETATIONS, AND IMPLICATIONS

Since, for the most part, those reporting on reform initiatives are outsiders to classrooms in rural places and often have a stake in the reforms; it is significant to give voice to the insider perspective. It was the intent of this work to understand mathematics education through the experiences of the individuals whose work and lives are the stuff that builds abstractions (Ferrarotti, 1981). This work also attempted to rectify Seidman’s (2006) assertion that too little research in the United States involved the perspective of teachers.

The Research Question

This study focused on issues addressing the following question: How do retired rural secondary mathematics teachers understand changes that occurred in mathematics curriculum and instruction during their careers? My goals were to identify themes of change that influenced mathematics education in a rural North Carolina school system and to describe the perspective of retired secondary mathematics teachers by examining changes within a historical context.

Three main themes emerged within the teacher’s voices regarding how teachers understood the changes that occurred during their careers. (1) In order to protect what they viewed as a *homeland*, it was necessary for teachers to sieve through reforms that were often viewed as outside intrusions threatening to change their community. (2) The teachers voiced concerns when individual perspectives became more significant than the *common good* of the culture. (3) A predominant view of mathematics as skill and arithmetic permeated the responses of the rural teachers in this place.
The data gathered in this study indicated that teachers perceived significant change resulting from technology, consolidation, block scheduling, and political policies. These emergent patterns created the most significant changes during the teaching careers of the rural teachers interviewed. The teachers seldom initiated the changes they described as significant, and they often assumed the policies emanated from the state level. Regardless of their origin, the specific programs were ineffective when viewed through the teachers’ lens; however, they reported a willingness to change if it benefited their students. The importance of context and an understanding of underlying teacher beliefs proved critical to the findings.

The retired teachers were familiar with many of the educational reforms that occurred in the 50 years that following Russia’s launch of Sputnik, which catapulted mathematics education to the national forefront. Is Graham’s (1993) claim that it takes 50 years for reforms to take root in school culture true in a small rural school system in western North Carolina? How would rural teachers describe these reforms? In this final chapter, I revisit the methodology, followed by a summary and an interpretation of the findings. The limitations of the study precede the implications for practice and the implications for additional research that conclude the chapter.

Methodology

Qualitative work cannot generalize results to large populations. However, the emergent comparative-contrast themes, which were systematically gathered and analyzed, could "offer insight; enhance understanding; and provide a meaningful guide to action" (Strauss & Corbin, 1998, p. 173). Substantive patterns confirmed the importance
of the individual without denigrating the possibility of community and collaboration as described by Seidman (2006).

This was a qualitative descriptive study using ethnographic interviewing methods. The study employed an in-depth three-interview process as advocated by Schuman and Dolbeare (1982). This phenomenological-based interviewing combined life history interviewing and focused in-depth interviewing using open-ended questions designed to build upon and explore participant’s responses.

Ethnographic research, in general, focuses on the identification of common cultural understandings. Because some, including researchers, often consider rural education as disadvantaged, this study took a critical analysis approach to identify the ways in which changes evolved and perpetuated or eliminated dysfunction. Without context, one cannot evaluate the meaning of experience (Patton, 2002). This is especially true in rural settings. The study analyzed the context of a limited number of persons, events, and situations, and included historical documents as well as participant journals and recall. Research field notes and memos provided additional documentation.

Summary of Findings

To understand the themes that emerged from the perspective of the participants, their underlying beliefs required illumination. In the summary of the findings, I examined these beliefs and the themes that emerged in comparison and in contrast to prior literature. This chapter concludes with an overall perspective of the views regarding change held by the retired rural teachers, which were confirmed through their personal experiences and historical documents.
A Native American saying suggests that to understand a person, one must first walk in his moccasins. It is with that sentiment that I write the next section from the perspective of the participants in this study with their words embedded within the text. Prior research on the perspective of mathematics teacher is limited and what exists, especially in rural research, speaks with an evaluative top-down voice, rather than one of comprehension. If we really care what teachers think and want to understand how they view change and reforms, it seems an obvious step to hear their voices, see through their eyes, and step in their footsteps. The "We" voice included in the following section is the rural retired teachers' voice speaking about each of the emergent themes. Following that section are salient comments regarding the teacher voice from the researcher.

In Our Shoes, Within Our Souls

The Homeland Defense. Our "homeland is very precious to us; it is a tie to our heritage." We grew up here; received our education here; many of us lived at home in order to attend the local college; and we chose to teach and raise our family in this place. We were "raised to believe in God" and grounded in our faith. We married local people and maintained long-term commitments to our families. Our families taught us to be independent thinkers, to obey, to be self-reliant, to follow the rules, and to "do our jobs to the best of our ability." Independent thought and obedience are not necessarily opposing actions in our view. Family chores as we grew up helped us become responsible. We do not see ourselves as difficult or ignorant as some have described.

Until we were on our own, we relied on our parents to be our support. "You better not go against parent values" in our community. We are not "less fortunate," rather we are blessed, and our "kids are as good as anybody else’s." We can point to "numerous
success stories in testing scores" if that is what others choose as a measure of our educational accomplishments. Our children are "better behaved, more polite, and well-mannered." Changes in our classrooms would not be difficult to make with "children who trust us" and with children who know we value their place.

If education or research is "belittling of our roots," our teaching becomes more difficult because we are always trying to make our children aware that "rural is okay" (Hektner, 1995). We do not appreciate social commentary added to our textbooks, which conflicts with our values. We want to teach mathematics, which includes applications to our rural life, and which encourages consumer skills needed to maintain a mathematics citizenry. Egalitarian rhetoric (Angus & Mirel, 1999) does not resonate with us. Our students are from proud families with a tremendous heritage of being self-sustaining. Applying for government assistance would be a last resort. McCullough and Johnson (2007) overlooked us in their report that outlined the "challenges and solutions for North Carolina’s most overlooked rural communities" (p. 57) because they used free and reduced lunch to measure resources. We not only get to "grow our own" but we must do it without equal resources. Therefore, we view our successes as remarkable but not surprising.

According to DeYoung and Theobald (1991), reforms maximized the teaching skills required for an urban-based economy. We question the "ambitious synoptic plans of the state" (Scott, 1998, p. 52) that assume experts know more than locals in the homeland know. Our approach is not one of rigid conservatism (Tyack & Cuban, 1995) that demands inclusive and child-centered schooling. Rather, we desire to preserve the family, the community, and the nation by "looking for the good in all our children, loving
them, and having an attitude that we’re going to teach the very best we can so that all our children benefit."

If rural schools are the "last bastion of the traditional community and the only place that brings the entire community together regardless of age or socioeconomic status" (Harmon, Henderson, & Royster, 2003, p. 35), then it makes sense that we must defend what we as teachers do in those schools. We must combat the "feelings of back woodsy" that occur when comparisons are made with nonrural places. We must take it upon ourselves to be the gatekeepers of the community (Coleman, 1987) and its values since we are community members. We collectively created our story of place (Nachtigal, 1998) and we provided the narrative of what our homeland became.

Our ethic of self-reliance and independence manifests in what researchers view as resistance to reforms (Duncan, 1999; Gaventa, 1980). We view our ethic as one of defense of what we value. We are teachers, part of the working class, and we interpret the reforms as a challenge to our local values (Woodrum, 2004). The new math era was the first time that "parents were unable to help children with homework," which changed focus and created conflict between education as a community endeavor and education as the responsibility of the schools. We have experienced the reforms that followed, which to us mirrored societal changes, and we fought when needed to preserve the homeland we value. Like Brint (1998), we believe the historical record shows that "there is a more immediate and enduring acceptance of reforms that do not radically alter our prevailing cultural understandings of what schools do" (p. 7). In rural areas, frequent interactions among relatives, neighbors, and the schools define the relationship between school and community (Sampson-Cordle, 2001). We, as teachers, have not physically protested.
However, we are keenly aware of our history of community "protests of courtesy" and the defense of the place we revere as our homeland.

*The Common Good.* "The commonwealth and common interests, commonly understood, of people living together in a place and wishing to continue to do so" is the way in which Wendell Berry (1993, p. 49) referred to community. We seek to preserve the community by doing what we feel is best for the common good. Our common welfare comes first and that depends on unity. The word community ends in unity. We see unity preserved through our schools. Although our students have individual needs, it is important to do what is best for all students.

Each of us has taught at least 10 years in Hewlett County and, like the Australian research of Boylan and McSwan (1998) involving rural long staying teachers, we have high levels of commitment that have increased over time, unlike what typically happens with teachers in urban and suburban places. Our belief that we contribute, like those of the teachers in Australia, aided us to be "long-staying rural teachers" who served to the betterment of our community.

It bothers the majority of us when we single out teachers and students for special privileges. When we intentionally segregate special education or gifted students, we question whether this is best for all. Although mathematics courses by their nature tend to level students, we are "generally opposed to having too many courses that level the kids." Not only student segregation but also teacher segregation is undesirable. Teachers paid on a differentiated scale create division in the faculty and is disharmonious to the community.
To do what is best for the community, schools need to be about more than training for jobs or competing in a global economy. "Measuring things by wins and losses can divide a community." Being in competition ultimately means comparisons of individuals or comparisons of places. If one is raised to follow the rules and the rules are different for individuals, then, in our view, community cannot be maintained. Our rural students had above average scores on state testing and were just as likely to take advanced mathematics courses as those in other places, which may be contrary to rural research in the NCES (2007) report. Bottoms and Carpenter (2005) provided evidence that rural "students take fewer ‘rigorous’ high school math courses, and experience instruction that places little emphasis on rich numeracy" (p. 21). We agree this was true where we taught but we would argue that it was not entirely of our making. Test scores seem to be the numerical focus administrators and legislators force our community to understand. Nevertheless, we try not to measure student worth by scores. It is difficult to have the community maintain this perspective when media reports comparisons at every opportunity.

For the "whole school to be successful, there needs to be mutual respect among teachers and students." Although we can single out individuals, it should not happen at the expense of the overall school. We agree with Von Braun that it is "ridiculous to think that by giving the brighter children a better chance, you run the risk of developing intellectual elite" (cited in Clowse, 1981, p. 124). However, we disagree with doing so if it jeopardizes the atmosphere of community. We think one can certainly be smarter or have more education but, one can never become better than someone else. Our students, regardless of their talent or lack thereof, are valued equally in our eyes.
Brint (1998) posited that the best hope for individuals was when the state provided essentially the same education for all through secondary education. We have mixed feelings about whether there should be a common curriculum for all students as advocated (Campbell & Silver, 1999) by national organizations. The problem in the past has been that our rural students have often not had equitable resources to implement changes in the common curriculum. If it were best for our students, we have been more than willing in the Hewlett High mathematics department to change to fit the needs of all students. As teachers, we are part of the Hewlett community and our parents taught us to do the best job we could no matter what the circumstances.

Maybe rural teachers were more part of our community than they were in other places because teaching jobs are working class jobs. Our entire county is really that way. Regardless of pay, we all had a job to do in our community family. Over the years, outsiders have moved in and teachers have had to compromise our values in order to keep our jobs. Since education to us is preserving the common good, we share the view that "education is deteriorating" because it has changed its focus.

*The Nature of Mathematics.* Research notes that teacher beliefs are important in reform implementation (Drake & Sherin, 2006; Spillane, 2001) and that an individual’s teaching follows those beliefs (Battista, 1994; Cooney, 2003; Cooney & Shealy, 1997; Nespor. 1987; Pajares, 1992). Our beliefs spring from our upbringing as well as our experiences in the classroom. This process of acquiring our mathematics teaching belief is through personally tested practices. Although Lortie (1975) argued that this process is one of refinement and the application of generally valid principles of instruction, we would tend to disagree. Perhaps, disagreement is the wrong choice of words because we
recognize that this happens but we feel that, often, we teach in ways that violate our beliefs and values about how and what students should be taught as revealed by Hatch and Freeman (1988) as well as Urdan and Paris (1994).

The mathematics departments where we taught did not lead the charge for change but we often implemented changes in a more consistent fashion and with considerable success. Howley, Howley, and Helms (2007) found that rural mathematics teachers "hang tough with conventional practices" (p. 34) and that is for the most part true of the rural math teachers in our county. Perhaps, as they suggest, it was largely to avoid faddism. However, we would argue there are other beliefs that inhibit reform efforts. We see mathematics as being more structured and needing less change. Because of our mathematical nature, which is inclined toward proof and contradiction, we are waiting for rural research that proves the reform effort really 'works' or contradicts what we presently know works from experience. We especially see neglect in research in rural Appalachia as noted by DeYoung (1995) and others.

Teachers as a rule are conventional because they have little exposure to people with different ideas (Ball, 2001; Cohen, 1989, Cooney & Shealy, 1997; Cuban, 1993; Ernest, 1991). Remillard and Bryans (2004), among others, noted that changes in our "instructional practices are the result of particular interactions between teachers and curricular materials around specific subject matter and pedagogical content" (p. 381). We often selected materials with which we felt comfortable but there were seldom extra funds to purchase additional resources, such as solutions manuals, technology, and professional development, which might have influenced our interactions. We concur with Drake and Sherin (2006) that teachers believe carefully aligned and appropriate
curriculum materials will improve student performance. This typically meant we sought materials with a strong testing component that aligned with our state tests, although we disagreed with testing as a comparative instrument. Unlike teachers in neighboring counties, we had few opportunities to attend conferences where we might find exposure to different ideas. However, in attending colleges, we encountered ideas that contrasted with those of our community.

Although we jokingly refer to rural community members as being "sot in their ways," this is not necessarily a negative evaluation; often, there are valid reasons for being "sot." An outsider might interpret this as resistance or conservatism. From our side of the fence, we see this as having made a decision based on experience, reflection, and analysis. We believe that youth who really want to learn "can excel no matter where they are educated" and that anyone who wants an education can get it if he or she is in school. We further believe that not all children learn mathematics in the same way or at the same pace. We believe that strict adherence to state curriculum and testing ties the hands of the teachers.

We feel that contextual constraints have exerted significant influence, not on our beliefs, as suggested by Pajares (1992), but on our ability to teach mathematics in a way that is more meaningful to our students. Prior mathematical applications in our classrooms involved tobacco allotments, acreage, and other activities prevalent in our community. However, the cultural context applications in mathematics have vanished. Consumer mathematics has disappeared along with a "common sense approach to volumes" in Solid Geometry. These changes have not been our choice for our students but rather imposed by outside sources. Our primary purpose in teaching mathematics was
to prepare our students to enter the workforce or to pursue higher education. Often, when we hear the word mathematics, we interpret it as meaning arithmetic.

We are mathematics teachers born with a passion for teaching. In our county in the past, we have always had mathematics teachers that instilled this passion in us. We revived that passion in our students by using the examples of our past teachers and our own experiences to improve our teaching whenever we had an opportunity. We believe all students can learn to love mathematics if we can make decisions that best preserve our community.

Patterns of Change

For these teachers, the four most significant changes that occurred in their 50-plus years of teaching were Consolidation, Block Schedule, Politics, and Technology. With their beliefs underlying the discussions, I summarize the changes that had the greatest impact on mathematics in the rural Hewlett County school system.

Consolidation. The premise for consolidations in Hewlett County was to provide equal education for all students, particularly at the high school level. However, politicians also used the opportunity to voice support for a sports powerhouse, which did not materialize. Even though most of the teachers had multiple experiences with consolidations and their aftershocks, as teachers, they realized consolidations were "inevitable." The state accelerated consolidations further by providing money for new buildings. Seldom was money available for renovations of existing buildings. Most of these teachers in this place did not leave their community when consolidations occurred. There may have been different feelings in the communities forced to give up their high schools. As teachers trying to follow the rules, they did not protest the consolidations.
Some of the reason for this may have been self-interest since they voiced satisfaction that they would no longer have to teach multiple subjects. They were pleased to be able to teach only mathematics once consolidation produced a single high school. It also allowed their students to take varied mathematics classes.

On the other hand, they agreed with the research stating that, in losing a school, communities lose an avenue for training its citizenry (Orr, 1995; Theobald, 1997). The social context changed with consolidation and resistance in the community was always an issue (DeYoung & Howley, 1992). In their county, known for its huge distances, consolidations were especially troubling. Students and parents who might have participated were often unable to attend school events. Transportation was expensive and the mountainous roads forced some students to endure three or four hours on a school bus every day. Since they believed that one-on-one tutoring resulted in improved learning and higher test scores (A. Howley, 2002), the Hewlett teachers developed an after school program at the high school. The fact that the teachers willingly donated time for tutoring signifies a commitment to students that may not be as noticeable in teachers represented by unions and teacher organizations. It was necessary to provide transportation for the after school program to enable students to attend. After school buses added additional expenses to their already financially strapped district. Students were required to find transportation home from the drop-off points. Prior community high schools and urban/suburban schools do not have these added expenses or programs.

Consolidation affected communities and education for a very long time. "Here it is 2007 and we are still talking about the 1974 high school consolidation." It took over six years for the students to mix well when the high schools merged. Students felt removed
from "their schools." The administration favored consolidation more than the teachers did. It was probably "one of the worst things we ever did in education." No two students ever receive the same education or learn things in the same way; thus, these teachers were unsure whether consolidation provided an equal education as was hoped.

*Block Schedule.* The Hewlett County teachers voiced their most significant change as switching to the four-by-four block schedule. Perhaps, they felt this way because they viewed the block schedule in a positive light. They thought the state promoted the schedule and that the research showed it improved testing results. They accepted testing as something they had to do, even though this conflicted with what they believed about community and teaching. In fact, the research proved contradictory on testing results under block scheduling. Scores either remained the same or initially increased with the change in schedules (Pisapia & Westfall, 1997).

Teaching three 90-minute classes each semester on the block schedule was a major change from their prior seven period days that included six 45- to 50- minute classes. As Pisapia and Westfall (1997) reported, the learning during block scheduling was not *watered down*, as some claimed; it was different. They focused more on content and problem solving. There were fewer class changes and they had a "calmer atmosphere." If, as suggested by Gitlin and Margonis (1995), restructuring of teachers’ work and culture is a precondition for reform, then the block schedule certainly restructured their work. Schön (1987) and Lortie (1975) noted the change in the nature of teachers’ work as playing a significant role in teacher change. Perhaps, as several of the teachers agreed, they welcomed the block schedule because of prior negative experiences
with the seven period days. It seemed that teachers were voicing approval for having more planning time in their day.

They did not initiate the scheduling change but made the best of a situation. Later, they considered block scheduling a positive move for teachers and for students. The Hewlett County teachers were no longer citing problems with the organizational structure of their workplace like the teachers in Hjelle’s (2001) work. Although their first reaction was opposition, they overcame through planning and visiting other schools already implementing the program. Once the teachers believed it would work, "every teacher in the mathematics department worked hard to change." Wasley, Donmoyer, and Maxwell (1995) concluded that a specific set of strategies were necessary for reform to occur. By visiting other schools, these teachers were able to acquire these strategies from teachers experienced in the block schedule change.

Some research suggested teachers’ attitudes and commitment decreased as their teaching careers continued (Fraser, Draper, & Taylor, 1998; Huberman, 1993). With the block schedule, the Hewlett County teachers felt invigorated and their commitment increased the longer they taught. These teachers were "long staying rural teachers" (Boylan & McSwan, 1998). For the first time, they had time in their day to plan and to work in-depth with students. With only four periods in a day, there was also more opportunity for teacher collaboration during their planning. The teachers also were pleased their students could take eight subjects a year, which helped with the additional state-mandated requirements for graduation that occurred during their later years of teaching.
Politics and Policy. Schön (1997) claimed, "Predictability and control are key features of the bureaucratic ‘epistemology of schools,’ which results in educational reform failures" (p. 78). Politics in Hewlett County and policies within North Carolina have contributed to this control. Teachers in the Hewlett County school system tried to follow the rules. They tried to remove themselves from politics. Porter (1997) stated, "Patronage, incompetence and politics frequently are responsible for disabling mountain children and their quest for learning" (p. 112). The teachers of Hewlett County would argue that these characteristics existed but they did the best they could and did not feel their children were educationally disabled. It should be noted that having only limited experiences with teaching in other places, the Hewlett teachers had little exposure to multiple teaching approaches within policy implementations. Often mandated, reforms worked in their school if the reforms posed little threat to important political constituencies, one of Tyack and Cuban’s (1995) requirements for successful reform. Outcome Based Education following a superintendent’s request and Effective Teacher Training mandated by the state were viewed by these teachers as unneeded. The teachers tried to implement these policies even though they found them "silly" and "an assault on our intelligence." Seldom were reforms specific to mathematics. As long as the changes did not negatively affect their mathematics students, they tried to follow the plan.

The Hewlett teachers needed what professional development dollars that existed to cover teachers in the entire system. The 2007 NCES report made clear rural districts "pay higher costs per course because funds are determined on a per-student basis" (p. 11). Local taxes are important in educational funding when rural school systems have equalization formulas based on population density. These teachers felt their system had
few local tax dollars to contribute to education. The Hewlett school system seldom acquired special grants, as often the grants were based on free and reduced lunch forms that community pride discouraged. Teachers felt any money spent to affect changes was never specific to mathematics reforms.

According to Joyner and Bright (2001), the standards released by NCTM "had a dramatic influence on how mathematics teacher educators understood the purposes and methods of mathematics instruction" (p. 284) in the state of North Carolina. The Hewlett teachers for the most part agreed that the NCTM standards served as the model of their state’s content standards, but the standards left many teachers in Hewlett County behind in the understanding. Only teachers with opportunities for professional memberships and supervisors knew much about New Math, Back to Basics, and Senate Bill 2. There was often little money for them to attend professional meetings or afford professional development activities. Purchasing supplemental materials seldom occurred. An NCTM (1997) report concluded that, in rural areas, isolated teachers raised issues of access to enhancement and follow-up supports as concerns about reforms. Contrast the Hewlett County position with neighboring counties, such as Greenwood, and it becomes evident that NCTM correctly recognized the issue. However, teachers and students in the Hewlett County system did not receive equitable educational opportunities.

The older they became and the longer they taught, the more the teachers in this investigation disliked mandated testing programs as evidenced by James' comment, "State testing took over and the longer it went on the worse it got." The Hewlett teachers viewed their students as family members needing an education. They were concerned with the direction testing was heading. They believed it became impossible to teach
unless they spent valuable time going over test questions. That is what most of them
indicated they did, as evidenced by Cassie's comment, "I spent way too much time on test
questions." A more recent study by researchers at Rice University and the University of
Texas (McNeil et al., 2008) found that "high-stakes, test-based accountability does not
lead to school improvement or equitable educational possibilities" (p. 14). The Hewlett
teachers tested because it was an expectation of their job, although they did not feel part
of the accountability process. McNeil concluded,

> The higher the stakes and the longer such an accountability system
governs schools, the more the school personnel view students, not as
children to educate, but as potential liabilities or assets for their school’s
performance indicators, their own careers or their school’s funding.
(McNeil et al., 2008)

In the view of the Hewlett teachers, their children were not commodities on an open
market that can be put at risk.

The Hewlett community and the Hewlett High mathematics department desired
more involvement in decisions. According to Darling-Hammond and Sykes (1999),
teachers in North Carolina were rated number one in expressing they had no control over
educational implementation. The Hewlett teachers voiced their lack of control in policy
or standards implementation. Perhaps this would not be different from what urban
teachers might voice. However, the rationale behind the voices in a rural place is quite
different. These teachers considered themselves citizens of their community and did not
want control, rather they asked for input opportunities in order to protect what they
viewed as a "place worth saving." They felt willing to change and were willing to allow
policy makers to do their jobs. They worked hard for what was best for their community.
The idea of community is anathema to urban and suburban sprawl. They volunteered for
numerous extracurricular activities, as well as after-school tutoring programs. They never asked or expected special pay, as was the norm in counties with less rural populations. They had no desire to be better than other teachers, any more than they wanted their students labeled and singled out. The Hewlett teachers believed their guidelines should not come from *up there*. They never had input regarding the hiring of math teachers or the implementation of programs. In the earlier years, they believed they had more academic freedom in their classrooms, and that they were trusted to do what was best for their students.

*Technology.* The males in the Hewlett High School mathematics department seemed more interested in computer technology than were the females. Each of the teachers was interested in placing calculators into students' hands in their classrooms. Perhaps, males were more interested in computers, or that females were only interested when they realized that all students could have access. Few, if any, of the Hewlett students had computers at home and yet, their "state test scores were above the state average."

The teachers of Hewlett County saw the benefits of graphing calculators and immediately tried to access professional development in effective use. They lagged behind most places in the western area of North Carolina in acquiring classroom calculators. The main reason for this was a lack of additional funding attributable to an impoverished rural economic tax base. Seldom did students have their own calculators for home use, which influenced these teachers' decisions on homework assignment choices. The teachers were aware that the high school mathematics department conducted fundraisers for 25 thousand dollars to replace the calculators they used in the early 1990s.
The teachers did everything possible to gain knowledge of the 'best practices' for graphing technology use. However, limited funding was a deterrent to calculator policy implementation and to the teachers' acceptance of change in teaching practices.

As older teachers, who recall slide rules and remember large computers that consumed massive amounts of space, the Hewlett teachers were not the first to jump into technological change in the classroom. They also perceived technology as somewhat of a threat to student's thinking, similar to the perceptions found in the rural Midwest study by Lucas and Fuggitt (2007). The teachers voiced concerned that technology would replace student thinking. However, after training and realizing that students could better explore concepts, the teacher's desire to provide all students with the best education possible grew immensely. They were aware of research that said calculators helped students with concepts and that the state required them on state tests. The state testing policy was the impetus for receiving funds from the local system to purchase calculators. Prior to that, students brought them to class and it was "a nightmare teaching with all the different models, especially when some calculators used Reverse Polish Notation, while others did not."

In the view of the Hewlett teachers, technology provided mathematical access to students who were not as proficient in skill-based learning. For these teachers in this study, their low-level students eventually understand abstract mathematical content by explorations with the graphing calculators. "The parents in the low-level classes sacrificed and spent money to purchase fancy calculator models." The teachers believed that parents were willing to sacrifice for their students as evidenced by Betty's comment, "Even though students did not use half of the calculator features, parents felt their
children could be top-notch math whizzes with access to the newest technology."

Technology made the teachers and students of Hewlett County change. "It wasn’t easy for those of who were older but our kids deserved the best."

*Reform Beliefs*

The Hewlett teachers believed Drake and Sherin (2006) were correct in their assertion that "teachers’ identities and prior experiences as learners and teachers of mathematics are keys to the facilitating and understanding of implementing reform materials" (p. 69). What views of change have their identities and prior experiences created?

The Hewlett County teachers readily admitted that their classrooms were highly teacher-centered. This type of classroom is how they learned and they believed remaining teacher-centered worked for them. Although "high school mathematics teachers can be among the most resistant to change" (Wasley, Donmoyer, & Maxwell, 1995, p. 57), in their experience they believed this was not the case. However, their remaining with teacher-centered classrooms indicates conflicting views between their belief and practice. At times, they considered themselves more willing to change than those in other departments at their school. It is possible they did not change their teaching method because they knew what had worked in the past rather than being unwilling to change. Bill Chambers expressed this view, "If you are grounded in what you believe or you weren’t doing it right to start with, then you need to change." They felt that change over time mirrored societal changes, including the breakdown of the family structure. Because their family structures were still in tact, maybe their changes were slower. This would probably not be a prevalent view in an urban setting.
Because the Hewlett teachers perceived their students as more disciplined and respectful than those in other places, change might have been easier in the rural classrooms of Hewlett County. However, in today’s technological world, everyone has the ability to check research individually. It might make convincing others to change more difficult today. The typical research-development-dissemination model that filtered down from university educators did not include consultations with rural customers. Learning within a rural context did not seem to be part of the equation. The Hewlett teachers felt that students do not learn at the same rate or in the same manner. Neither do teachers learn at the same rate and in the same manner. If rural is changing at a different rate, it may be that slower change is more familiar to teachers in Hewlett County.

The teachers voiced an agreement that "some people thrive on change" but did not unanimously agree on who those people might be. Most of the teachers interviewed thought that highly intelligent people were more likely to thrive. The Hewlett teachers were either impartial or had varying opinions according to their length of teaching service about who benefited from the changes. They agreed that block-scheduling changes benefited everyone. They agreed that change happened even if they are not the ones promoting it. Moreover, they agreed, "Teachers have to believe the change will be best for students" for implementation to succeed.

Change in Hewlett County occurred due to state mandates. The high school, according to Haselkorn (1982), is "relatively impervious to change and responds most to local demands" (p. 52). The changes involving consolidation, technology, and the block schedule appeared to the Hewlett County teachers as state changes even though local
demands ultimately made the decisions. They viewed change, much as they viewed consolidation, as 'inevitable.'

My Interpretation of the Findings

Consolidations created change. The teachers, as good citizens, accepted and, in some cases, agreed that newer and larger schools were the best way to provide equitable access to mathematics education. As they lost their community schools, they appeared to transfer their defense of place from their community to the entire school system. The lack of funding for small class sizes, extra teachers, and resources in the smaller schools made their acceptance of larger consolidated schools more palatable. The Hewlett teachers accepted consolidations because there seemed no other way to provide educational equity. In their minds, other options involved finances they felt were unavailable from the community. State financing was for new construction, not to maintain current buildings. However, the consolidations contributed to feelings of loss of community and loss of control by local administration. It is possible there was a desire to provide facilities comparable to other counties. Competition is not usually a quality compatible with the common good. It appeared the desire of Hewlett County teachers was more in line with following trends from other nonrural places, which they perceived as being an 'inevitable' event.

The secondary mathematics teachers of Hewlett County seemed willing to change but were never leaders in promoting it. Schedule changes over the years came from outside sources. These rural teachers might have had little time to plan for and think of new ideas. This is typical in most schools and not unique to rural settings. It seemed probable they were happy to leave things as they were and resistant to changes.
mathematics department voiced satisfaction that they did the best possible job implementing changes. It is of note that particular state or national reforms in mathematics over the years did not result in successful or long-term implementation. The changes were slow in reaching Hewlett County; there were few professional opportunities to develop understanding of mathematical reforms; and there were few resources available to help teachers implement change. Years of experience in what they perceived as successful teaching served as a backdrop to decisions regarding reform efforts.

Feeling they had no voice, the retired teachers felt they were not empowered in policy decisions. The Hewlett teachers often regarded reformers as treating them as 'others.' When Cassie relates how the "people from Raleigh came down and tried to tell us what was best for our kids," she resented the intrusion of the top-down approach and that the prevailing view was someone needed to 'fix' the community she valued. It was not clear that the teachers perceived the standards reforms as intended only for more advantaged schools. With few administrators knowledgeable about mathematics education, and generic professional development offering little benefit to mathematics teachers, reforms seldom happened. Isolation, which resulted from limited exposure to outside educational settings, and indirectly promoted by local professional development policies, contributed to the lack of significant change in the secondary mathematics classrooms of the county. Isolation is unique to rural areas so urban and suburban teachers would not share this trait. Some teachers chose not to participate in state meetings, which seemed to contradict their statements that they were willing to change. However, without a culture of prolonged support for professional growth, teachers do not
develop the habit of lifelong learning. Teachers tied to family and community find it is difficult to leave home for several days.

Teachers appreciated policies that brought 'experts' to the schools and allowed the teachers to remain in the community. Someone willing to take the time to respect the teacher's place and culture had more impact. The Hewlett teachers resented policies, which were not theirs, coming from up there. Some might easily interpret their responses as resistance. With a local teacher in a neighboring county as a state officer and the sister of one of the teachers as a national leader in mathematics education, it was clear that the Hewlett County teachers were familiar with reform efforts. It is not clear whether those efforts manifested in the same way as they did at state and national levels. Policies that required more work of the already overburdened teachers or that took away from time for their students had little chance of success. In their eyes, the students in the classrooms were part of the homeland in need of defense.

With few resources, teachers tried to keep up with technology. If needed, they undertook fundraising that took more of teachers’ time, demonstrating the willingness teachers mentioned. Their willingness to change contradicts the idea of teacher resistance often cited in reform research. Without professional training, teachers were reacting to, rather than being pro-active to technological changes. Initially, they considered computers a limited access item and teachers, especially female teachers, did not embrace their use. However, as graphing calculators made access possible for every student, teachers requested and received professional development. Giving up their own time seemed a small price to pay to do what was best for all students. From the interviews, it did not appear they used technology to enhance mathematics learning. Rather, it seemed
the technology was more demonstrative in nature. Teachers expressed concern that students were not using their 'thinking' as much with technology use. This implied that teachers were not convinced that technology was anything more than a tool to save time. Teacher belief in what is mathematics and how to teach mathematics played a significant role in technology decisions.

Even in times of "B" certifications and alternative certifications, fully certified mathematics teachers usually taught the mathematics classes in Hewlett County. They had the "background, confidence and experience to challenge what was presented." The older and more experienced teachers seemed more grounded and saw less need to change. With a majority of the high school state testing evaluations resting on the shoulders of the mathematics teachers, it should come as no surprise that they questioned change prior to accepting it. Nevertheless, once they recognized change as beneficial to all students, the mathematics department was willing to do whatever was needed to implement reforms.

As an experienced secondary mathematics teacher, I tried not to make assumptions about their perspectives. It may not have been entirely possible to avoid these assumptions, but I made every effort to use the data to understand their views. Much as they "let those outsiders do their thing as long as they aren’t doing anything to hurt our kids," I tried to let them speak and interpret their own life stories.

**Limitations of the Study**

Qualitative research has limitations that one must consider when drawing conclusions. This study depended on participants being open and honest. It also relied on recollections of an elderly population. However, the three primary themes of change stood out in the participants’ minds and their recall, after a substantial time lapse, made
them more and not less significant. However, they may have forgotten other changes and their details, and that might contribute to accurate data analysis.

The interviews revealed the Hewlett teachers defending of their homeland, which begged consideration of a question that qualitative work should address (Strauss & Corbin, 1998). Did participants tell me what they thought I wanted to hear? The rich data and their trust in allowing me to enter their homes indicate they openly told their stories but one can never be sure. There is a "tendency for researchers, especially in semi-structured interviews, to obtain the results they expect" (Seidman, 2006, p. 25). There is the possibility that I probed more deeply into more fascinating comments or into issues that were more controversial. I tried not to have pre-conceived results but personal interest cannot be overlooked.

The cultural perspective of those interviewed may be in contrast to other studies, which may mean that comparisons between previous findings and this work are not valid. No two cultural perspectives are the same. With the exception of one participant, the participants in this study lived in Hewlett County, taught there, obtained their education nearby, and elected to remain in Hewlett County. Other rural populations of retired secondary mathematics teachers may not have these characteristics. The data are representative of only the population studied. The results may not be transferable to other rural places. Rural Appalachia in North Carolina may not be the same as other rural places. Even persons and school systems within rural western North Carolina differ in their characteristics.

I selected the place because of its distinct qualities and for convenience and access. Some may question this methodology for selection of place. Some may consider
the sample size small. However, the small sample size of eight, with only seven
having taught in the county, provided large quantities of rich data. Two other participants
meeting the selection criteria did not participate, one with dementia and the other
unwilling. Had they been available, they might have provided different interpretations for
the data. It could also be that the decision not to participate was a result of their nature to
defend their homeland, which supports the conclusions presented.

My Implications of the Findings

The results of this study contribute to an extremely limited literature base that
examines the perspectives of teachers in a rural setting. This investigation also provides a
contribution to the literature base investigating teacher voice, especially the voices of
rural teachers. The data support the body of literature that describes rural education. The
NCTM Research Committee Report (Confrey et al., 2008) stated, "In the current policy
environment, 'what works' has been operationalized as what increases students scores on
state-administered achievement tests" (p. 10). In rural Hewlett County, they may have
found what works. The difficulty is that the teachers in this study and those in the NCTM
report acknowledge arguments about whether standardized test scores should be the
definition of success within mathematics education. The teachers seemed willing to go to
great lengths to change to fit any definition used for success. When it conflicted with
their values, they questioned and measured change against past teaching experience.
Their desire to portray their students and their place in a positive light created a necessity
for a homeland defense. According to Hass and Nachtigal (1988), schools should serve
the community. Rural communities do not determine success or happiness by economic
accomplishments. Thus, schoolteachers should not have to focus on preparing rural students for lives involving material acquisition and personal recognition awards.

Listen to teachers; allow them to be involved with policies; maintain respect for their community and culture; and give them time and respect to do their jobs—these were the messages I heard in the participant stories. As early as the New Math era, recommendations included allowing teachers to be on a professional level with researchers and mathematics educators in reform efforts. Teacher voices need to be heard, offering more than a confirmation of policies written without teacher's practical advice. Over 50 years from the mathematics reforms emanating from the New Math era, the teachers in this study noted this recommendation as still unheeded. Their stories provided evidence that reform from the top-down does not reach students in the manner intended; thus, they would continue to create hybrid forms or ignore reform as long as teacher voice and attitude were not part of the implementation. Teachers should have the autonomy to interpret educational aims in terms of local conditions and cultural norms. One size fits all reform efforts has a history of failure. The history is the same in this specific place in rural western North Carolina.

Recommendations based on the research include the following: (1) Do not evaluate successes, especially in rural places, by strictly quantitative means; (2) Provide resources that allow time for teachers’ voice and reflection when implementing change; (3) Establish a culture of professional growth by encouraging and supporting professional development opportunities, keeping in mind rural teachers’ defense of place and attachment to family; (4) Conduct studies tying student achievement to teacher perspectives.
DeYoung’s (1994) work provided evidence that rural places honor tradition more than other places do. This study confirms that rural teachers changed very little when they had evidence that traditional methods worked. Logically, reform efforts should substantiate the need for changes that are better than what teachers believe works.

According to Darling-Hammond (1997), professional development for teachers must "create a sufficiently high level of cognitive dissonance to disturb in some fundamental way the equilibrium between teachers’ existing beliefs and practices on the one hand and their experience with subject matter, students’ learning, and teaching on the other" (p. 121). Further, it must "insure that the dissonance-creating and dissonance-resolving are connected to the teachers’ own students and context or something like them" (Darling-Hammond & Sykes, 1999, p. 23). In the experience of the rural teachers interviewed in this study, neither dissonance nor connections to student and context occurred. According to Ball (1988), professional development "must be oriented toward a view of teachers as learners" (p. 18). Teacher educators need to provide teachers with experiences where they "engage in mathematical activity; come up with their own ideas, formulas, solutions and rules" (Taylor, 2002, p. 14) in order for them to see reform as meaningful. "It is not enough for teachers to seek new activities. For significant change to occur, teachers need to continually reflect on how teaching affects students’ learning" (Taylor, 2002, p. 15). Teacher educators need to encourage and guide this reflection. In this work, the rural secondary mathematics teachers of Hewlett County provided evidence that change did not occur when teachers’ advice and voice is not considered.

This research highlights the significance of textbooks and resource materials in isolated areas with limited resources. The rural teachers of Hewlett County ignored or
supplemented materials without applications to their culture. Teachers with limited time depend on texts for their lesson plans and guides to the curriculum. Teachers with limited time and no opportunities for training are not able to use technology to enhance the learning of mathematics as reformers intend. This may be different in less isolated areas. Placing resources in the hands of teachers without establishing learning communities contributes to the failure of intended reforms. The teachers in this study requested materials involving consumer skills and three-dimensional Solid Geometry. They noted a lack of practical applications to life in their rural community.

Teachers new to rural places need to be aware of rural issues, such as community and consolidation. As suggested by Theobald and Nachtigal (1995), educational history should be a more important part of teacher preparation. Teachers within a place need educational opportunities convenient to their lives and families. A lack of resources, including professional development opportunities, creates barriers to change in rural places. Superintendents and supervisors attending professional meetings along with teachers promote dialogue and a culture of professional growth, which leads to improvements. There needs to be an evaluation of state and federal policies that provide funding to rural places. Policies that ignore cultural context should be discouraged. We cannot continue to determine policy for rural places based on research in nonrural places. We cannot continue to implement policies that ignore teacher perspectives and voice.

Suggestions for Further Research

We need to learn about communities and families in rural places. The teachers’ voice needs to be present in the research if we expect reforms to occur. We should not publish work dealing with teacher perspective without a single teacher included. It is
arrogant to assume we know how teachers think and why they do what they do without including their stories. By not including some of the thousands of teachers who have served in secondary mathematics classrooms for long periods of our history, we are ignoring many of the lessons already learned. An attempt to replicate this study with numerous teachers in varied locations seems an obvious first step.

A particular need in future research is the teasing out of what teachers really mean when they are expressing their ideas regarding the teaching and learning of mathematics. Several of the Hewlett teachers referred to mathematics when further analysis revealed that the teachers perceived mathematics as arithmetic. In discussing how students learn mathematics the teachers expressed the idea of learning by repetition such is in how one learns how to make biscuits. If teachers, in fact, view the learning and consequently adjust their teaching accordingly, as learning by repetitive actions, then researchers need to evaluate past and future studies with this notion in the forefront. Continuing with studies involving teacher voice seems an obvious implication.

National mathematics education literature mentions rural education often as an afterthought rather than incorporating rural characteristics into the research designs. NCTM repeatedly calls for equitable access and programs for all. Yet, few appear to understand the diversity of rural places. The results of this study in this particular rural place do incorporate rural characteristics of Hewlett County. Too often, rural is associated with poverty in research studies. In the research, rural continues as a deficit model needing fixing rather than as a model for successful learning. We need to examine other rural and nonrural settings and contexts to determine teacher perspective and
viewing rural as an asset might significantly contribute to "what works" when we are measuring student success.

There is a need for further research that compares and contrasts teacher perspectives in other rural cultures. Since research implies that African-Americans in rural poverty are in worse conditions than those in urban poverty (Kozol, 2005), a study of the perspectives of the secondary mathematics teachers in those settings would be worthwhile. Interviewing teachers currently nearing retirement might provide details that are more specific regarding change and reform efforts. The intent of this study was to have teachers discuss their perspective regarding various reform efforts specific to mathematics (New Math, Back to Basics, Constructivist Approach, and various NCTM Standards Implementations). It is possible another study with a different design, rather than the semi-structured approach advocated by Seidman (2006), or with teachers nearing retirement would elicit direct focus on specific math reform eras.

Since the teachers in this rural place perceived the effects of block scheduling as beneficial to students, more research in rural places seems warranted, especially since the present research studies on block scheduling neglect school size and location considerations. Comparing the views of teachers in rural places with more access to technological advantages could result in a different teacher perspective. Exploring gender differences in teaching with technology in rural places would also be of value. It seems that the technology discussed by teachers in this study was to supplement and not enhance the teaching of mathematics. We need research to determine successful characteristics of reform efforts designed to enhance student learning. More research on
the long-term effects of consolidation along with the impact of school size seems warranted.

This study of rural Hewlett County suggests that when conducting rural research, it is important to understand teacher resistance to reform in the context of their defense of their homeland and the value the teachers place on the common good of the community. Labeling rural as deficit, in need of fixing and resistant to change, rather than acknowledging rural qualities as a possible asset has hindered research efforts to utilize what works in rural places for solutions to more urban ones. Research in mathematics education must continue to include teacher belief and voice regarding the nature of mathematics. If research is to be meaningful, researchers need to have a clear understanding of when teachers are thinking of mathematics as merely arithmetic. How can we 'grow our own' teachers within their culture so that rural community can be preserved? This question begs an answer if we are to defend our educational homeland.
REFERENCES


Executive Order No. 71(77) 20510 (2006).


APPENDIX A: REFORM ERAS

Table 1: Reform Eras (1830 - 2000)

<table>
<thead>
<tr>
<th>Era</th>
<th>Reform Movement</th>
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<tbody>
<tr>
<td>1830 - 1840</td>
<td>Common School Movement</td>
</tr>
<tr>
<td>1890s</td>
<td>Administrative Reform and &quot;One Best System&quot;</td>
</tr>
<tr>
<td>1950s - 1960s</td>
<td>Sputnik Scare and Meritocracy</td>
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<tr>
<td>1960 - 1970</td>
<td>Great Society and War on Poverty</td>
</tr>
<tr>
<td>1980s</td>
<td>Era of Public Alarm About Economic Competitiveness</td>
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<tr>
<td>1990s</td>
<td>Equity in Education</td>
</tr>
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</table>

Table 2: Research Study Matrix—New Math Era

<table>
<thead>
<tr>
<th>Author</th>
<th>Type</th>
<th>Method</th>
<th>N</th>
<th>Topic</th>
<th>Results</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moon (Moon, 1986)</td>
<td>Qual</td>
<td>20-year study (1960-80) Case studies (Interviews, reports, Media, govt. process, Prof org activity) Europe countries.</td>
<td>6</td>
<td>How do Educational Systems respond to Curriculum reforms?</td>
<td>All university top-down programs. Official programs ignored at local level. In all countries, administrators were limited in effects by teachers. Interaction between groups is vital for reform.</td>
<td>1986</td>
</tr>
<tr>
<td>Bossé (Bossé, 1995)</td>
<td>Qual</td>
<td>Phone interviews 1 year Seminal New Math &amp; NCTM Standards people</td>
<td>7</td>
<td>What are beliefs about success of reform? Comparison of curriculum outcomes</td>
<td>Clear demarcation lines between curriculum writers and practitioners It’s all about the teacher</td>
<td>Oct 1993 to Mar 1994</td>
</tr>
<tr>
<td>Price (Price, Kelley, &amp; Jonathan 1977)</td>
<td>Quant</td>
<td>Anonymous questionnaire to teachers Reviewed by professionals</td>
<td>122</td>
<td>What was happening in the math classrooms?</td>
<td>Teachers did not belong to professional organizations as much as supervisors did. New Math topics and methods were not being used.</td>
<td>1975</td>
</tr>
<tr>
<td>Stake &amp; Easley (Stake &amp; Easley, 1978)</td>
<td>Qual</td>
<td>Case Study School districts Visits and surveys</td>
<td>11</td>
<td>What materials and methods were being used in secondary math classrooms?</td>
<td>Nothing much new happening from 15 years ago</td>
<td>1978</td>
</tr>
<tr>
<td>Weiss* (Weiss, 1978)</td>
<td>Quant</td>
<td>Surveys to math and science teachers Nationwide</td>
<td>?</td>
<td>What materials are being used that deal with new math? Counted %</td>
<td>Teachers are not using much different materials than in the past</td>
<td>1978</td>
</tr>
</tbody>
</table>

Note: *Entire study not found
Literature Review Outline—Chapter 2

Introduction

1. Reform
   1a. Educational Reform
   1b. Mathematics Reform
   1c. Secondary Mathematics Reform
2. Rural Education
   2a. Community
   2b. Appalachia
   2c. Consolidation
   2d. Resistance to Reform
3. Mathematics Reform in Rural Education
4. Teacher Belief
5. Rural Teacher Belief
6. Teacher Belief/Change and Mathematics Reform
7. Rural, Reform and Teacher Change—where my question fits

Conclusion
APPENDIX B: SEMI-STRUCTURED INTERVIEW PROTOCOLS

Interview 1 Protocol

The purpose of Interview 1 was to gain demographic data on each participant as well as to establish rapport between the participant and the researcher. This was also preparatory for Interview 2 questions to allow participants time to reflect. Introduction of researcher – who I am, why I am doing the study, teaching history IRB issues, confidentiality, data checks
Explanation of multiple interviews – scheduling concerns
Find out
- name
- where raised
- where attended school(s)
- teaching experience (years and places)
- secondary experience (years and places)
- mathematics course taught (years and places)
- school responsibilities (dept chair, etc) – extra duties
- community issues
- rural education
- personal: children and their educational background
- philosophy of teaching mathematics – views of why we teach math
- Teacher belief
- Suggestions for school board/community issues to review
Concerns and questions of the participants
Reminder of Topic for second Interview – keeping journal – paraphrased research question
Contact information - both parties
Provide journals for participants – highlight rural, mathematics education, reform.
Include the research question on introductory page as well as contact information for researcher. Keep small to avoid appearance of major writing expectations.

Interview 2 Protocol

Greetings
How many years did you teach?
Follow-up questions on demographics in Interview 1 if needed
"I would like to hear your response to these questions:"

Tell me about changes in mathematics curriculum and instruction during your career.

What topics (courses) are no longer taught that you liked and why?

Were there changes in hiring practices?
Tell me about changes that you personally made during your career and why you made those changes? (Probe if needed - Were they good changes for students?)

Probe responses so they interpret the changes and give reasons why they think it occurred. Try to get a feel for whether it was a positive change, negative change, or neutral change, and for whom?

Can you tell me about local decisions that affected change in secondary mathematics education – who made the decision and why? Reactions to it?

What about State changes? Senate Bill 2, Career Ladder, Outcome Based Education, Effective Teacher Training

Discuss textbook changes, homework changes, schedule changes, grouping of students.

What about national changes?
Mention New Math, Back to Basics, NCTM Standards, and NCLB.

Do any of these topics mean anything to you when secondary mathematics changes are mentioned?
Consolidation, Rural Education, Small Schools, Appalachia, Technology, slide rule
Can there be a high school too small or too large?

Out of all the changes you mentioned, are there any that stand out as the most significant? Why?

Why did you decide to retire when you did?

Did you ever think about doing anything else besides teaching high school math?

What were changes in males and females in mathematics?

Last Questions:  What would be different in your teaching career if you had it to do over again? What changes would you make and why? What are your suggestions on how best to implement change in mathematics education at the secondary level?

Keep focus on changes in secondary mathematics education.

**Interview 3 Protocol**

Seek clarification on any responses in Interview 2
Have participants read my commentary on Interview 2 and the secondary mathematics changes. Reflections on that?
Question them about topics other participants mentioned that they omitted – see why
Collect journal
Ask for new thoughts since Interview 2.

Respond to "High school mathematics teachers are more resistant to change" research.
Respond to "rural areas are more resistant to change'
Did socioeconomic level of parents/students change?

What would be your ideal location for a school?

If all the resources possible, what would you do in your high school?

How would it be for you to teach high school in Maine, NYC, California, Nebraska, over seas?

Where/When did you use calculators and why?

What does it mean for you to be a mathematician?

Did you change more when you were younger? Does age matter?

Which students have benefited and which have not from changes and why?

How do kids who struggle in mathematics react to change?

How would you improve testing?

Tell me about fundraising efforts and how they have changed? Did it affect mathematics teaching?

Describe a parent situation that was pleasant or not pleasant

What are positive and negative things you would say – or someone might say about your math teaching career?

Did local committees or state regulations work best and why?

Are there some people who thrive on change? Who and why?
# APPENDIX C: SAMPLE CHANGE MATRIX

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<td>changed 8 years – changed with them. used HM books … I was prejudiced in favor of the way they presented the material – chose it every time. The general way they presented the material was consistent. I had a teacher’s edition and could order pre-published tests. Over the years they started including solutions and they would put a solution to every problem in there. It was not at all like that when I started teaching.</td>
<td>We chose mostly by the series. …someone wanted a different series and then you got that textbook picked was erasable one year, you could erase entire paragraphs. Over time the books more reading material were supposed to get them to read instead of tellin’ em. But we begin to wonder if contrary to what we learned at home, the social commentary added. I think two plus two is four and making up a rubric as to whether it is three or five is a little silly. They could have left social commentary out and included more applications.</td>
<td>A big change in geom. Books The first ones had lots more proofs. But then they switch to applic more. …they want to know why they needed to know. The word problems seem to be more relevant towards the end of my teaching. We did have little mini meetings to look at books. What I teach rural kids may not be same applications as for others I created some tobacco allotment problems and like that for kids.</td>
<td>No concern that textbooks changed. Taught what I thought was best for all the kids.</td>
<td>By five years, we were ready to change. I liked getting new textbooks but you better be sure and pick out books you were comfortable with. Textbooks got better – you had more materials to work with. In other subjects texts were more of a problem. Math doesn’t change much A lot of technology driven testing came in later books.</td>
<td>We had a choice – whatever we though went with curriculum. The biggest thing I noticed was calculator use encouraged in the textbook. The text book was our lesson plan towards the end because you had to teach that test.</td>
<td>Everybody in the school system teaching a course had the same textbook. Maybe there were things you didn’t like or areas you didn’t feel good about …so you could decide what are we going to do about that?</td>
<td>When I started we only had text. They offered workbooks but I didn’t dare ask the kids to buy em! But it was much easier to do your own worksheets. When I first started we didn’t even have solutions… the companies produced them but we never got them. I do remember a plane geometry book that I used one time had full explanations with it. I would have been totally disgraced if I had had to ask someone how to do a problem. Secondary teachers lectured too much Books eliminated in old court house. I made up problems.</td>
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APPENDIX D: TIMELINE FOR MATHEMATICS EDUCATION

Timeline for Mathematics Education in HC, NC, and US

1868 – State Constitution adopted contained relatively strong article on public education – unpopular and viewed as "carpetbag government" – progressive – provided taxation for free to all 6-21
Supt of Education elected to 4-year terms – with school terms at least 4 month each and for State
Board of Ed – also provided for education of blacks
However, funding was slow and finances fell on local government. In cities and towns, local taxes levied for education "but education in rural area did not recover from setbacks during the war years until end of century.
Normal school established for teacher training – 8 for whites and 5 for blacks – the white ones had a term of 1 month in summer – black ones were 8-9 months. Money for black normals was double that of white

1901 – General Assembly for first time made direct appropriation of funds to public education

1907 – high schools only existed in special tax districts – this year money went to establish rural high schools

1913 – first compulsory attendance act – all between ages of 8-12 had to attend school at least 4 months a year

1914 – Smith-Lever Act and 1917 Smith-Hughes Act – provided federal funds for vocational and agricultural – and home economics entered NC curriculum

1917 – Bond funds for school construction allowed in counties
Rosenwald Funds used for rural black school construction
RS’s father brings family from TN to Jaspar

1919 – Constitution amended to increase mandated school year from 4 to 6 months
State Board of Examiners established to certify teachers

1920 – Census of HC shows 20,083 and 100% rural – 2% NW (nonwhite)

1929 – Stock Market Crash and Great Depression halted school progress in NC
Because funds were local in nature for most places, education varied from county to county
No counties were able to operate the same as pre-depression

1931 – NC General Assembly took action – School Machinery Act – included state funding for all places
Counties would maintain buildings – but no required matching funds for state money
Act established county as basic government for schools – all special charter districts abolished

1933 – School term expanded to 8 months – and money from state for books and supplies

1935 – textbook rental plan for 20% costs provided by state

1937 – Textbooks free for all students by state

1939 – RS graduates Jaspar High School (age 15 after 11 years)) with 100 students in class
RS remembers private school in HS called DB

1940 – Joint commission of MAA and NCTM – report from 1935 – proposed college track and vocational
HC has 22,522 according to census with 100% rural and 1% NW (nonwhite)
1941 – Teacher Retirement plan implemented

1942 – Constitutional amendment strengthened State Board of Education fiscal responsibilities
   US Commissioner of Education Studebaker wants curriculum for war effort WW 2
   Compulsory attendance age increased to 16 and 12th grade added
   School year increased to 9 months and school lunch program created
   Special Education programs providing for "the promotion, operation and supervision of special
   courses of instruction for handicapped, crippled, and other classes of individuals requiring special
   type instruction."
   RS starts at Maryville College

1945 – SM at Center School – grade 1 – no library books

1946 – or 47   Oakton Student walk out – BB at high school – students mad at Principal – parents bring
   kids back – kids thought rules too hard
   No graduating class since 12th grade added
   RS to Western Carolina

1947 – RS thinks grade 12 added at Jaspar – about 600 total students there
   BB graduates high school – a year early in the summer at OAKTON HIGH SCHOOL

1948 – RS graduates Western – begins teaching at Jaspar – taught math, science and history – RS thinks
   students had to have 2 maths at Jaspar to graduate
   University math and math ed complaining about precollege math readiness

1949- First State Bond Program for building construction – 50 million
   Lower Valley and Poplar consolidates to Oakton – BB meets husband
   BB graduates MHC

1950 – BB graduates UNC-G and starts at Weaverville HS

1951 – Principal teaching SM at Oakton algebra 1 – gone farming a lot
   RS leaves Jaspar for Principal job at Crest Branch
   BC graduates from Oakton High School

1952 – RS leaves teaching to take another job
   UICSM – Precision of language emphasized
   BC at ETSU

1953 – Bond Issue for construction passed

1954 – US Supreme Court in Brown vs. the Board of Education of Topeka ruled against separating the
   races
   EB graduates HS at Oakton
   Consolidation in adjacent county Greenwood creates NGHS – BB teaching then at W
   Greenwood County required more math than other places to graduate
   RS returns to teach at Dawson Springs

1955 – NC Pearsall Plan transferred control of enrollment and student assignment to county and city boards
   Ratified by popular vote in 1956 – declared unconstitutional in 1966
   BR graduates HS from Oakton – M S her math teacher with Principal teaching her algebra I (and
   farming) – she took 4 maths solid, plane, alg 1 and 2 – trig in solid
   E returns to take math this year
   RS completes masters
1957 – NC Community College System building construction authorized
SM graduates Oakton College (2-year school)
BC teaching and coaching at Ashton High School – geography, typing, math, science – says most
teachers had B certificates
One math course at Ashton High School to graduate
Sputnik launched - New Math Era surfaces

1958 – SM graduates ASTC
SMSG (AMS and NCTM) – funding by NSF

1959 – SM at Cedarville – 7th grade
Lower Valley and Poplar to Oakton – consolidation
CEEB report on college entrance – calls for concept focus

1960 – SM at Dawson Springs and student teaching at NGHS
Objecting to consolidation between Dawson Springs and Cedarville in community
Jerome Bruner book The process of Education (1960) – concepts in math emphasized
US Census reports HC pop of 17,217 with .7% NW and 100% rural

1961 – Consolidation of Cedarville and Dawson Springs
RS leaves Dawson Springs (Principal) and goes to Enka to teach
SM to Cedarville to high school – algebra I, II, physics and English
1 math required – college kids took more
Solid and plane geometry there at Cedarville – EB taught science and geometry
Walkout at Oakton over Principal firing – DT at school them
BC is in military
RS graduates Oakton High School
MS and others leave Oakton High School

1963 – NC Governor’s School established – summer Program for gifted
BC leaves Ashton High School and goes to Oakton High School
– no minorities there until a few years later
CR graduates MHS

1964 – National Civil Rights Act Prohibited discrimination
Desegregation of NC public schools begins
SM at NGHS and gets Masters
DT graduates HS at Oakton
CR graduates HS at Cedarville
JH thinks minority kids merged in with whites and some to Asheville on bus

1965 – JH graduates from MHC
JH teaching in Yancey County @ East Yancey HS
JA graduates from Oakton High School (JH and Bill Chambers were his math teachers)
Federal Elementary and Secondary Education Act (ESEA) provided money for schools with
regulations

1966 – JH to Jaspar to teach - JH thinks federal money started arriving in county then

1967 – SM leaves NGHS and goes to Oakton College – runs for HC Board of education
DT graduates Oakton College – does student teaching at NGHS under SM
CR graduates Oakton College
JH to Dawson Springs in middle school – high school had already gone to Cedarville
RS to Jaspar HS – returned from another type job
1968-69 – Governor Dan Moore’s "blueprint for education" Provided comprehensive report of NC schools recommendations for improvement
   Lower Valley consolidates with Poplar
   SM completing doctorate (1st woman at ETSU)
   CR teaching at Crest Branch

1969-70 CR to Cedarville teaching – math and English
   Article in Asheville paper about HC spending much more per student than others
   JA graduates ASU and starts teaching LCounty middle – no HC jobs

1970s – Back to Basics Movement
   US Census shows 16,003 MC pop with 100% rural and 2% NW

1971 – JH to run vocational career exploration Program
   JA to Dawson Springs
   First NCCTM meeting

1972 – Eight Regional Centers established to aid local systems from State Department of Public Instruction
   JA to Oakton HS
   Small calculators – four function for $100+

1973 – State bond for school construction for improving buildings along with 10-month teacher salary for teachers with 12.5 leave days and 12-month salary for administrators. First State funded pilot kindergartens with phase in until 1979 (actually completed in 1977-78 year)
   Hewlett High started construction
   BC hired as coach – teams but no school

1974 – 1st students graduate Hewlett High – but no building yet
   SM resigns from Board of Education to go to HC Central Office – worked with Title 1
   RS to HHS from Jaspar
   CR to HHS from Cedarville
   JH to HHS from Career Exploration
   Janet H to HHS from Oakton
   JA to HHS from Oakton

1975 – Primary Reading Program established with teacher assistants added in grades 1-3
   Statewide testing for Accountability enacted – 1st high school graduation test of basic competency
   Grades 1,2,3,6, 9 testing required

1976 – public Law-142 federal funding for special education Programs
   NC Creech Bill required all students regardless of handicap ages 5-18 be served free in public schools. prior to 1974, schools could refuse to admit students
   Full day kindergarten made available statewide
   BC to teach at NGHS – b/c of politics in HC
   NCTM recommends computers be available in schools

1979 – NC General Assembly ruled home schooling did not meet compulsory attendance law
   Computers coming in

1980 – NC School of Science and Mathematics funded by state admitted its first students – school for exceptionally gifted and became the first of its kind in the nation.
   BC quits teaching after 22 years to farm
   An Agenda for Action – NCTM – reform needed
1981 – NC graduation units increased from 18 to 20 units for class of 1987

1983 – A Nation at Risk released by President Ronald Reagan urging school improvement for national security
Scientific calculators allowed on AP Calculus exam

1983 – NC Governor James Hunt authorized NC Commission and high school graduation requirements increased beginning with class of 1987 and NC Scholars Program rewarding students taking more challenging curriculum was started.
NC required Writing Tests for grades 6 and 9
DT went to HHS

1985 – Courts ruled that home instruction could occur
NC Basic Education Plan (BEP) required arts, communication, P.E., health, mathematics, media, science, second language, social studies and vocational for all – funding Provided
Effective Teacher Training

1986 – End of Course tests for some high school courses – Algebra and Geometry included

1989 – Recession and NC Dept of PI restructured with cutbacks in personnel
Uses of federal chapter 1 monies to lower drop out rate, increase SAT scores and improve early childhood education
School Improvement and Accountability Act – offered local flexibility – school improvement plans
Senate Bill 2 for waivers if they were meeting goals
NCTM Standards – curriculum
RS retires from MHS with 38 years

1990s – HHS switches to block schedule – honors classes during this time
WCU graphing calculator classes offered BC

1991 – NCTM Standards for Teaching Mathematics
College Board announces that graphing calculators will be required on 1995 exam

1992 – State Report Cards for school systems

1993 – Drop out rate of 3% a year
Teacher pay scales improved
End of Grade Testing
Consolidation to one Middle school in county
Scientific Calculators required on AP Calculus Exam
BB retires from NGHS
JA remembers getting sets of calculators – not graphing

1995 – Writing tests shifted to grades 4 and 7
NC General Assembly wants faster improvements – more local flexibility enacted
ABCs of Public Education – NC Accountability, Basics, Control (local) started
Graphing Calculators required on AP Calculus Exam
Proofs lose their importance
HC has OBE (Outcome Based Education) plans in place

1996 – Implementation of ABCs piloted in 10 systems – local set goals with rewards for meeting and state intervention for failures
State vote approved bonds for school construction
New superintendent of PI - implements ABCs Plus Program recognizing schools of excellence
Charter schools legislation approved
SM retires from MC schools Central Office and serves as director of AB Tech campus in MC
Block Scheduling at MHS
JA - his sister who had been with NCTM president to ASU

1997 – ABCs statewide - bonus money for teachers if goals met by school
   Excellence Schools Act – raised teacher salaries and paid National Board Certification fees for
   teachers with 12% pay increase for attainment
   JH retires at Christmas with 32.5 years
   California is leading way to Protest NCTM standards as vague on computational skills – too much
   theory

   HC getting computer labs – according to JA
   JA has worst 29th year – determines to retire at 30 next year

1999 – Student Accountability Standards – required test scores for Promotion and course credit at high
   school – retesting allowed with interventions
   JA retires from HHS after 30 – continues to coach basketball

2000 – NC SATs jump 40 points – largest of any state that tests 40% of its students or more
   Achievement Gaps a big issue – even when allowing for socio-economic differences, Hispanic,
   American Indian and African American students do not score as well as white students.
   Closing The Gap becomes focus.
   HC using graphing calculators

2001 - Recent results show improvement in NAEP data in NC – NC only state reducing achievement gap
   between and high and low performing students
   NCLB enters picture
   DT retires from HHS
   JA gives up coaching at HHS

2002 – CR retires and does some tutoring for a year

Today – 90 students in Grades K-5 at Jaspar – RS is 84 – BB is 73 – SM is 68 – DT and CR are 61 – BC is
72 – JH is 64 – JA is 60  State Rep. reports 23.47% disadvantaged in HC
# APPENDIX E: INTERVIEW, TRANSCRIPTION & REVIEW RECORD

## Transcription Record

### Interviews Round 1

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APPENDIX F: ANALYSIS TIMELINE

Analysis Timeline

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APPENDIX G: INFORMED CONSENT FORM

IRB # 07E213

OHIO UNIVERSITY COLLEGE OF EDUCATION

HUMAN SUBJECT CONSENT FORM

Title of Research:
Retired Rural Secondary Mathematics Teachers’ Perspectives of Reform

Principal Investigator:
Deborah Britt, Doctoral Student       (Dr. George Johanson, Advisor)

Department:
Teacher Education

Federal and university regulations require signed consent for participation in research involving human subjects. After reading the statements below, please indicate your consent by signing this form.

Purpose of Research: I have been informed that this study will be used to complete the doctoral work for the researcher. I am also aware that the study involves research that will be used to help mathematics educators understand the rural secondary perspectives of change in mathematics teaching and learning.

Procedure: I understand that I will be interviewed three times for no more than ninety minutes for each interview. The interviews will be conducted over a two to eight week period. The first interview will be used to gather demographic information and teacher belief regarding teaching and learning mathematics. Following the first interview, I realize that if I chose to write in a journal, that I will be allowed to do that and that a journal will be provided. The second interview will involve a discussion of my perceptions of change in mathematics teaching and learning during my career. If I want to add to my response, I realize that I can continue to write in the journal prior to the third interview. The third interview will involve clarifications of issues from the prior interviews and will provide me an opportunity to review what has previously occurred.

Risks and Discomforts: I understand that there are no risks involved in the interview process.
**Benefits:** I understand that my participation in the study will help further the knowledge needed in order to improve mathematics education. I also understand that I am a volunteer and that there will be no financial gain to me.

**Confidentiality:** I understand that information produced by this study will be used in the dissertation and resulting work of the researcher. However, I am aware, subject to the confidentiality and privacy regulations of Ohio University, that information of a sensitive personal nature will not be part of the record, but will be stored in the investigator’s research file and identified only by a code number. The code key connecting name to numbers will be kept in a separate secure location. If the data are used for publication in the literature or for teaching purposes, no names will be used, and other identifiers, such as audio, will be used only with my special written permission. I understand I may see the photographs and videotapes and hear the audiotapes before giving this permission.

**Request for more information:** I understand that I may ask more questions about the study at any time. I understand that I can contact the researcher Deborah Britt, 326 Back Hollow Road, Mars Hill, NC 28754 (828-689-5863 or dgbr531@aol.com) for answers to pertinent questions about the research and research subjects’ rights. Additionally, I know that I can contact Rebecca Cale, Associate Director of Research Compliance Institutional Review Board at Ohio University (740-593-0664 or www.ohiouniversity.edu/research) if I have concerns.

**Refusal or withdrawal of participation:** I understand that my participation is entirely voluntary and that refusal to participate will involve no penalty or loss of benefits to which I am otherwise entitled, and that I may discontinue participation at any time without penalty or loss of benefits to which I am otherwise entitled.

I certify that I have read and understand this consent form and agree that known risks to me have been explained to my satisfaction and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this research. I certify that I am 18 years of age or older. My participation in this research is given voluntarily. I understand that I may discontinue participation at any time without penalty or loss of any benefits to which I may otherwise be entitled. I certify that I have been given a copy of this consent form to take with me.

_______________________  _____________________
Participant  

_________________________  _____________________
Witness to Signature  

Date  

Date
A determination has been made that the following research study is exempt from IRB review because it involves:

Category 2 - research involving the use of educational tests, survey procedures, interview procedures or observation of public behavior

Project Title: Retired Rural Secondary Mathematics Teachers' Perspectives of Reform

Project Director: Deborah Britt

Department: Teacher Education

Advisor: Geroge Johanson

Rebecca Cale, Associate Director, Research Compliance Institutional Review Board

Date 10/11/07

The approval remains in effect provided the study is conducted exactly as described in your application for review. Any additions or modifications to the project must be approved by the IRB (as an amendment) prior to implementation.
APPENDIX I: VITA

Deborah Betthauser Britt was born May 31, 1953, in Gaffney, SC. She was raised in the suburbs of Charlotte, NC, and Washington, DC as well as the rural piedmont of North Carolina. She graduated from East Carolina University, Greenville, NC, with a B.S. in mathematics with 7 - 12 teaching certification. With a full scholarship, she returned to complete an M.A. degree in mathematics with a college teaching endorsement in 1977.

Upon graduation from college, she taught high school for 27 years in the state of North Carolina. She taught at East Carolina University, UNC at Asheville, Mars Hill College, and East Tennessee State University. She was the first director of the developmental studies program at Randolph Community College. She was appointed to teach at the North Carolina Governor’s School in 1978.

Britt won a national RadioShack® Tandy Technology Award and the Presidential Award for Excellence in Teaching Mathematics. She has written and received local, state, and national grants that include Eisenhower Grants for Teacher Development. She is an endorsed consultant for The College Board. While raising two sons, she edited and wrote solutions manuals, textbook and teacher resources for John Wiley publishers. She is a National Board Certified teacher with licenses in North Carolina and Tennessee.

Britt is a member of the National Council of Teachers of Mathematics and its state and local affiliates as well as the Association of Mathematics Teacher Educators. She was recently elected to the board of the Appalachian Association of Mathematics Teacher Educators. She is the editor, executive secretary, and past president of the North Carolina Association of Advanced Placement Mathematics Teachers (NCAAPMT). She was editor of the online magazine Rural Mathematics Educator.

This dissertation is another step toward a better understanding of rural education. It is also a first step in a future involving teacher perspective in research.