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Five Factors That Contribute to the Success of Middle Grades Math Teachers in North Carolina's Most Challenging Schools

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Abstract

Rural middle and high schools are not doing enough to engage students in active mathematical learning, to provide extra support, to guide them in planning for higher-level mathematics courses, nor to create an environment of high expectations (Bottoms & Carpenter, 2000). We studied three beginning middle grades mathematics teachers working in eastern North Carolina's high-minority, high-poverty schools who are achieving high growth with students. These three lateral entry teachers entered the teaching profession later in life and resided in the communities where they worked. Teachers taught mathematics through real-world problem solving. This practice was deemed imperative as they developed positive relationships, demonstrated perseverance by providing extended and varied opportunities for learning, promoted high expectations, and attended quality professional development. They perceived the variables as positively impacting student growth and achievement on North Carolina's End of Grade Mathematics tests. Together, these findings provide insight into how three teachers are beating the odds in North Carolina's lowest-performing schools.

North Carolina's Middle Grades Mathematics Learning Gap

> I bring food, leftover food, and I put it in my refrigerator. I cook every day and my kids know it – and homemade everything. They come up and tell me I'm really hungry or sometimes, they come in and they have their head down and I say, "Are you ok?" They say, I didn't get any sleep. Then, I find out that the sister and parents were up fighting and the cops were there…and things like that. So, yes you do make modifications for these students because of course, I'm going to say, that's fine, just sit in the back and put your head down (Participant 1).

In 2009, North Carolina hired 2,062 new teachers via lateral entry and 1,143 new teachers via traditional licensure (North Carolina Department of Public Instruction [NCDPI], n.d.). Low-performing schools have the highest proportion (29%) of inexperienced teachers working in these schools; inexperienced teachers make up only 19% of the teaching population at higher-performing schools (NCDPI). The problem continues: North Carolina's lowest performing schools are more difficult to staff with experienced teachers. Our review of 2009 End-of-Grade mathematics test results for teachers working in 11 high-poverty, high-minority, rural school districts in eastern North Carolina, found only three beginning middle grades teachers whose students achieved 60 % or above proficiency, as measured on the 2009, NC End of Grade Mathematics Test. Sadly, only three of the possible 12 beginning teachers achieved results demonstrating that 60 percent of their students were working at grade level or above. These results should cause concern for educators and policy makers. In addition, due to the location of the high-minority, high-poverty schools the reality of the lack of traditionally prepared teachers available in these areas becomes apparent. We studied three middle grades mathematics teachers in rural, high poverty schools in southeastern North Carolina who achieved student achievement averages above the 60th percentile. In doing so, we found five factors that contributed to their success. The teachers in this study lived in the community with the students they taught and planned to remain in the area. Each understood the culture of the school and community and overcame low student, school, and family expectations**.** As North Carolina leaders face the challenges of increasing the achievement of middle grades students living in rural poverty, changes in teacher recruitment, preparation, professional development, and teacher practices are needed.

Review of the Literature

"It is during the middle grades, particularly in lower-performing schools that serve high-poverty populations, that achievement gaps often become achievement chasms" (Balfanz, 2009, p. 13). Although the data show a lack of success in a majority of high-poverty, high minority schools, this study explored why some beginning middle grades teachers of mathematics were successful with minority students living in similar districts. Specifically, the study examined the instructional content, pedagogical, and dispositional strategies of teachers used to achieve above predicted success with students.

The results of the Third International Mathematics and Science Study (TIMMS) told the story. While fourth graders in the United States ranked among the top five nations in math and science

skills, by the end of eighth grade, the performance of American middle schools ranked below many third-world countries (Middle Web, n.d.). If we expect all middle grades students to succeed, we must eliminate the disparities in their education starting with the quality of the schools they attend and the teachers hired to work with them. How do we create quality middle schools?

Since the emergence of Eichorn's book, *The Middle School,* in 1966, debates of policy makers and educational leaders focused on the need for specialized professional preparation for the teaching of young adolescents. Effective middle grades teacher preparation programs provided a comprehensive understanding of young adolescent needs through a variety of learning opportunities including the formal study of young adolescent development and the application of that knowledge through working with young adolescents in field-based experiences (McEwin, Dickinson, & Anfara, 2005).

Continuing to focus on effective middle grades teacher preparation, the National Forum to Accelerate Middle Grades Reform issued a policy statement in 2002. The Forum advocated that every state should require middle grades teachers to have specialized middle level credentials. In addition, middle level licensure should be specific to the middle grades and not overlap significantly with elementary or high school licensure. They also recommended that colleges and universities design teacher preparation programs to prepare future teachers specifically to work with this age group. The April 2002 policy statement provided specific guidance for teacher preparation programs. The three critical areas recommended as teacher preparation focus areas were:

- Developmental responsiveness – understanding of early adolescent characteristics and how to motivate and actively engage them in learning
- Academic excellence – understanding of subject matter and pedagogy
- Equity and cultural diversity – have a wide variety of skills and a sense of hope, support, and expectations for achievement to enhance learning for the most racially and ethnically diverse school population in our nation's history (p. 3).

In 2002, key leaders in the Division of Instructional Services in the North Carolina Department of Public Instruction (NCDPI) offered their leadership in convening a second statewide task force that could offer recommendations for improvement in the context of middle level education. Twenty-nine of North Carolina's education leaders in public schools, universities, and colleges, state Parent Teacher Associations, business organizations, and the North Carolina Middle School Association in addition to Department of Public Instruction staff became members of the task force. Their work, strengthened by significant focus group input from across the state, produced *Last Best Chance 2004: Educating Young Adolescents in the 21st Century*. The document provided an updated and valuable framework to improve middle grades education in North Carolina (NCDPI, 2004). The North Carolina Middle Grades Task Force (NCMGTF) supported the belief that teachers needed specific preparation to teach young adolescents (NCDPI, 2004). According to the North Carolina Department of Public Instruction, North Carolina was a leader in the field of middle grades education; yet, most of the universities and colleges were not preparing the number of middle grades teachers needed throughout the state. "Of the 245 [middle grades] graduates in 2000, they represented just 7% of the pool of new

teachers coming from North Carolina's undergraduate programs (NCDPI, 2004, p. 20). The Task Force posited the following teacher preparation recommendations:

- Undergraduate degree-seeking candidates should be required to complete one teaching concentration in the core areas of mathematics, science, social studies, or English language arts with an enhanced literacy component of reading, writing, or English as a second language.
- The current licensure should be changed to reflect the needs of young adolescent learners to K-5, 5-8, and 9-12.
- All teachers who are seeking lateral entry or add-on of middle grades licensure should be required to complete middle grades professional development focusing on young adolescents, middle grades and best practices within one year of beginning their teaching at the middle level (NCDPI, 2004, pp. 20-21).

According to the North Carolina Department of Public Instruction:

> Lateral entry is an "alternate" route to teaching for qualified individuals outside of the public education system. Lateral entry allows qualified individuals to obtain a teaching position and begin teaching right away, while obtaining a license as they teach. The North Carolina Department of Public Instruction authorizes lateral entry licenses on a provisional basis in licensure areas that correspond to the individual's academic study. NC TEACH is an alternative teacher preparation program designed to recruit, train, support, and retain mid-career professionals as they become licensed teachers in North Carolina (NCDPI, 2009, p. 1).

Researchers thoroughly documented the relationship between specialized preparation for middle level teachers and student achievement (Bruce, Hogaboam-Gray, & Ross, 2006; Darling-Hammond, 2000; Flowers & Martens, 2003; Kanold et al., 2008; NMSA, 2003). According to the National Forum to Accelerate Middle Grades Reform (2002), only 20% of teachers nationally were formally prepared to teach in the middle grades. In addition, approximately 30% of seventh and eighth grade teachers assigned to teach math or science lacked the requisite subject knowledge to do so. According to the National Forum to Accelerate Middle Schools (2002), forty-three states and the District of Columbia had some form of specialized licensure requirement for middle-level teaching. The National Forum's policy statement recommended that middle level teacher preparation programs differ from elementary or high school teacher preparation programs. "Again, we urge colleges and universities to design teacher preparation programs that specifically prepare future and current teachers to work with this age group and to ensure that students meet academic standards" (National Forum to Accelerate Middle Grades Reform, p. 5).

A culture that included educators who value working with the age group and are prepared to do so created successful schools for young adolescents (NMSA, 2003). Middle grades teachers needed both specific teacher preparation before they entered the classroom and integrated professional development as they continued to teach. This preparation should include depth of knowledge in at least two content areas, an understanding of the adolescent learning process, and extensive field-based experiences at the middle grades level (NMSA). The National Forum to

Accelerate Middle Grades Reform advocated the creation of excellent middle grades teachers who were prepared to teach challenging content to young adolescents.

Can beginning teachers placed in schools with high populations of minority students living in poverty be better prepared to enter the classroom and positively impact student achievement? A second study completed in 1998, surveyed approximately 3000 beginning teachers in New York City regarding their views of their teacher preparation programs (Darling-Hammond, Chung, & Frelow, 2002). The authors concluded that highly rated programs should be:

- Grounded in knowledge of human development
- Supervision from university supervisors who also work as course instructors for their student teachers—the classroom teaching responsibilities are interwoven with university coursework
- Combined experience, reflection, and study within the study design
- Emphasized a strong liberal arts education plus intensive preparation for teaching—secondary candidates major in the discipline they want to teach and minor in education or stay on for a 5th year of education coursework that includes three courses in foundations of education and five courses in methods and content of education
- Combined series of course-linked practicum experiences with two rotations of student teaching resulting in about 24 weeks of supervised clinical work of which at least one placement must be urban
- Provided methods courses are taught at the schools and offer professional development for school faculty as the college moves toward a professional development school model – significant attention is placed on the development of content-based pedagogy (pp. 298-300).

In addition, the study results showed that teacher ratings of their overall preparedness related significantly to their beliefs that they could reach all students, handle classroom management, teach all students to high levels, and make a difference in student lives. Teachers who felt underprepared noted that students' peers and home environments had more influence over their learning than did the teachers. Only 36 % of the teachers interviewed who felt underprepared for teaching said they would choose teaching as a career again compared to 76 % who felt they were well prepared for teaching. Additional insight from the study concluded that teacher preparedness was more positive when teacher candidates were engaged in a formal program of preparation than a series of courses from different institutions or alternative programs that minimized pre-service training (Darling-Hammond, Chung, & Frelow, 2002).

As the No Child Left Behind (NCLB) policy initiatives tried to improve teacher quality and qualifications, the teaching of mathematics received much criticism (U. S. Department of Education, 2001) Since middle grades mathematics served as a critical gateway to high school courses and college enrollment, one study used a nationally representative sample of middle grades mathematics teachers to investigate teacher content knowledge for teaching students in middle grades mathematics (Hill, 2007). The study specifically attempted "to capture profession-specific mathematical knowledge, or the mathematics that teachers would need to know to communicate it effectively to students" (p. 98). Results suggested that middle grades teachers

had difficulty explaining ideas and procedures behind the mathematical concepts taught. However, data indicated that years of experience, a mathematics-specific certification, and the number of methods and mathematics courses taken predicted higher levels of mathematical knowledge for teaching. The study also found that teachers credentialed as high school teachers performed better on middle grades mathematics content. Based on these results, implications for improved teacher preparation programs for middle grades mathematics candidates included substantial integration between content coursework intended to improve teacher knowledge and the association between mathematics methods coursework intended to address the ways in which young adolescents learn mathematics. Hill noted that her results supported the findings from the Third International Mathematics and Science Study (TIMSS), which characterized lessons in the United States as memorizing terms and practicing procedures without focusing on the rationale for either. "This suggests that the TIMSS findings might also result from teachers' impoverished understanding of the mathematics they teach" (p. 111).

A predicted teacher shortage, especially in the areas of secondary science and mathematics has led to alternative methods for certifying teachers in order to guarantee qualified people in every classroom. Advocates argue that the increasing need for qualified teachers demands creative solutions and that alternative certification guarantees that teachers have extensive knowledge of the subject they teach. Opponents argue that condensed teacher education fails to cultivate adequate pedagogical skills and leaves teachers unprepared for the classroom (University of North Carolina at Chapel Hill, n.d.). Lateral entry in North Carolina is described as certification of teachers by means other than traditional four-year college and university education degree programs. Candidates for alternative certification hold a degree in the subject matter they will teach and meet condensed pedagogical coursework requirements, often during the first two years of teaching (NCDPI, 2009). Alternative teacher preparation programs that train teachers to work in North Carolina schools include NC Teachers of Excellence for All Children (NC TEACH), NC Model Teacher Education Consortium, NC Restructuring Initiative in Special Education (NC RISE), and Teach for America (TFA). These programs offer classes at convenient times for working adults, combine face-to-face classes with online components, and provide mentoring and support (NCDPI Teacher Education Programs, n.d.). Once middle grades teachers of mathematics were in the classroom, was support and additional professional development provided to increase the likelihood of increased student achievement?

As educational leaders continue to address the specific challenges of teaching students living in poverty, they need an understanding of highly successful beginning teachers' preparation and support in meeting the challenge. Our study will offer insight into the perceptions and behaviors of middle grades teachers of mathematics who are teaching students in poverty and demonstrate above predicted student achievement and growth. If we can understand how teachers are beating the odds with some of North Carolina's neediest students, we may glean ideas for future improvements in teacher preparation and professional development programs for middle grades teachers of mathematics.

Our Study

We observed and interviewed three middle grades mathematics teachers throughout the 2009-2010 school year. In an effort to focus on beginning teachers of mathematics who have

demonstrated success with high-poverty, high-minority students, we collected data that focused on a purposeful sample of middle grades teachers with students attending low-performing schools in eastern North Carolina. End of Grade Mathematics scores confirmed that 60% of the teachers' students were performing at or above grade level in mathematics. The three teachers were identified from a group of twelve beginning teachers working in eastern North Carolina's high-minority, high-poverty middle schools, using the 2009 End of Grade Mathematics test scores.

Based upon Robert Slavin's theoretical framework of effective instruction, we identified the following teaching behaviors associated with high student achievement:

- Quality of Instruction: The degree to which information is presented so that students can easily learn them.
- Appropriate Levels of Instruction: The level of instruction is appropriate when a lesson is neither too difficult nor too easy for the student.
- Interest: The degree to which the teacher motivates the students to work on the instructional tasks and learn the material presented.
- Time: The degree to which students are provided enough time to learn the material presented. (Slavin, n.d., para. 5-6)

As we observed teachers, we examined their actions and practices through the lens of these elements. We conducted one hour-long observation in the teachers' classrooms once a month, for four months. During the observations, we utilized field notes to record the detailed actions of teachers during classroom observations and interviews. Interview data assisted in developing an understanding of common behaviors demonstrated as successful in positively impacting student achievement as measured on the North Carolina End of Grade Mathematics Test. In addition, asking successful teachers for their interpretations of teacher preparation and professional development experiences developed an understanding of how teachers gained the knowledge that influenced their success in teaching minority students living in poverty. Data collection and analysis guided the research as the study unfolded. An observation form based upon the National Council of Teachers of Mathematics teaching standards provided standardization for cross-case comparisons filed with each separate case. In addition, the following essential attributes of successful middle level education were included in the development of the observation form: Curriculum, Instruction, and Assessment; Leadership and Organization; Culture and Community (NMSA, 2010). Verbal descriptions of the teachers, the students, and the interactions, direct quotations or the main points of what they said, and comments or diagrams revealing observed events then created the field notes for each observation.

Documents substantiated and illuminated the observation and interview data collected. Examination of teacher lesson plans, school improvement plans containing strategies to improve mathematics achievement of students, professional development logs, mentor support documents, teacher evaluations, and individual growth plans accompanied the observations. Document review afforded insight into the teachers' planning of instructional strategies, and school-wide initiatives to improve student achievement in mathematics. Additionally, the mentor support documentation, teacher evaluations, and the Individual Growth Plans provided verification of professional development and support efforts made available for the beginning

teachers. Document summary forms were attached to the documents and included in each case file, summarized and explained the significance of each. Electronic storage of forms and hard copies filed in folders for individual case studies allowed effective analysis of and between case studies. The document review triangulated interview and observation data while providing further insight into possible patterns of teacher behaviors that address the research questions. Through this multiple-case study design, the time spent with teachers demonstrating success with students attending high-poverty, high-minority schools provided insight into strategies that may be generalized to assist beginning teachers working with students in analogous situations. Observation logs based on the data analysis collected aided in exploration of emerging themes and categories. Following the observations, the field notes were organized and analyzed to describe possible reasons for the teachers' success with minority, poverty populations. The nature of this qualitative study required simultaneous collection and analyzing of the data.

The multiple-case study required two stages of analysis: within-case analysis and cross-case analysis (Merriam, 2009). To facilitate the two stages, the study followed the process of data analysis as described by Creswell (2003). A coding process generated a description for themes and categories for each case study in detail. Analysis for comparison followed. Words or phrases of importance were highlighted, the information was coded, and the information was organized on index cards by themes and categories as they evolved. Field notes on insights and possible relationships and document findings added to the categories to create an organized electronic means of storing and analyzing the data. Using Slavin's framework for effective teaching, the NCTM standards, and the NMSA standards, a table was created (See Table 1) to show the correlations. Observation, interview and document analysis data was then categorized using this table. The critically compared insight from each case explored and the categorized data illustrated possible relationships among the teachers demonstrating above average mathematics achievement with students living in poverty. We found that the most effective teachers demonstrated many of the elements of QAIT, NCTM & NMSA – the more characteristics observed, the more achievement growth demonstrated by students as measured on the NC End of Grade Mathematics test.

Triangulation of the observations and interviews with the archival documentation, as well as triangulation of the interviews with one another rendered a holistic understanding of the situation. Participants received electronic copies of the interview transcriptions and were given one week to check for accuracy. As provided by one of the participants, the additional comments and insights were included with the transcripts. Use of verbatim statements further authenticated the findings. Finally, the study included a detailed narrative indicating possible bias (Creswell, 2003; Merriam, 2009).

Table 1

Correlations Between QAIT, NCTM, NMSA Standards

Slavin – QAIT	NCTM Standards	NMSA Recommendations
Quality of	Communication	Students and teachers are engaged in

Instruction	Connections Representations	active, purposeful learning Every student's academic and personal development is guided by an adult advocate Educators use multiple learning and teaching approaches
Appropriate Level of Instruction	Communication Reasoning and Proof	Varied and ongoing assessments advance learning as well as measure it Comprehensive guidance and support services meet the needs of young adolescents
Incentive	Problem Solving Connections Representations	Educators who value young adolescents and are prepared to teach them Curriculum is challenging, exploratory, integrative, and relevant The school actively involves families in the education of their children
Time		Organizational structures foster purposeful learning and meaningful relationships The school environment is inviting, safe, inclusive, and supportive of all

Our qualitative study explored beginning middle grades mathematics teacher perceptions of their teacher preparation, professional development and practices. Our multiple-case study design added confidences to the findings as commonalities among teachers were discovered using the variables that contributed to the success of their students. Four research questions guided this study.

1. What are the educational practices of beginning middle grades mathematics teachers working with minority students in rural poverty?
2. How do teachers report the effectiveness of teacher preparation programs for beginning middle grades math teachers in influencing their practices with minority students in rural poverty?
3. How do teachers report the effectiveness of professional development for beginning

middle grades mathematics teachers in influencing their practices with minority students in rural poverty?

4. What additional variables contribute to the student achievement gains of some middle school mathematics teachers with minority students in high poverty rural schools?

Factors That Contribute to Success

Following are five factors that emerged from the data that contribute to the success of middle grades teachers working in North Carolina's most challenging schools. The participants were beginning middle grades teachers of mathematics working in high- minority, and high-poverty schools in eastern North Carolina. Although the beginning teachers had one to four years of experience, all three of them were lateral entry, thus they entered teaching as a second career. The type of teacher preparation programs completed by the participants also varied. Two of the teachers who participated in the study were completing alternative certification programs such as the NC TEACH or CT3 (Coalition to Teaching) program, and one of the teachers completed a licensure only program, but completed a traditional teacher education program in secondary mathematics more than twenty years earlier. The nationality, age, gender, and background experiences were diverse.

Participant 1 is a 36 year old black female. She was born and raised in Colorado Springs, Colorado. Her husband was in the military so consequently, she moved to North Carolina with him. She obtained a B. S. Degree in Mathematics and then entered the NCTEACH program at a North Carolina University to obtain licensure and a master's degree in education. She is now divorced and the mother of two children. Participant 1's daughter has been a student in her own eighth grade mathematics class the entire year. When I asked her to discuss the reasons she thought she was an effective teacher, she was eager to tell me how much she loved teaching.

Participant 2 is a 44-year-old white male who was completing his master's degree in secondary mathematics education at a North Carolina university. He was raised in North Carolina and graduated from a North Carolina university in 1989 with a degree in secondary mathematics education. After teaching computer science and business classes at a private school for five years, he decided to leave the profession. He worked part time at video stores and pizza parlors and then bought his own video store. In addition, he bought a rental property business and learned to do the repair work himself.

The third teacher, Participant 3, is also a white male who is 44 years old. He was born and raised in Erie, Pennsylvania and then joined the Marine Corp after graduating from high school. His military assignment brought him to a North Carolina base where he eventually retired. He then attended a North Carolina University where he earned a Bachelor of Science degree in Business Administration.

Factor One: Building Relationships

> The importance of relationships was demonstrated by each participant:
> I'm a conduit and once that conduit to knowledge is closed down, then you've got a hopeless situation. It's critical – whether the child gets the math lesson or not, the child

> leaves here knowing that I care about him and that they feel good about coming to my class – even if they don't like math – even if they don't like me – they are still okay with coming here. That's the key (Participant 2).

Another teacher expressed the importance of relationships as she explained:

> I don't do anything different – but I think the relationship is number one. The relationship I have with the kids is the first thing – if I didn't have this relationship, it doesn't matter what kind of teaching I try to do because it won't work (Participant 1).

The ages and vast background experiences of the teachers provided them with an understanding of the students they teach and the struggles they endure by living in poverty. As one teacher explained:

> I try to find some way for them to find something for them to do, I make an attempt to team them up with some body, one on one, or push some responsibility their way. When they are feeling bad, withdrawn, or left out, or something is going on – they have some trauma in their life - I might leave them alone. I try to make them want what I've got. To me, it's about salesmanship (Participant 2).

The teachers indicated the need for patience on the part of teachers due to students' low expectations, lack of motivation, and lack of prior knowledge. High-expectations were also described by the teachers as an additional variable necessary for motivating students. These teachers emphasized the importance of building relationships.

Factor Two: A Solid Background in Mathematics

The teachers in this study decided to teach for different reasons, but ultimately indicated that their background knowledge in mathematics drew them into the education of middle grades mathematics. Participant 1 obtained a B. S. Degree in Mathematics and then entered the NCTEACH program at a North Carolina University to obtain licensure and a master's degree in education. Participant 2 was completing his master's degree in secondary mathematics education at a North Carolina university. He graduated from a North Carolina university in 1989 with a degree in secondary mathematics education. Participant 3 attended a North Carolina university where he earned a Bachelor of Science degree in Business Administration. The strong mathematics background of the three teachers participating in this study appeared to provide them with the content knowledge they needed to understand and the confidence to teach middle grades mathematics supporting the literature found on effective teachers having a strong background knowledge in mathematics (Hill, 2007). They were able to explain procedures and processes in a variety of ways and focus on teaching for understanding as opposed to following a textbook script. One of the teachers described his own difficulties in learning math as he recounted the following situation:

> I've learned through observation of others' teaching, but the main thing I've used is called my "180 rule." The "180 rule" says that I need to find a way to teach students that is the opposite way that I was taught, because it wasn't an effective way to learn. And

> while I gathered the material and mastered it, I have very little understanding – good test grades, good transcript, but no understanding. So, I teach for understanding (Participant 2).

The same teacher was excited to forward an email exclaiming his success in teaching and demonstrating his ability to effectively teach mathematics:

> Our last benchmarks were today and my students and I have started some pre analysis of their scores and answers. I am seeing incredible growth since the last one...in the range of 40 % to 100 % for most students...but more importantly, I am seeing students use a variety of strategies as well as multiple strategies to solve problems, which tells me they are thinking... and that they are thinking is very encouraging (Participant 2).

Factor Three: Real-world Application

> I hated accounting even when I owned a business. After teaching accounting, I saw the relevancy in accounting. I taught the course so well that I saw the relevancy of math - the value of math. It became relevant to me. It is critical to create relevance in your subject area if you're going to be an effective teacher. That might be the underlying theme to everything I do - Is this relevant? I see more of the importance with this group of kids. And I could find ways for them to create model situations that they might face in the real-world. Investing in stocks, calculating appreciation on equipment, and it was relevant to these kids (Participant 1).

The teachers entered the profession with a variety of life experiences and careers that provided them with the ability to implement real-world applications they used to teach math and make it relevant to middle school learners. They did not rely on the mathematics textbook and referred to it as one of many viable resources used to find practice problems and ideas. Although the beginning teachers had one to four years of experience, all three of them were lateral entry, and thus they entered teaching as a second career. One teacher reflected upon the advantages of his experiences with other careers:

> I was thinking about something else profound – back to the question about people who go into teaching right away – straight from college into the classroom – they don't have the same relevance. They don't see the same relevance as someone who has had to shingle a roof or create a balance sheet. When I teach children, if I can teach with sincerity, I've done it, so it does give an advantage. Um, my underlying strategy is discovery. Because, that's where I see learning occur when the child makes a discovery. And in my case in my lessons that I set up and design, my best lessons are hands on activities with something the child can relate to in their home life. Like a set of steps - I bring in a stringer of steps so that they can see. A parachute, CD's, Cheerio boxes, because we are surrounded by math and I don't want to sound like uh, a Pollyanna, but these children, it needs to be relevant to their life experience and I try to make the most relevant type lessons that I can find. I cut out fish – we have fish that we do scatter plots with. I bring in a bicycle and we roll wheels, we measure cans of beans, things that they can put their hands on and touch cause a lot of these students are concrete – still in the concrete stage

> and um, just because of the age and where they are at in the education system (Participant 2).

Several studies (Hyde, 2007; McKinney and Frazier, 2008; Michigan State University, 2007), address the importance of facilitating students' thinking to real-life application as the teachers in this study demonstrated.

Factor Four: Learning to Teach

The teachers acknowledged their lack of knowledge and demonstrated perseverance as they learned through professional development and on the job experiences. All three of the participants were involved in taking courses to complete middle grades mathematics licensure while teaching and were able to immediately apply the new learning to classroom experiences. They learned how to teach through daily on the job encounters in their own classrooms and collaborating with colleagues thus supporting the literature stating that professional development was found effective when it provided teachers with math content or math pedagogy (Oliva, 2005; Villegas-Reimers, 2003).

In addition to the university courses taken, the three teachers participated in a variety of professional development opportunities. Many of these sessions involved the integration and use of technology and, every teacher agreed that it had improved her/his teaching practices. However, without the pedagogical coursework or student teaching experience completed by most traditionally prepared education students, these teachers experienced difficulties with pedagogy and effective research-based learning strategies to promote student learning. They perceived their persistence in trying different strategies to reach all students as a strength. They learned from other teachers, daily classroom experiences and, professional development that included strategies to meet the diverse needs of students living in poverty. One teacher described the importance of the professional development received:

> Creating Great Classrooms was pretty much, as a lateral entry teacher - that was really effective because when they said the word, rigor, I'm like what is rigor? I have a college degree but really, what is rigor? It didn't make sense - I kept hearing the word, but not really understanding it. And not knowing what it meant about lessons. So, I think that was probably the best cause it went over everything, positive emotional climate, all of the things that were important from day one (Participant 1).

The type of teacher preparation programs completed by the participants varied. The three teachers were required to complete specific university courses in middle grades education to receive licensure but, all of them commented on the value of learning from experience. The importance of quality professional development to provide strategies during the first years of teaching should not be overlooked. However, the teachers persevered and overcame obstacles as presented to them. In the absence of formal pedagogical training, the variety of strategies learned and employed seemed to be a crucial variable and an alternative explanation for their success in contributing to the student achievement gains of these minority students in high-poverty schools.

Two of the teachers emphasized the importance of integrating their professional development and graduate coursework with the actual classroom experiences once they began teaching. Since the three participants were involved in university coursework to complete middle grades mathematics licensure, the new knowledge learned was applied in their own classrooms. These opportunities not only provided the new teachers with strategies they could immediately use, but they could reflect on the results as they shared with professors and other teachers in the university courses.

Factor Five: Reflective Practitioners

The teachers reflected on their practices since they were all involved in graduate level or licensure courses through a university program. This experience provided them with support, guidance, best-practices, and resources. During their first years of teaching, they experienced support and gained new knowledge through continued course work at universities. They were provided strategies and new ideas for teaching the curriculum, cultural diversity, and middle grades learners through school, district and, state professional development efforts. The combination of these elements provided opportunities for these successful teachers to reflect upon their growth as professionals, and focus their actions on increasing student achievement. The formal instruction teachers received during the first years of teaching was seen as making a positive difference in teaching as all were complimentary of the knowledge and skills learned and admitted that they consistently adjusted their instruction based on their new learning.

Conclusion

Through the words of beginning teachers working in some of North Carolina's lowest performing schools, we shed insight into their journey of becoming effective middle grades teachers of mathematics who are able to positively impact student achievement growth. The teachers told us about the importance of providing a learning environment for students to think mathematically, become engaged and solve real-world problems. The teacher who is excited about seeing his or her students use a variety of strategies to solve problems exemplifies the National Council Teachers of Mathematics (NCTM, 2000) Learning Principle, "Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge" (p. 20).

The three teachers' experiences prior to coming to teaching allowed them to easily design relevant and engaging curriculum for the young adolescents. They also overcame obstacles in their own personal lives and were able to persevere through every day, routine classroom occurrences that often discourage more novice professionals. Their prior personal and professional experiences enabled them to understand the challenges of their diverse students and find instructional strategies to meet their needs. They understood the connection between content, pedagogy and their own dispositions to inspire middle grades learners. In addition, they each were willing to change instructional practices as they learned through trial and error. The teachers provided extended opportunities for students through individual tutoring during and after class. They used the textbook primarily as a resource as they developed creative, real-world lessons and experiences based upon the North Carolina Standard Course of Study grade level objectives.

According to the findings of Clotfelter, Ladd, Vigdor, and Wheeler, (2006), high poverty schools have the highest percentages of inexperienced teachers, who have graduated from less competitive undergraduate institutions, and who have non-regular or lateral entry licenses compared to schools in the other poverty quartiles. These higher percentages imply that the high poverty schools have teachers with weaker average qualifications. The teachers in this study benefitted from the opportunity to reflect upon and discuss the impact of their teaching on student learning with colleagues and mentors at school and in continuing coursework. These factors contributed to the success of students attending some of North Carolina's lowest performing schools and may provide direction for the majority of middle grades teachers struggling to meet the needs of students living in rural, high-poverty districts.

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