

# Working Paper Series

Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics  
Working Paper No. 40

## Understanding the Meaning of Rural within a Middle School Mathematics Professional Development and Research Project in Nebraska

Ruth Heaton  
Wendy Smith  
Rebecca Kromminga  
David Hartman

(University of Nebraska-Lincoln)

June 2008

ACCLAIM's mission is the cultivation of *indigenous leadership capacity* for the improvement of school mathematics in rural places. The project aims to (1) understand the rural context as it pertains to learning and teaching mathematics; (2) articulate in scholarly works, including empirical research, the meaning and utility of that learning and teaching among, for, and by rural people; and (3) improve the professional development of mathematics teachers and leaders in and for rural communities..



Copyright © 2008 by the Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics (ACCLAIM). All rights reserved. The Working Paper Series is published at Ohio University, Athens, Ohio by the ACCLAIM Research Initiative.



ACCLAIM Research Initiative  
Address: 314F McCracken Hall  
Ohio University  
Athens, OH 45701-2979

Office: 740-593-9869  
Fax: 740-593-0477

E-mail: [howleyc@ohio.edu](mailto:howleyc@ohio.edu)

Web: <http://www.acclaim-math.org/researchPublications.aspx>

Funded by the National Science Foundation as a Center for Learning and Teaching, ACCLAIM is a partnership of the University of Tennessee (Knoxville, TN), University of Kentucky (Lexington, KY), West Virginia University (Morgantown, WV), Marshall University (Huntington, WV), University of Louisville (Louisville, KY), and Ohio University (Athens, OH).



This material is based upon the work supported by the National Science Foundation Under Grant No. 0119679. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



## **Understanding the Meaning of Rural within a Middle School Mathematics Professional Development and Research Project in Nebraska<sup>1</sup>**

Improving teacher quality in P-12 mathematics is a national need, and many universities and schools are working to address it. With the support of the National Science Foundation (NSF), twelve math and science institutes across the country are helping P-12 teachers strengthen their capacity to support students' learning. These NSF Institutes operate under the leadership of STEM university faculty, representing colleges of arts and science as well as colleges of education. The strategy is to build capacity by improving teachers' content knowledge, pedagogy, and leadership skills.

One such venture is The Math in the Middle Institute Partnership (M<sup>2</sup>) at the University of Nebraska-Lincoln (UNL). This professional development effort for middle level mathematics teachers, grades 5-8, is being led by a mathematician and mathematics educator, Jim Lewis and Ruth Heaton, working in collaboration with 65 local school districts and 14 of Nebraska's Educational Service Units (ESU) across the state. The Math in the Middle Institute was designed for four cohorts of teachers to participate in 25 months of face-to-face summer courses and on-line academic year courses resulting in a master's degree either through the University of Nebraska-Lincoln's Department of Mathematics or the Department of Teaching, Learning and Teacher Education. Through a coherent program of study of mathematics and pedagogy, teachers deepen their mathematical knowledge for teaching and develop their pedagogical knowledge and skills, thereby

---

<sup>1</sup> The research reported in this paper was supported in part by grants from the National Science Foundation (EHR-0142502) and the University of Nebraska Rural Initiative.

positioning themselves to be leaders among their peers. M<sup>2</sup> also has an extensive research agenda aimed at understanding how teachers translate learning from the institute into classroom practice and its impact on students' achievement.

Math in the Middle, approaching the end of its fourth of five years of funding, provides professional development for 130 teachers statewide. Thirty-five teachers from the Lincoln Public Schools and 95 teachers from other areas across the state have already completed or are currently participating in the program. M<sup>2</sup> teachers work in Lincoln Public Schools as close as several miles from the university to towns nearly 500 miles away. Geographical distances across the state are large and add to the challenge of offering professional development. Nebraska is about 77,000 square miles, making it the 16<sup>th</sup> largest state in the country, though it is sparsely populated. Ninety-three percent of the state's total land area is dedicated to agriculture. Over half of the state's 1,768,000 citizens reside in the eastern part of the state in two metropolitan areas, Lincoln and Omaha. Seventy-one percent of M<sup>2</sup> teachers work in areas with populations fewer than 25,000 persons and 41% teach in schools meeting the U.S. Census Bureau's definition of rural or places with 2,500 or fewer persons.

M<sup>2</sup> teachers are predominately female (80%) and white (97%). Upon entry into the program, the average participant has taught 7-10 years (Median:7; Mean: 9.5) with the range of experience spanning 1 to 38 years of teaching. The majority of Lincoln Public School participants have one type of certification, whereas the majority of teachers outside Lincoln tend to hold multiple certifications at two or even three levels (e.g., elementary, middle, or secondary). A faculty equipped to teach multiple subjects at multiple grade levels is perhaps viewed as a necessity in smaller rural school systems. Just over 20% of the

participants had already acquired a master's degree, with the majority of such participants coming from outside the Lincoln area; outside of metro Nebraska, acquiring graduate credit is the only way to advance on the salary scale.

Throughout the previous four years, we have repeatedly questioned the degree to which it matters that we are working with and studying rural teachers. Do we need to think differently about professional development because we are working with rural teachers? Are the work lives of rural teachers different than those of other teachers? Are the needs of rural teachers as learners in our courses and as middle-level teachers different from those of other teachers? What are rural issues? To what degree does it matter to the research agenda that the majority of the M<sup>2</sup> participants are from rural areas in Nebraska? What would it mean for M<sup>2</sup> to have a rural research agenda? What is a rural finding? To understand better the place of *rural* in our project we have done both systematic and informal inquiry, and samples of our findings will be shared here.

As part of our efforts to understand the place of rural in M<sup>2</sup>, the research team systematically interviewed the 63 rural participants from the first three cohorts in summer 2006. During those 30-60 minute interviews we asked participants about the contexts in which they teach, their professional roles and responsibilities, and circumstances that influence their teaching. The interviews were transcribed and analyzed for emergent themes. We asked Lincoln Public School M<sup>2</sup> participants a smaller subset of these questions in an open-ended questionnaire. We also did a rural needs' assessment at two different points in time. In fall 2005, we gave the needs' assessment to 46 attendees of an M<sup>2</sup> Rural Education Workshop, including rural administrators and teachers; and in spring 2007, we gathered the same data from 87 rural teachers across all four cohorts. A doctoral student

who served as an M<sup>2</sup> research assistant, conducted case studies of the teaching practices of three of the cohort 2 teachers, including two rural teachers (Smith, 2008). On end-of-course evaluations, we also asked questions about the advantages and limitations of distance learning. Finally, we listened and observed carefully in our interactions with all participants and considered how what we heard and saw, even though anecdotal, might inform our ongoing work as teacher educators and researchers and help us better to understand when and how it might matter that the majority of our teachers were from communities smaller than the ones in which the university was located.

### **The Ambiguity of Rural**

At the onset of Math in the Middle, we characterized M<sup>2</sup> teachers as being either Lincoln Public School teachers or non-Lincoln teachers, and sometimes we referred to the non-Lincoln teachers as “rural.” We wanted a shorthand way to say who was involved in our professional development project. We were doing what Farmer (1997) says some people do to define rural, “the rural is whatever is left over after the urban has been defined” (p.624). For our project, rural was whatever was “not Lincoln.” However, these simplistic classifications quickly revealed our own insensitivities to and naïve understandings of “rural.”

We soon found that teachers we called “rural” did not necessarily refer to themselves that way, and sometimes even teachers from the same town did not agree on whether or not to call themselves rural. In the interview we asked all teachers, “We’ve been calling anything non-Lincoln, rural. Would you consider where you teach rural?” Two teachers from a town of 2,500, surrounded by farmland and located just outside Lincoln,

were not entirely in agreement. One teacher, who grew up in another small town outside Lincoln, said,

Oh, you know, it's almost more of a suburb of Lincoln, but there are a lot of rural kids that come from the rural areas as well. I'm not sure I would consider it [district] all that rural any more . . . when I was growing up it was, but I'm not sure it is now.

In response to the same question, the other teacher from the same school remarked,

Technically, yes, it's a rural school . . . because it is non-Lincoln. It's a small community. I mean, you're looking at a community of people. It's 13 miles from downtown Lincoln . . . It's really five miles outside of the city limits, but it's still very rural. There's a good 25-30 percent of our students whose families are agriculturally based.

We heard similar lack of agreement, when interviewing teachers working in far western Nebraska, nearly 500 miles from Lincoln, in a town of 9,000, amidst vast ranches. One teacher noted,

Oh, yes . . . Just the fact that it's so community-based and there are ranchers, which contribute so much to what's happening there. We're far away from anything that's city life. . . It's just the fact that we're so far from anything that's very big. We're very rural. If we want to shop, we often times drive three hours to Rapid City or three hours to Cheyenne and that sort of thing; so we're pretty, pretty rural.

Yet another teacher working in the same town seemed slightly put off by the question of whether or not she considered the school she taught in rural. She commented, "Kind of—in the Lincoln sense. You guys think we are rural, but I don't think we are. To us, rural schools

are the small, small, small country schools.” She was asked to elaborate on why she did not consider her school rural. She explained, “We’re in town. We’re not, you know, clear out in the middle of nowhere.” For others, the answer to whether their school was rural seemed simple, descriptive, and picturesque. A teacher, from a town of 3,600, stated, “When the corn is high, it's hard to see us, so I consider myself to be at a rural school for sure.” The idea of rural was becoming for us much more ambiguous and complex than what we had imagined before M<sup>2</sup> began.

We recognized that there was a lack of clarity around a definition of rural and thought M<sup>2</sup> teachers could help us better define what rural is. However, we found this to be as messy as asking them if they taught in a rural school. We did get responses representing measurable considerations that one would expect, with the majority of teachers defining rural based on economic activity or the extent of farming and ranching in an area. A smaller number of teachers defined rural by size of population. But even that was not straightforward. When asked for a definition of rural, a teacher from a small town in western Nebraska echoed earlier comments of what constitutes rural in terms of population relative to the populations of towns around her own. She said, “Probably not a city. You know here, they're (M<sup>2</sup>) considering all teachers that aren't in Lincoln rural, which is probably true. However, if you think of York, that's pretty urban compared to Oshkosh, which is 1,000 people.” York is a town of 8,000. And another teacher from a town of 14,700 near the western border of the state compared his town to towns around it and said,

Out there, we consider ourselves not one of the rural schools, because we have all the smaller ones like Bayard, Bridgeport and Gordon around us. I mean all those

*really* small towns. So since we're the biggest one out there, we don't feel rural, but in the big scheme of everything, we are considered rural.

Still others defined rural as proximity to shopping and other services. One teacher in a town of 1,100 explained, "It's rural because to have certain necessities, we have to travel outside of our own community to get those necessities." A teacher from a town of 6,000 noted,

I wouldn't say my town is rural, *per se*, because we have a lot of amenities that even Lincoln has. You know, we've got a Wal-Mart, we've got a hospital, we've got those kinds of things. You know what I'm saying?

One teacher in a town of 2,200 said, "considering how close regular shopping is, to me would be rural. You know, like the Wal-Marts or the things like that." She was implying that the further one is away from shopping the more rural one's location is. And another teacher from a town of 8,000 remarked, "There are times when I think my town is big, because we do have things to offer, but as soon as I get anywhere else and I see the traffic, I realize we're very rural." And a teacher from a town of 250 in north central Nebraska, without another town for miles around said,

Well, the first thought that crossed my mind was anything more than 50 miles from Wal-Mart would be rural. But I think that probably to be rural a town has to have a major percentage of their income from agricultural sources.

There were still others that had less tangible ways of defining rural, based on feelings, sometimes intermixed with more measurable ways. A teacher from a town of 300 offered her definition of rural:

It just has a feeling of a smaller town. . . the attitudes of the people and the pace of the people make it rural. . . an attitude of calmness, I guess. Not to beat out the other guy, but to help the other guy, I guess, I think it's rural versus the city people and we're kind of all in it together, so it's a community effort on anything we do...you get a real sense of community because the community is small enough that everyone has stake in everything that goes on. . .

Clearly, the teachers offered us little consensus on a definition of rural. Perhaps because there is not one (Coladarci, 2007) and we did not need one (Howley, 2003). Rather, what we needed was to better understand the individual and varied contexts of the M<sup>2</sup> participants, which these interviews helped us to do.

### **Hired to Be More than a Teacher**

As we listened to the teachers talk about their work lives during course work, we began to wonder if there were professional differences among the Lincoln and non-Lincoln teachers. We asked a set of questions around teachers' roles and responsibilities in the non-Lincoln teacher interview and devised a question as part of the open-ended questionnaire we gave Lincoln teachers. Generally, we saw no major differences in the day-to-day expectations placed on teachers across settings. All teachers had multiple classes to prepare for, were obligated to be involved in school or district committee work, and had before or after school professional obligations. All the teachers seemed to feel equally over-worked and over-committed. In terms of professional expectations, then, little stood out to us as uniquely rural.

The one exception was found among the several teachers who were teaching in one-room schools at the time of the interview in summer 2006. Nebraska legislative action in

spring 2007 closed these “Class I schools.”The teachers in one-room schools had roles and responsibilities others did not, including the following: librarian, custodian, cafeteria worker, school nurse, and administrator.

We did, however, notice several differences in the conditions of the work of teachers outside of Lincoln when compared to Lincoln teachers. We found that the Lincoln teachers generally had more planning time actually built into their schedules than the non-Lincoln teachers, which might be related to the comparatively stronger presence of the teachers’ union within the Lincoln Public Schools. We also noticed a difference in the extra curricular work lives of non-Lincoln teachers. Twenty two of the 63 non-Lincoln teachers interviewed had coaching responsibilities and 21 (some of whom were also sports coaches) also advised academic clubs or teams. For the teachers outside of Lincoln, these responsibilities were tied to their teaching contract, whereas in Lincoln these responsibilities were additional and fell outside a teaching contract. We asked a teacher from a town of 850 what would happen if she were to tell her principal she no longer wanted to be the school's volleyball coach. She replied,

I'd be looking for a job in a big place probably. I taught one year at a Lincoln elementary school. I know that what I was there was a teacher and that's all I was. I did happen to help out at [coaching high school] basketball that year. I was assistant coach. But, if I hadn't wanted to coach there, I wouldn't have had to do it. And I could have still kept my job.

For this teacher, teaching and coaching are both required. The same is true of other non-Lincoln teachers who were also coaches. Their roles as coaches are part of what they were hired to do when they were hired to teach. Coaching is not a choice within their job. It is a

condition of their employment—one that tends to entail a variety of positive relationships with students and the community.

We have had to take these teachers' coaching responsibilities into account to help them balance their professional lives as teachers and try to be successful students. This was a change from typical practice; when Heaton and Lewis are not doing professional development, they teach future elementary teachers in an undergraduate elementary teacher education program at the University of Nebraska. If those students complain about being stressed and over committed and try to negotiate the course expectations, Heaton and Lewis advise them, among other things, to cut back on their extra curricular activities. Initially, the M<sup>2</sup> teachers were advised to do the same. Once the project understood that many of the M<sup>2</sup> teachers were obligated *by their contracts* to meet extra curricular obligations, the usual approach was changed. Due dates became more flexible and the project offered to video tape on-campus classes when coaches and advisers had to miss class because of non-teaching professional obligations.

### **Desire for Professional Community**

Ironically, a theme prominent in the interviews was the sense of isolation described by many of the rural teachers. While teacher isolation (Lortie, 2002) is not an inherently rural phenomenon, it is one quite apparent within our data. Moreover, in much the same way that there is complexity around defining rural, there is also complexity around what any of the teachers mean by feeling isolated. For example, many teachers reported there was no one of whom to ask questions regarding mathematics or teaching. Many have no time for collaboration. Some rural teachers comprise a school's entire math department. Other rural teachers are part of a math department with just one other teacher. Some rural

teachers feel like community outsiders, living in one town but teaching in another. Feelings of isolation were apparent also in the rural needs' assessment data we gathered. Desire to collaborate with others around matters of curriculum, instruction, and ways to engage students were top priorities for most teachers surveyed.

As soon as we began the on-line component of the first course, with Blackboard as the on-line course management program, we recognized that the learning situation was quite different for our teachers in Lincoln and those outside Lincoln. The teachers in Lincoln quickly formed study groups and started meeting weekly at someone's home or school to help themselves with homework. Instructors or teaching assistants attended the study-group meetings. We encouraged—and teachers valued—group work. For many, it is how they managed the intellectual demands of the courses. Initially, staff members drove around the state, leading study groups to help with course assignments. This kind of face-to-face help with math homework is what students wanted. However, soon the need to assist participants multiplied and project staff could no longer manage face-to-face assistance so well. With additional cohorts, project staff were not always able to drive to a location when the help was most needed, and the large distances among participants was taking its toll on project staff, not to mention the fact that winter weather sometimes precluded travel altogether.

We became creative with resources. UNL is a land grant university and offers extension courses across the state through Polycom, a live telecommunications' systems with interactive classrooms on campus and interactive classrooms at ESU offices and school buildings statewide. We identified interactive classrooms across the state, near clusters of participants, and project staff held study sessions from interactive classrooms

on campus. This assistance could be provided in any weather. The one downfall was that classroom use required advance scheduling; spur-of-the-moment help was not possible.

We advanced our technology and flexibility to help teachers when we began using two different video conferencing systems, CENTRA and BREEZE. In fall 2005, Dr. Paul Eakin, professor of mathematics at the University of Kentucky and PI for the NSF Appalachian Mathematics and Science Partnership gave a presentation at a regional American Mathematical Society meeting held at UNL. He described his project's efforts to stay in touch with rural teachers through CENTRA (a video conferencing system) and PC NoteTaker, an electronic drawing tool. His virtual classroom was not at full capacity and he offered us "seats" to try out this mode of communication. We purchased the necessary equipment and a project faculty member mentored a homework group using CENTRA and PC NoteTaker and we assessed how it worked.

We concluded that it added to our capacity to support teachers across Nebraska. The next semester, we learned UNL had entered into a contract to use BREEZE, it was currently under used, with many virtual seats available to our project. A technology assistant in the College of Education and Human Sciences trained our staff and teachers and we increased our use in spring 2006. By Fall 2006, BREEZE, as a teaching tool, was as central to our on-line courses as Blackboard.

Participants' reaction to the technology varied. Some people used dial-up service from home, and their internet connections were frequently slow, limiting their participation. The availability of high-speed internet service is often limited beyond the metropolitan pale. Some students did not have internet access from home and connected

only from their schools. Here are some of the relevant comments from the course evaluation for the math course taught in Fall 2006:

BREEZE was priceless. Blackboard was somewhat helpful. The peer learning is essential to fulfilling course requirements.

It was great to get help this way. The verbal communication, though, had problems and my NoteTaker never did work.

Okay, kind of jumpy and delayed, but OK.

Just some technical problems such as sound and internet speed, but mostly ok.

It was wonderful to see facial expressions and hear people. The NoteTaker was a problem-saver many weeks. I would gladly participate again.

We used BREEZE at least once a week! This is the reason that I was able to finish this class. However, as mentioned before, the sound did not work. It was very sporadic.

My group work was the most important. The Blackboard site was very helpful. The BREEZE meetings were helpful but frustrating as the sound never worked effectively.

It seemed every time my group used BREEZE something went wrong. (Mostly the sound)

It was *great* and *needed* to get complete understanding of what was being asked of us. It really helped me to feel connected as a class.

Generally, participants seemed to favor what BREEZE had to offer but were frustrated when there were technical problems. Some participants and instructors had more patience than others. As one participant commented, "I think this will become easier to use as we use it more." The problem of creating virtual study groups to support on-line course work did not seem to be an issue inherent to rural. However, connectivity does seem to be a rural issue; high-speed connections are seemingly more difficult to access in rural places. Additionally, many of the virtual study groups created to support coursework have

continued, after coursework, as personal and professional networks for participants, addressing some rural teachers' feelings of isolation.

### **Is It Rural Research?**

It has been challenging to create a rural research agenda for Math in the Middle. There are limited examples of high quality rural research (Coladarci, 2007) and even fewer examples of rural research in mathematics education (Silver, 2003). What sort of research questions prompt rural findings? What is a rural finding? These are questions with which we have struggled.

One UNL doctoral student designed a dissertation study (Smith, 2008) to investigate how three M<sup>2</sup> teachers use their experiences in their classroom practices. She chose three teachers, including two rural ones. While unsure what would be learned from this investigation, Heaton, as her doctoral chair, thought the likelihood of rural findings would be increased by studying multiple rural teachers. Brief portraits of the two rural teachers are presented next.

### **Cases of Two Rural Middle-Level Teachers**

Nebraska's education system is one of local control. Until recently, Nebraska was the only state in the country without a statewide achievement test as means of meeting expectations of No Child Left Behind. Until the 2008 legislative session, school districts across the state created their own tests. Beginning next year, the state must establish statewide tests in all subject areas. The decentralized nature of education in Nebraska also means that there is no common mathematics textbook used at any grade level across the state. Districts, schools, and sometimes even individual teachers choose their own textbooks. In a survey done by M<sup>2</sup> evaluators, we found that our teachers, spanning 65

different school districts, use 36 different textbooks, with Saxon, McDougall-Little, and Glencoe the top three publishers in rural areas. These are textbooks representing differing views of curriculum, teaching, learning, and the nature of mathematics.

The two rural teachers Smith studied happened to use Saxon, though it was not why she initially chose them for her study. Neither was involved in the choice of Saxon. The Saxon philosophy is one of “incremental development.” Concepts are broken down into small learning increments and these small increments are sequenced throughout textbooks, across grade levels. Practice is also incremental and topics “spiral.” Assessment is frequent (after every five lessons) and cumulative. The purpose of Saxon textbooks is to move students to automaticity of mathematical computations and procedures. Each daily lesson in a Saxon textbook has four components: a collection of warm up activities (facts practice, mental math exercises, and one problem-solving exercise); an explanation of the day’s “increment” (including illustrative example problems); guided practice problems (students work independently, with close teacher monitoring); and a homework set of 30 problems. Teachers are expected to cover one lesson a day and students are expected to achieve at least 80% mastery. The teacher’s role is to read the lesson to students, guide them through practice problems, answer student questions and ensure student mastery.

Carrie Lamb teaches in a rural Nebraska school, four miles from a town of 24,000. She teaches fourth, fifth, and sixth grade mathematics in a relatively small elementary school with 15-20 students per grade level (126 K-6 students). Ms. Lamb’s use of Saxon textbooks aligns with the Saxon philosophy and intent, and she follows the lessons in order, covering all parts of each lesson. Her students know the Saxon routine, and do well on district assessments.

Daria Zatechka also teaches in a rural Nebraska school in a town of 850. She teaches seventh, eighth, and ninth grade mathematics in a slightly larger school with 20-39 students per grade level (390 K-12). Unlike Ms. Lamb, Mrs. Zatechka does not feel as tied to using Saxon on a daily basis. Mrs. Zatechka views the textbook more longitudinally, seeing she has three years to teach her students three years of material, although not necessarily in the recommended order or with the recommended pacing. By using the textbook as only one piece of her mathematics curriculum, mathematics looks different in Mrs. Zatechka's classroom than it does in Ms. Lamb's. Mrs. Zatechka examines Saxon with a critical eye to determine its potential and limitations, sees Saxon as only one of many resources for teaching, creates problems to stimulate ideas, and makes conceptual adaptations.

Smith (2008) analyzed the contexts and teaching practices of Ms. Lamb and Mrs. Zatechka using the theory of mathematical knowledge for teaching (Ball & Bass, 2003; Ball, Thames, & Phelps, 2007) and Boaler and Humphreys' (2005) categories of teacher questions. Smith investigated how teachers choose and use questions, representations, and precise mathematical language. Mrs. Zatechka and Ms. Lamb's teaching practices look quite different when analyzed along these dimensions, even though both use Saxon textbooks.

Choosing & Using:	Ms. Lamb	Mrs. Zatechka
Questions	Asks predominantly (nearly 95%) questions to enable students to state facts or to step through procedures. Even when Ms. Lamb asks higher order questions, she receives (and accepts) very brief & superficial student responses. Because Ms. Lamb follows the Saxon curriculum very closely, what would be surprising would be if this were not the case.	Only about twenty percent of the questions she asks are of the basic “gathering information” type. A full one-third of the questions she asks have the purpose of enabling student problem solving. Frequently asks students to reply to each other’s answers—Did anyone do this differently? Is there another way? Mrs. Zatechka almost always responds to student questions with another question.
Representations	Uses algebraic representations, drawings in textbook, and occasionally physical representations. Ms. Lamb chooses all representations. Sometimes Ms. Lamb will draw a figure to accompany an algebraic representation, but overall multiple representations do not occur frequently.	Uses charts, diagrams, tables, algebraic, and graphical representations. Students and teacher both generate representations (teacher chooses who presents). Multiple representations are always used in problem solving (often a table with algebraic or graphical representations)
Precise Language	Elicits precise language by direct questions: What is that called? Starts with a [letter or syllable]. Has students read and paraphrase definitions of terms during lesson. Uses precise language, usually correctly.	Elicits precise language by direct questions: What’s the word for that? Has students use glossary or dictionary to look up words if they can’t define a word. Uses precise language correctly.

*Figure 1. Ms. Lamb’s and Mrs. Zatechka’s Choices and Uses of Questions, Representations, and Precise Language*

Smith explains the differences between Ms. Lamb’s and Mrs. Zatechka’s instruction through an analysis of the life-worlds of each teacher. Smith identifies seven key contexts surrounding teaching: (1) school structure, (2) testing policies, (3) curriculum, (4) professional development, (5) principal expectations, (6) community expectations, and (7) extra-curricular activities. Although Ms. Lamb and Mrs. Zatechka teach in similar rural settings, use similar district assessments, loop with students for three years, and use the same textbook series, they use the features of their contexts differently. For example, Mrs. Zatechka uses her knowledge of students, both personally and mathematically, to shape her planned curriculum, whereas Ms. Lamb follows the textbook closely. Similar to what

Swidler (2004) found in his studies of two rural teachers, Ms. Lamb is teaching in exactly the manner her principal and the community expect (see also, Kannapel & DeYoung, 1999).

Is Smith's research rural? The phenomenon under study, middle-level mathematics instruction, is certainly not inherently rural (Coldarci, 2007). Yet, Smith's analysis seems to address what Howley (2003) identifies as rural education research's and math education research's concerns—context and instruction—unpacking complexities of contextual influences, some of which seem uniquely rural (Kannapel & DeYoung, 1999; Swidler 2004), while revising theories in mathematics education of teacher knowledge (Ball & Bass, 2003; Ball, Thames, & Phelps, 2007) and practice (Boaler & Humphries, 2005). Perhaps Smith's analysis, focused on both context and instruction, offers a hybrid example of what it could mean to bridge the worlds of research in rural education and mathematics education.

### **Understanding Rural in the Math in the Middle Institute Partnership**

We are becoming wiser about the questions posed at the start of this article, though still struggling with answers and the place of rural in our project. We are learning to question issues that arise in teaching and research such that we try to see whether there is anything inherently rural in the phenomena (Coladarci, 2007). We have come to see our non-Lincoln students as our greatest resources in our pursuit of answers to our questions about the place of rural in our teaching and research. Furthermore, it is in the strengths of the remarkable teachers with whom we work that we have come to see rural as anything but a deficit (Howley, Howley, & Huber, 2005).

## References

- Ball, D. L., & Bass, H. (2003). Making mathematics reasonable in school. In J. Kilpatrick, W. G. Martin, and D. Schifter (Eds.), *A Research Companion to Principles and Standards for School Mathematics*, (pp. 27-44). Reston, VA: National Council of Teachers of Mathematics.
- Ball, D.L., Thames, M.H., & Phelps, G. (2007). *Content knowledge for teaching: What makes it special?* Manuscript submitted for publication.
- Boaler, J. & Humphrys, C. (2005). *Connecting mathematical ideas: middle school video cases to support teaching and learning*. Portsmouth, NH: Heinemann.
- Coladarci, T. (2007). Improving the yield of rural education research: An editor's swan song. *Journal of Research in Rural Education*, 22(3). Retrieved August 27, 2007 from <http://www.umaine.edu/jrre/22-3.pdf>
- Farmer, F. L. (1997). Rural, Definition of. In G.A. Goreham (Ed.), *Encyclopedia of rural America: the land and people* (pp.623-626). Santa Barbara, CA: ABC-CLIO, Inc.
- Howley, C. (2003). *The mathematics education researcher's brief guide to understanding rural education research*. Retrieved on July 24, 2005 from <http://www.acclaim-math.org/docs/htmlpages/mersguide.htm>
- Howley, C. B., Howley, A. A., & Huber, D. S. (2005). Prescription for rural mathematics instruction: Analysis of the rhetorical literature. *Journal of Research in Rural Education*, 20(7). Retrieved August 26, 2007 from <http://www.umaine.edu/jrre/20-7.htm>
- Kannapel, P. J. & DeYoung, A. J. (1999). The rural school problem in 1999: A review and critique of the literature. *Journal of Research in Rural Education*, 15(2), 67-79.
- Lortie, D. (2002). *Schoolteacher: A sociological study, with a new preface*. University of Chicago: University of Chicago Press.
- Silver, E. A. (2003). Attention deficit disorder? *The Journal for Research in Mathematics Education*, 34, 2-3.
- Smith, W. M. (2008). *Exploring how three middle level mathematics teachers use their experiences in a professional development program*. Unpublished doctoral dissertation, University of Nebraska-Lincoln, Lincoln, Nebraska.
- Swidler, S.A. (2004). *Naturally small: Teaching and learning the line one teacher schools*. Greenwich, CT: Information Age Publishing.