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Ponderings of a Rural Mathematics Educator On Others' Perceptions of the Teaching and Learning of Mathematics in Rural Areas

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Ponderings of a Rural Mathematics Educator On
Others' Perceptions of the Teaching and Learning of Mathematics in Rural Areas

This paper offers my reflections about an unusual event at a research pre-session of the 2003 annual conference of the National Council of Teachers of Mathematics (NCTM) held in April 2003 in San Antonio, Texas. The session offered a rare opportunity for the mathematics education community to consider rural issues. The Council has, after all, asked mathematics educators to imagine

> a school district where all students have access to high-quality, engaging mathematics instruction... with knowledgeable teachers [who] have adequate resources to support their work and are continually growing as professionals. (NCTM, 2000, p. 3)

Upon my first reading of this paragraph (and on each successive reading) I admit to not only vigorously nodding my head, but to goose bumps and smiles and shouting "yes." You see, I was born and raised in Appalachian Ohio. Except for the four years spent earning my undergraduate degree at Ohio State University, I have lived and worked within a 40-mile radius of where I was born. So when I see the classroom described above I see a classroom in a school located in a very small town or maybe even in a field a few miles from the nearest small town. I see Appalachian teachers and Appalachian students. I see options for students – to go or to stay. And, as is typical of Appalachian people, I see with my heart and become somewhat emotional about such things. Note that this vision does not prescribe specific mathematics, such as mathematics for the college-bound only. But it does prescribe a way-of-thinking mathematically and therefore opens doors. Corny as it may sound, I am passionate about realizing this vision in the area in which I live and work. And so this paper deviates a bit from standard scholarly papers and may possibly offend some and be ignored by others as all emotion

and fluff. In this paper, I summarize and react to five papers presented at the research pre-conference of the 2003 Annual Meeting of the National Council of Teachers of Mathematics.[1] The papers were presented in a session sponsored by the Appalachian Collaborative Center for Learning, Assessment, and Instruction in Mathematics (ACCLAIM). Readers be warned that the summaries and reactions herein are based upon what was heard and felt by one who has lived the rural life in Appalachian Ohio. My ponderings are not meant to be critical of the presentations. All of the speakers are knowledgeable professionals who shared their perspectives based on their experiences, which may or may not be the same as my perspective.

Jim Schultz, co-principal investigator of the research portion of ACCLAIM, set the stage for the other presentations by describing the Center's work. Using mathematical terms, Schultz described ACCLAIM as the intersection of mathematics education and rural education. (Parenthetically I would add that from my personal experiences and readings, this intersection has been the empty set, prior to the emergence of ACCLAIM.) As if reading my mind, Schultz contended that research in rural mathematics education is critically underrepresented. To affirm this notion, the reader is invited to read Silver's editorial, "Attention Deficit Disorder," (Silver, 2003). Schultz further elaborated on the five specific expected outcomes of the research initiative of ACCLAIM: to describe the landscape of existing research, to conduct research, to support research, to facilitate ACCLAIM Research Symposia, and to publish the *Rural Mathematics Educator* (an on-line journal with over 1,200 subscribers).

[1] Papers were presented at this session by Jim Schultz, Ohio University; Larry Hatfield, University of Georgia; Craig Howley, Ohio University; Carolyn Mahoney, Elizabeth City State University; Ed Silver, University of Michigan.

Oddly enough, Schultz's brief introduction produced a sweep of emotion ranging from pride and encouragement to embarrassment and anger. As I heard my personal world described I at first felt pride in a culture that I find unique and wonderful and worth sharing with others. But my pride turned to embarrassment when I heard, again, stories of trailer homes and crumbling sheds along winding, narrow country roads. On second thought, however, I was encouraged by the realization that, at last, the mathematics education community was recognizing that the education of rural children and youth is important and that it may be logically differ from the education of children and youth who live elsewhere.

The encouragement conflicted with the anger I felt at the thought that professional educators, whose opinions I otherwise value, might find rural life somehow inferior to urban or suburban life, and that rural mathematics education would be somehow inherently inferior as compared to, say, suburban mathematics education.

So I wonder, as a rural mathematics educator, should I take pride in being different or should I feel inferior and try to force myself into the mold cast basically by a non-rural educational community? I was a bit disappointed that Schultz didn't specifically mention two project goals, described in ACCLAIM literature, that I particularly like and find relevant here: to understand the rural context as it pertains to learning and teaching mathematics, and to articulate in scholarly works, including empirical research, the meaning and utility of that learning and teaching among, for and by rural people. As the reader might guess, my favorite part is the phrase "among, for and by rural people." This is indeed important work. I sincerely commend the work of Schultz and others for the birth and life of ACCLAIM.

The second presentation discussed in this paper was delivered by Larry Hatfield, speaking from his experience in rural Georgia and Minnesota. I found Hatfield's title significant: "Up the back holler, down the dusty road, cross the windy prairie: Issues, perspectives, and strategies for research in the crisis of improving mathematical education of rural youth." Unfortunately, I had a bit of trouble getting past the title, finding the 'up the back holler' a bit offensive. For one who has lived there, 'up the back holler' sounds more off-putting than 'down the dusty road' or 'cross the windy prairie.' But the title does immediately point out one major problem with this area of research – the problem of defining rural or the implication that there are common characteristics that define rural. There is indeed a great deal of diversity within the set of rural youth, described somewhat by the title. Students who live in the "windy prairie" are different that the students who live "up the back holler."

Later in his presentation, Hatfield returned to the problem of having no commonly accepted definition of what constitutes "rural America." He elaborated on the problem being compounded by the fact that "rural America" is clearly a changing phenomenon, contributed to by a variety of factors, among them economy, technology, and basic transportation. According to Hatfield, there has been the outflow of rural youth to metropolitan areas in search of jobs or a different life and inflow of commuters, who want to live in the country but work in cities. Hatfield contended that within rural communities, the socio-economic gap between "traditional rural" and "newcomers" can be wide, "representing a social, cultural, and educational dichotomy that presents unique challenges and transformations to communities and schools."

Clearly not having a commonly accepted definition is problematic. For further thoughts on the definition problem, the reader is referred to article titled "What's Rural" in the *Rural Mathematics Educator* (Anonymous, 2002).

Hatfield is perhaps correct that "rural America" is changing and that there is indeed a gap between "traditional rural" and "newcomers." Although I'm not personally certain that the gap is socio-economic, I am confident that it is not *only* socio-economic. While traditional rural people are typically friendly, warm, welcoming, they are a bit distrustful of outsiders. Concurrently newcomers, although well meaning, tend to give the impression that they know more than the traditional rural dweller and want to change the community to be more like non-rural environments. I have observed such changes in my own home town, and I can't help but feel somewhat sad. For example, when I was growing up we only locked things like the bank, the post office and grocery story. I don't think the back door to our house had a lock. Now even the church is locked. I have heard it said that "no one likes change but a wet baby." Perhaps that is true and I just don't like change, but as I pondered this phenomenon I thought of titling this paper "Gone with the Wind," because I feel that an important culture has been lost.

Hatfield spend a considerable amount of time talking about rural youth facing a "knot of unmet needs." In Hatfield's view, issues surrounding the teaching and learning of mathematics in rural schools are embedded against a backdrop of complex issues, beyond the scope of what we in mathematics education can do anything about, but which have an effect on what we can accomplish and what teachers and students experience. He stated the obvious: that researchers must be attentive to these contextual issues. Although he felt there were some general indicators, Hatfield contended that there has

been little research identifying background conditions and how those relate to the teaching and learning of mathematics.

I agree with Hatfield's premise that there are conditions that affect teaching and learning of mathematics in rural schools that educators cannot control. The same is true in non-rural schools as well, however. In fact, in my opinion that's what the "effective schools" movement in the 1970s and '80s was all about, as opposed to the "who's to blame" research of the 1960s and '70s. In any case, it is important to know the background of students and to identify what we as educators can and cannot do. Appropriate research may help us as we seek the serenity to accept the things we cannot change and the courage to change the things we can. Most definitely research can help provide a knowledge base as we seek the wisdom to know the difference.

In addition to being concerned with background, Hatfield urged researchers to be concerned with what he called "foreground." He stated that, although mathematics is honored and respected, there is a pervasive culture of failure in school mathematics in rural communities. Hatfield observed that it is socially acceptable not to do well in mathematics, resulting in lowered local standards and expectations. He called for a "cultural revolution in rural mathematics."

Hatfield acknowledged that the basic issues of improving and understanding mathematics education in rural contexts mirror those of many other U.S. communities. Yet he contends that there are unique aspects in rural schools, homes and communities that must be identified. Hatfield envisioned a new rural mathematics culture with a "triadic support system" for student learning: schools (including higher education partners), homes, and communities. He proposed a forward-looking vision that does not

bring rural mathematics education up to current standards but that leapfrogs over the current standards to a progressive model.

In my opinion, though, the culture of failure in school mathematics is pervasive throughout America, in rural and non-rural communities alike. In fact, in the late 1980s, when I was still working in public schools, the national PTA launched a campaign to dispel such a culture, which PTA officials felt permeated our society at large. Indeed, 15 years ago both the National Research Council's *Everyone Counts* (NRC, 1989) and the first NCTM standards document, *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989), called for what could be termed a "cultural revolution" in mathematics.

Regardless of how wide-spread the culture of failure is, investigation into its existence is important in my view. My own father, who had only an 8th grade education, always stressed to my five siblings and me that doing well in mathematics was one of the most important things you could do in school, whether you planned to be a mechanic, a farmer, a housewife or a teacher. So, indeed I never experienced a culture of failure.

Hatfield's presentation was followed by Craig Howley's delivery of "The Lifeworld Makes Mathematics Education Rural: Implications for Math Education Research." Howley, a rural education scholar, introduced a new word to the mathematics education crowd – lifeworld – the fully realized, socially constructed world of everyday life. Howley stated that schooling has almost nothing to do with the lifeworld. But since schooling constitutes a lifeworld, students confound it with things in the wider lifeworld. For example, students may think that the mathematics instruction they experience is the same thing as mathematics. I don't think that this distinction would be as great if the

vision quoted at the beginning of this paper were realized. Howley added that it is trendy today for mathematics educators and classroom teachers to claim to be constructivists. Yet he pointed out that "…if meaning-making is important, then the connection to the lifeworld is not just nice, it's essential." Oh, I do like this statement! I believe this is true for all – not just rural children and youth. It is especially and emphatically true for rural people, however. Whether students are "traditional rural" or "newcomers," school mathematics needs to be connected to the where they are and yet prepare them for where they want to be. The fact that they don't know where they want to be only increases the challenge. It does not give us permission to ignore "making connections to the lifeworld."

According to Howley, the issue of the separation of lifeworld and schooling might indeed be a topic for education research. He further contended that to study this separation one must study particular lifeworlds more deeply, with rural lifeworld being appealing and interesting for a variety of reasons. Howley identified some qualities of rural lifeworlds, such as land ethic, community, family, conservatism and "intradependence." He added that while hardly universal across rural America, they are common in most rural places.

Howley ended with five practical points for mathematics education researchers who may not have given thought to the rural lifeworld: discard deficit models of rural culture; read up on rural issues and dilemmas, read up on social constructivism, do survey research and post-hoc analyses with large data sets, and accommodate the sharp variability of rural places in research designs.

I think – although I'm not sure – that Howley is on target. Although his wording at times puzzled me, Howley expressed a love and understanding of rural America that is refreshing. He did not propose that rural mathematics education was "broken" and could be fixed with a non-rural model, but proposed some practical suggestions for those who might want to look at the rural lifeworld more closely. Perhaps his thoughts are worth pondering by those in non-rural environs as well. Readers can access this paper online on the author's personal website (Howley, 2003).

The fourth presentation was delivered by Carolyn Mahoney, Dean of the School of Mathematics, Science and Technology at Elizabeth City State University (ECSU). Upon going to ECSU, Mahoney visited each school district in the immediate area, meeting with superintendents, assistant superintendents, curriculum specialist, principals, teachers, technology specialists and counselors. Based on this informal research that involved meeting and talking with school personnel in her region and on her experiences with organizations such as NSF, Mahoney identified four possible points of research: curriculum implementation, professional development, teacher workforce, and mathematics content.

In the area of curriculum implementation, Mahoney stressed the need for research investigating teachers' capacities, abilities, interests and success in aligning curricular materials with state and national standards. Nationally and internationally, attention has been given to what the mathematics curriculum is, how it was created, what was intended, and how it is enacted. Mahoney called for investigation of these same concerns as they apply to rural areas. Mahoney's suggestion implies, to some extent, that state and national standards are set by non-rural people. Undoubtedly, she is right for the most

part. And because that's true, non-rural people are determining local, rural curriculum. With proficiency testing, local schools have no choice really but to adopt the state standards as their own. I would add to Mahoney's research suggestions a call for investigation into ways that rural teachers take the stated curriculum and make it appropriate for rural students. I don't think that rural teachers water down the curriculum, but rather expand it to a rural context.

Mahoney expressed concern with both access and conduct of professional development. Almost without fail, she said, teachers desire connections between professional development and their everyday lives. Mahoney affirmed that "connection to place" is crucial to teachers with professional development opportunities based in the values and resources of the places in which they live. I agree that this connection to place is important, perhaps more so in rural areas where teachers tend to live in, or near, the communities in which they teach.

Mahoney further identified the geography of rural regions as a challenge to accessing quality professional development. Personally she had found teachers eager and willing to improve their knowledge and skills, but with a preference for programs and classes offered at sites close to where they live and work. Mahoney proposed distance education as an alternative, but felt that teachers are more accustomed (and therefore are more comfortable with) face-to-face interactions. I'm certainly not surprised by Mahoney's comments and would agree for the most part. Sometimes those of us in rural areas whine and complain about the isolation and how hard it is to get anywhere. But personally, all I had to do to cure my complaining was to drive across Dallas, Texas,

once. Suddenly that 30 miles over curvy, hilly roads was not so bad. I don't even complain much when I get behind a hay wagon or corn picker.

Mahoney suggested that the economy of the region posed serious challenges to teacher retention. She pointed out the national crisis of retention of qualified teachers and the need to recruit, to educate, to induct and to retain highly qualified teachers. She recommended research in determining what might inform our efforts and what might work in rural areas. Mahoney suggested that it might be important to determine who is teaching our students with related questions about how they enter the profession, what induction programs exist and how the operate, what provisions are effective in keeping teachers in the classroom, and what role partners and collaborations play in these matters. I am not sure if Mahoney's comments were specific to rural areas. Are these teaching force issues more prevalent in rural areas than non-rural? I think not. But it certainly doesn't make the issues less important to rural areas.

To achieve excellence in mathematics education in rural areas, Mahoney suggested that mathematicians and mathematics educators could work together to ensure that university courses and programs address the identified needs of prospective teachers. Second, she proposed that mathematicians could be involved in professional development efforts and the development of resource materials. Third, Mahoney called for more research in determining what mathematics should be required for elementary teachers and suggested that mathematicians could be useful in revising what mathematics is needed for mathematics teachers, perhaps even developing a new field of mathematics called "teachers' mathematics."

Personally, I don't think the specific mathematics content matters all that much. I think it's crucial, as proposed at the beginning of this paper, to develop a mathematical way of thinking, Will more (or even "better") mathematics per se help students think mathematically? It seems doubtful. What will be gained by involving pure mathematicians in professional development and curriculum development? It's a difficult proposition: in many cases research mathematicians don't do well with preservice teachers. Moreover, it seems a generally unreasonable expectation. If mathematicians wanted to be educators they would be mathematics educators, not mathematicians. I'm not opposed to involving mathematicians in the conversations about these matters—I'm arguing only that we need to keep expectations reasonable for all participants. There are several fine mathematicians at Ohio University with whom I work on a regular basis. They contribute a great deal to my work with preservice teachers, and I sometimes forget that they are university ("pure") mathematicians. In general, research mathematicians have much to contribute—but the contribution is not the leadership of mathematics education reform, teacher preparation, or professional development. Mathematics educators, however, need to stop trying to "pass the buck" and instead to take primary responsibility for teacher preparation and professional development programs.

The final speaker reviewed herein was Ed Silver. Drawing from his experience several years ago with an NCTM-sponsored Working Conference on Mathematics Teaching and Learning in Poor Communities, Silver presented "Mathematics Teaching and Learning in Rural Communities: Some Research Issues." Readers may want to refer to this conference report available from NCTM: Teaching and Learning

Mathematics in Poor Communities (Campbell & Silver, 1998). Silver quickly stated that not all rural communities are poor and vice versa. He affirmed, however, that poverty is not exclusively an urban issue, with 20% of the poor living in rural settings. With this in mind, Silver continued by disaggregating data from the most recent National Assessment of Educational Progress (NAEP). The NAEP data at grades 4, 8 and 12 show disparity among subgroups defined by socioeconomic status (SES), with the percent of students eligible for free or reduced lunch as the indicator of the socioeconomic status of the community. In general, student in low SES communities performed poorly on NAEP. Rural students at grade 8 performed as well as their non-rural counterparts, however. The NAEP data became more interesting with Silver's mention of variation across rural settings. Students in rural Iowa and Maine did not perform the same as students in rural Mississippi and Arkansas. The picture painted by the NAEP data became still more blurred by Silver's report that rural students at grade 12 performed poorly compared to their non-rural counterparts. So what is going on between grade 8 and grade 12 in rural communities?

Silver contributed a list of possible subjects for productive work on mathematics education in rural settings.

- Small schools with respect to achievement
- Spread of mathematics reform
- District/school organization and support
- Teacher professional development and support
- Teacher professional community
- Locally relevant applications

- Interdisciplinary approaches
- Community beliefs about mathematics

Silver then asked the question: "Why should researchers in mathematics education consider rural settings?" and gave two responses.

- Researchers in rural education have knowledge and perspective that complements those of researchers in mathematics education. Each group can gain from the other.
- Researchers in mathematics education who are interested in the influence of culture, language and poverty on mathematics teaching and learning have focused on urban settings. Studies in rural settings would allow tests of current theories and knowledge claims.

Silver observed the lack of articles on rural mathematics education, and proposed that perhaps one of the reasons is that universities are typically located in urban settings. He added that it is fashionable to talk of improving educational opportunities and achievement for all students. The goal arises in a variety of places, from NCTM's equity principle to the federal "No Child Left Behind" legislation. Without more attention to rural education, Silver contended, it will not be possible to realize the aspiration for <u>all</u> of the nation's students.

> I appreciated Silver's clearly stating that "not all rural are poor" and "not all poor are rural." I commend his efforts to translate his earlier work of mathematics teaching and learning in poor communities to mathematics teaching and learning in rural communities. I think much is translatable. His disaggregation of the NAEP data was just a taste of data that might be available to those of us who are developing an interest in rural mathematics education. What other interesting tidbits can be gleaned from the NAEP data? With just the data he presented, he provided evidence that not all rural areas are the same. It may indeed be impossible for researcher to generalize across all rural areas. At the very least, Silver's comments invite caution. A relatively minor comment, made almost in passing, had an impact on my personal

reflections. Silver mentioned that there may be little research in rural mathematics education because most universities are in non-rural areas. Ohio University may be one of the few large universities situated in a rural environment. I regret that we, and other universities similarly placed, have not taken the initiative to research the relevant issues and to inform the mathematics education community about them. Silver's suggestions for research are timely and appropriate.

As I listened to these five presentations and reflected on the content, I identified several myths about rural people, rural schools, rural communities—or just the word rural in general—that the speakers either alluded to or dispelled . In this final section I list these rural myths for the reader's consideration in pondering the possibilities of research in the teaching and learning of mathematics in rural areas.

- All rural people are alike.
- Rural people are poorer and less educated than they should be.
- Rural means isolated.
- Rural children and youth are missing something.
- Rural youth want to leave rural areas.
- Rural parents are afraid youth will leave the area.
- Rural people do not value education—especially mathematics education.
- It's bad to live in one place all your life.
- There's no diversity in rural communities.
- Rural people are unaware of what's happening in the real world.
- Nothing good comes out of rural areas.
- Rural schools aren't as good as non-rural schools.
- Rural teachers water down the mathematics curriculum.
- Synonyms for rural include ignorant, under-educated, resistant to change.

These are indeed myths—at least I've heard them often but actual rural experience proves them to be gross exaggerations—and mostly flat-out wrong. But the strange power of these particular myths is that they can distort the growing interest in research in the

teaching and learning of mathematics in rural communities. Researcher beware: to repeat a caution made by Howley earlier, “Discard deficit models of rural culture.”

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