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Prescriptions for Rural Mathematics Instruction: Analysis of the Rhetorical Literature

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ACCLAIM's mission is the cultivation of *indigenous leadership capacity* for the improvement of school mathematics in rural places. The Center addresses the mission through efforts 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.

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Abstract

Very little empirical research has examined mathematics education in rural schools and communities. A modest non-research literature, however, does exist, and this study analyzed it and found three themes describing the prescriptions given to rural mathematics educators: (1) mathematics education in rural schools needs to be fixed; (2) good things happen in some rural schools; and (3) fixing mathematics instruction requires certain practices. These practices include providing challenging curriculum, undertaking professional development efforts, making use of distance-learning options, and engaging local support.

The non-research literature only rarely tied its prescriptions to *any* relevant empirical research (either general or rurally focused). Reports of improvement projects based in rural schools tended to recommend their own practices uncritically and with little or no warrant. Among these works, for instance, the magazine articles reached the widest audience, and among them, 70% cited not a single reference, let alone a reference to the empirical literature.

In general, the prescriptions given loosely reflect conventional wisdom in their support of the NCTM (National Council of Teachers of Mathematics) standards and the exigencies of the various state-level accountability schemes. Some attention is paid in this literature to the concept of place-based pedagogy, usually articulated to support national and state goals and individual achievement rather than local knowledge and purposes.

Alternatives to the conventional wisdom are neither examined nor argued in this literature, thereby ignoring the arguable rights of rural communities to define their own

educational purposes. We conclude that a strong need for a critical literature of mathematics education exists. Issues surrounding the rural lifeworld, especially in the context of globalization, would have much to contribute toward the development of such a literature.

Prescriptions for Rural Mathematics Instruction: Analysis of the Rhetorical Literature

Concerted research attention has turned for the first time to mathematics education in rural schools with support from the National Science Foundation ("Spotlight on Centers: ACCLAIM," 2003). The attention, according to some observers, is warranted because rural locations entail variations in lifeways, cultures, and political economies that sharply distinguish the rural experience from the suburban and urban experiences. These differences turn on the historic change from a national political economy centered on agriculture (through approximately 1920) to an industrial political economy (predominating by 1950) to the emerging post-industrial economy (DeYoung, 1994, 2003). Moreover, as some observers have noted (Arons, 1997; Silver & DeYoung, 1986), these differences point to overarching conflicts—arising from legitimate disputes among institutions as well as among individuals—over the ultimate aims of education. Based on such understandings, this paper examines the comparatively extensive prescriptive literature within mathematics education that has been specifically directed at rural educators.

The Problematic of Prescriptions for Rural Mathematics Education

Mathematics education enjoys a remarkable position in the culture and in the school curriculum as (1) a difficult subject that frightens students and the public alike as it simultaneously compels respect (Smith, 2002), (2) a required course sequence in all high schools and colleges, and (3) one that, with natural science, has figured for half a

century as a national security issue (Barlage, 1982). In prominent policy documents mathematics, along with natural science, is commonly affirmed as the knowledge of most worth, and funding for its instructional improvement is impressive.

There is ample cause for skepticism, however. Briefly, the reasons entail the dubious role of mathematics as cultural capital¹ (e.g., Bourdieu, 1997; Moses & Cobb, 2001), the global damage arguably done by mathematics in the hands of multi-national corporations² (Apple, 1992), and the very arguable equal importance of other knowledge (Smith, 1992). Whether such objections are accepted or not, the prevailing lack of skepticism means that mathematics education researchers have *never* to our knowledge questioned the prescriptions given to rural mathematics educators. We do remain skeptical, however, and this independence of perspective allows us to interrogate the accumulated prescriptive literature about mathematics education directed at rural schools and educators from the mathematics education community.

The National Council of Teachers of Mathematics has worked diligently for at least 15 years to iterate standards to guide the improvement of mathematics curriculum and instruction in the United States. The effort for improvement is certainly needed because so much instruction yields so little learning and so much fear (Steen, 1990); nevertheless, the application of such standards remains problematic, and *must* remain so, and certainly also in rural places.

¹ For instance, as “gatekeeper” to further study—particularly when the gatekeeping function is not substantively connected as pre-requisite knowledge. Algebra plays this role in high school, and calculus plays the role in undergraduate and graduate programs.

² The practice of mathematics and science figures prominently in the process of capital accumulation in multi-national firms; in a sense, the practice of mathematics and science is owned by these companies, and this is particularly the case when proprietary knowledge is involved.

Why? First, the American conception of reform itself remains dubious. According to Stigler and Hiebert's account of Japanese "reform" in *The Teaching Gap*, the improvement of mathematics teaching and learning is not achieved there by self-conscious and inconstant reformism, but by a steady form of grassroots professional development, with teachers playing the leading role (Stigler & Hiebert, 1999). The American route to improvement (i.e., reform per se) is, according to Stigler and Hiebert, inconstant, misdirected, and predictably ineffectual. Second, the history of reform efforts in the US shows a massive record of incompleteness and abandonment, with perpetually disappointing results (Giboney, 1994; Tyack & Cuban, 1995). Third, struggle over pedagogy and curriculum, according to many scholars, is inevitable (Arons, 1997; Kliebard, 1986). Indeed, for some, such contest is not only inevitable, it is essential to the sustainability of American democracy. Arons, for instance, argues that attempts to impose a single curriculum—a single set of standards—constitute an unconstitutional and dangerous imposition of official knowledge (see also Apple, 2000).

The threat to rural areas from the imposition of official *mathematics* knowledge is probable in our judgment, which is based on the critique of Raymond Williams (Howley, 1997; Williams, 1973). The critique centers on the putative opposition of *cosmopolitan* (not urban) and rural commitments. Cosmopolitan commitments are those associated with the idealized world-city: anonymity, isolation, "primitivism," elitism, and violence. In Williams's account these qualities are cultural products invented by the cultural avant-garde at the turn of the 20th century but now consciously marketed internationally as the model of a timeless (aka "modern") global culture. One review

(Kannapel & DeYoung, 1999) articulates the related schooling issues, which will perhaps be more familiar to educators, this way:

The Rural School Problem today...is that rural schools have endured 100 years of assault from outside reformers in search of the “one best system” and that this assault continues to this day. Not only are rural schools faced with trying to piece together and capitalize on the remnants of their remaining uniqueness, but they must do so under a barrage of ongoing reforms that seek to integrate rural schools into a national [and global, one might add] system of schooling. At issue is the complex question of whom the schools should serve—the local community, the larger society, or some combination of both? (p. 70, bracketed material added)

In short, the prescriptions for rural mathematics education can be examined (i.e., from a culturalist perspective) in order to determine the extent to which they attend to the actual life circumstances that prevail in rural places. The lifeworlds inhabited by rural people differ sharply from those experienced by the residents of suburbs and cities, and such circumstances are known to exert profound influences on schooling (Haas & Nachtigal, 1998).

Finally, a more practical, and theoretically less substantive, reason exists for interrogating the prescriptive literature on mathematics education directed at rural schools. While the prescriptive literature is ample, the empirical literature that describes mathematics education with respect to rural context is exceedingly thin. Two of the National Science Foundation’s Centers for Learning and Teaching (ACCLAIM and CLT-West) have begun to focus research attention respectively on rural education and Indian

education, but their efforts are barely two years old, and the extant prescriptive literature has not been informed by these recent efforts.

Methods

We focused our analyses on recent non-research literature covering a 10-year period (1993-2002). This choice intentionally positions this review before the advent of published work from ACCLAIM, with its commitments to community-based mathematics and social justice and its skepticism of deficit models of rural life.

We consulted the *Thesaurus of ERIC Descriptors* to create a search strategy sufficient to cover the available literature in mathematics education pertinent to rural areas. The actual search strategy follows:

Set #1: *mathematics curriculum or mathematics education or mathematics achievement or mathematics instruction or mathematics activities or mathematics assessment or mathematics materials* (11,347 items)

Set #2: *rural education or rural areas or rural urban differences or rural schools or rural youth* (5,701 items)

We limited the intersection of these two sets to exclude records indexed with the descriptors “foreign countries” or “developing nations” and to exclude records cataloged as “research reports” (i.e., document type 143).

This search strategy yielded a final set of 58 documents prospectively available for analysis for the time period under consideration. Thirty records were cataloged as “project descriptions” (document type 141), 11 were cataloged as “evaluation reports” (document type 142), 9 as “information analyses” (document type 071 or 072), 7 as “guides” (document types 052 or 055), and one as a “viewpoint” (document type 120).

Of these, 18 appeared in the journal literature. Fifteen documents were eliminated from the analysis pool based on further inspection. Inspection of actual documents revealed cataloging and indexing oversights that put these documents outside our explicit analytic scope (i.e., they were dissertations, masters' theses, research articles or summaries, foreign documents, barely mentioned rural context, and so forth).

To analyze the recommendations embedded in this diverse literature, we first abstracted major points from each document in the subset, developing a database of annotated bibliography entries. We used consistent terminology throughout the process of building the annotated bibliography in anticipation of the need to perform multiple electronic searches in the content analysis of our information. Using the recurrent terminology from the annotated bibliography in our search, we tallied frequencies of the occurrence of each term and used the highest frequencies to narrow our search for possible emergent themes and to identify the documents best suited to illustrate each theme. In an iterative process, we reread the documents in overlapping clusters representing each of the high frequency terms and repeated the search process on the entire data set until several consistent categories emerged. We developed text illustrative of each category and collaboratively integrated the categories into the major themes.

Results

Three integrated themes emerged from this analysis: (1) Mathematics education in rural schools needs to be fixed, (2) good things happen in some rural schools, and (3) fixing mathematics instruction relies on certain practices. The following discussion describes each of these themes, including two or more sub-themes in each case.

First Theme: Mathematics Education in Rural Schools Needs to be Fixed

Perhaps the most prominent theme revealed in the rhetorical literature was the focus on deficiencies in mathematics education in many rural schools. Commentators provided a variety of explanations for these deficiencies, most of which pointed to the poverty, isolation, and backwardness of rural schools and the communities in which they are located. Royster (1994), for example, explained:

Systemically reforming mathematics, science, and technology education in rural schools in high poverty areas requires addressing critical barriers. The list of local barriers is extensive and includes lack of resources, low tax base, geographical and cultural isolation, low socioeconomic status, low value placed on education, low self-esteem perpetuated by a welfare system, low expectations for students' educational achievements due to parents' life experiences and regional values, dysfunctional families, lack of awareness of role of education in students' future, lack of role models and professionals in the community to provide community leadership, lack of awareness of how to obtain supplemental funding through grants in many cases, inadequate facilities to attract more talented teachers, insufficient staff development and distance to training sites, and in-service professional development often lacking in quality and content. (p. 70)

Other writers concentrated more on weaknesses in the curriculum, instructional methods, and professional development used in rural schools. For example, Harrison (1993, p. 10) asserted that the "traditional" textbook curriculum and instructional methods employed by rural educators have resulted in "unequal opportunities" for

learning mathematics. According to Harrison, standards-based curriculum delivered in a cooperative environment increases students' understanding of mathematics.

Change rural curriculum from traditional to standards-based. From the perspective of some writers of mathematics education prescriptions, rural schools have had problems with mathematics instruction for a long time, but only recently, with the advent of state accountability mechanisms, has the problem been viewed as sufficiently serious to warrant attention. Writing about Appalachian schools, Smith (1999-2000), for example, notes that

low student performance in mathematics and science has long been a factor known by Appalachian educators and community leaders, but was not seen as a problem sufficient to cause disequilibrium State emphasis on accountability has changed the school system environment, escalating the visibility of school and district test data and attaching real consequences to low performing schools. Problems can no longer be ignored, and the system must respond to the disequilibrium. (p. 3)

Others (e.g., Childers & Howley, 1993; Howley & Boren, 1993; Madden, Slavin & Simons, 1997) have discussed the value of developing and implementing standards-based mathematics activities in rural schools. Van Boening (1999), for instance, argued that students learn "more mathematics better in this environment" (p. 32), become better writers and problem solvers than in the past, and learn to think mathematically. The repetitive review incorporated into traditional curricular materials is no longer needed, according to Van Boening.

Change pedagogy from “traditional” to constructivist. Schifter (1996) noted that “traditional” beliefs about learning dominate most classrooms, namely: “that people acquire concepts by receiving information from other people who know more; that, if students listen to what their teachers say, they will learn what their teachers say, they will know; and that the presence of other students is incidental to learning” (p. 494). “Conventional wisdom” (Knapp, 1995, as cited in Campbell & Silver, 1999, p. 11) assumes that students are deficient and that the curriculum should follow a fixed sequence of lessons emphasizing practice on basic through more advanced skills, never addressing reasoning or problem solving.

According to Schifter (1996), the salient difference between such “traditional” and constructivist environments is that, in the traditional mathematics classroom, the teacher tells the class exactly how to perform a task, but in the constructivist classroom the teacher poses a problem and expects students to develop and argue a solution. Students engage in spontaneous, unscripted, teacher-guided discussions about their perplexities and discoveries.

Second Theme: Good Things Happen in Some Rural Schools

Perhaps counterbalancing the deficit model apparent in the most prominent theme, a second somewhat less commonly evidenced theme is organized around assertions that good things happen in (some) rural schools. Texts representing this theme assert strengths associated with rural schools that can support teachers and students in the pursuit of mathematical understanding.

Strengths in some rural schools. Acknowledging that studies have often focused on reputed deficiencies (or challenges) of rural schools and communities, Royster (1994), noted that such views are not uniformly held by those living in rural areas. Local people believe there are strengths in rural schools, where opportunity to learn is supported by stronger community ties and schools of smaller size. “They also feel their students are better improvisers and have learned to do more with less” (Royster, 1994, p. 72). Salyer, Curran, and Thyfault (2002) asserted that more cohesive groups of parents, teachers and community members constitute an advantage for rural educators. Baldwin (1988, p. 12) reported the assertion of one principal working in an impoverished rural community: “Our children don’t go to museums and factories. But we’re trying to prepare them to cope with the world. We don’t have much in terms of money... [or] technology. But we do have people who want to see change.” Others (Breckon, 1997; Harrison, 1993; Murphy, 1994) have asserted that frugal habits permit poorly funded rural schools to keep up with the mandates of the standards movement and improve accountability results.

Connections for place-based mathematics pedagogy. Place-based pedagogy is thought by some writers to exploit the available strengths of rural life by drawing upon the human and material resources of rural communities. Carter and colleagues (2000) and Barnhardt (1999, p. 10), for example, suggest that curricula (including “standards-based” curricula) should be grounded in local culture as the “main catalyst” for improving the formal education system of rural schools. According to Hill, Kawagley, and Barnhardt (2000), a place-based approach that

foster[s] connectivity and complementarity between the formal education system and the indigenous communities being served in rural Alaska ...continues to

produce an increase in student achievement scores, a decrease in the dropout rate, an increase in the number of rural students attending college, and an increase in the number of Native students choosing to pursue studies in fields of science, math and engineering. (p. 13)

Llamas (1999) also described a similar approach involving the use of curriculum units designed by teachers and students. These units provided opportunities for students to identify and solve problems relevant to their rural community.

In recommendations focusing on place-based pedagogy, connections to the business community figure prominently. Carter and colleagues (1999), Baldwin (1998) and Enterprise State Junior College and MacArthur State Technical College (1992) all recommend the involvement of local business people in the development and delivery of locally responsive curricula.

Certain Practices Must Be Adopted to Fix Rural Mathematics Education

This literature prescribed a familiar set of practices to fix mathematics instruction in rural schools, as follows:

1. building capacity of teachers and administrators through long-term professional development;
2. developing challenging mathematics curriculum;
3. employing available distance-learning technologies to equalize access to information, resources and materials; and
4. engaging the local area through sustained community involvement.

Professional development. The most persistent recommendation in the literature we examined concerned the need to effect reform in mathematics instruction through improvement of rural teachers' knowledge and skills (e.g., Cauley, Van de Walle & Hoyt, 1993; Batey & Hart-Landsberg, 1993). Cauley and colleagues, for instance, claimed that rural teachers are in "serious need" of support and professional development to grasp what the mathematics standards are "actually saying" (p. 40).

According to much of this prescriptive literature, regional consortia should be used for demonstrating "best" practices, coaching for the improvement of teaching, and supporting the development of standards-based curricula. For example, Hoffman (1999, p. 30) claimed that the Challenger Learning Center of eastern Kentucky fostered the "wholesale reinvigoration of [mathematics and science] teachers."

Other writers focused on the importance of promoting coordinated efforts among the various entities (e.g., local curriculum developers, teacher education programs) that provide professional development to rural teachers (Schatzman, 1995). Taking yet a different tack, some commentators extolled the benefits for rural schools of grassroots approaches such as peer-coaching (e.g., Baldwin, 1995).

Challenging curriculum. Many sources insisted that rural curriculum and instruction should be "more challenging." For instance, Hill, Kawagley and Barnhardt (2000) asserted that current and future employment conditions required more knowledge about mathematics, including algebra, geometry, and calculus. This claim represents one of the rare instances in this literature of a connection to actual research. Campbell and Silver (1999), citing empirical work and also asserting this need, claimed that rural high school students were less likely to be enrolled in advanced algebra, analytic geometry,

trigonometry, or calculus than suburban students. One source (University of Alaska, p. 19) argued that there is a connection between community and challenging curricula: “As students see greater relevance for linking the study of math and science to the needs of their communities, their level of expressed interest has increased” such that several Alaskan districts had developed higher level course offerings. And one rural teacher’s report of her own practice in a heterogeneously grouped mathematics classroom (Harrison, 1993) identified several practices thought to contribute to a challenging program of study:

1. High heterogeneous-group standards,
2. Flexible within-class grouping,
3. Improved whole class instruction,
4. Varied use of class time, and
5. Varied structures to support re-doing assignments.

Distance-learning technologies. Some sources pointed to improvement in rural mathematics education that might result from the use of various distance-learning technologies. This recommendation tended to accompany descriptions or evaluations of rural telecommunication projects (e.g., Baldwin, 1998; Barker and Dickson, 1993; Schatzman, 1995; Schmidt, Sullivan & Hardy, 1994). Harmon and Blanton (1997) described the Internet as an “equitable link” (p. 7) for rural schools to access curriculum resources, professional development, sharing of ideas among colleagues, and expert assistance.

According to one writer (Rogan, 1996), use of the Internet to augment instruction in rural classrooms improved mathematics learning for several reasons. First, it affected

how lessons were taught: “A major difference in the way in which lessons are taught appears to be the use of resources not previously available... The availability of these resources, in some instances, had a major impact on the content taught... Those teachers who were involved in telecollaborative activities cited the data collected and distributed by other schools as an important resource” (p. 23). Second, the Internet worked to counter the professional isolation often cited as a difficulty encountered by teachers in rural schools: “A second emerging theme describes personal growth, or, more specifically, the ability to overcome isolation and to incorporate more diversity in lessons taught,” (p. 24). Finally, the use of Internet resources contributed to changes in teaching practice. According to Rogan, “some teachers reported a major change taking place in their teaching style. Lessons were becoming more student centered and less teacher directed” (p. 24).

Community involvement. The final prominently recommended practice associated with this theme concerned the purported benefits of engaging community members in decision-making about mathematics curriculum and instruction. According to Smith (1999-2000, p. 3), for example, “community involvement and stakeholder support [are] necessary to sustain long-term educational improvements.”

As a part of rural systemic reform, several consortia (Alaska University, Fairbanks, 1998; Appalachian Regional Commission, et al., 1998; Barnhardt, 1999; Llamas, 1999; Smith, 1999) promoted community involvement through partnerships with families and communities, and among groups of schools. Connections with a somewhat broader set of community partners were recommended as well. Duval and Mark (1994)

and Hoffman (1993), for instance, in describing their projects discussed the benefits for rural schools of forging connections with institutions of higher education.

The Cosmopolitan Agenda for Rural Schools and Communities

The recommendations evidenced in the works examined in this study seem to us intended to encourage rural practitioners to embrace general principles that inform current thinking in the field (challenging curriculum, professional development, use of technology). The emergent themes described previously (1) assert a prevalent weakness of mathematics instruction in rural classrooms, (2) iterate the need to improve both curriculum and teaching methods, and (3) allege some strengths in the fact of rural community. With respect to rural connections, however, the recommendations rest on a completely inadequate empirical base. The applicable empirical base is the generic one that might apply, for instance, to the national standards as a whole (Kilpatrick, Martin, & Schifter, 2003). Actual reference to this literature, even as given in research summaries, is uncommon in this literature. Weaker connections are also made with the research literature on the mathematics education of students living in poverty (e.g., Campbell & Silver, 1999).

Our claim that this literature offers little empirical warrant for its prescriptions is substantiated by an inspection of the reference lists included in the documents we examined. More than half of these works (54%) provide *no references at all*. Although the lengths of the narrative portions of the works vary from 3 to 77 pages, the correlation between length and number of citations is not statistically significant ($r = .17$). In other

words, the lack of citations is arguably not a function of the brevity of many of these works.

This measure of the engagement of these works with the professional literature suggests a tendency for writers of prescriptions to rely heavily on their own judgment, but the finding does not address the engagement of these works with the research literature per se. We therefore examined the reference lists of the works that included such lists (46% of the total), looking for the frequency with which empirical studies from peer-reviewed research journals had been cited. Fully 65% of these works—those with at least one reference cited—contained *no citations to research in peer-reviewed journals*.³ When the latter works are added to those articles containing no citations at all, 84% of works in the prescriptive literature did not directly cite peer-reviewed research studies. Another finding, concerning the use of references in magazine articles, seemed particularly disturbing. Although these works are positioned to reach wide audiences, 70% contained no references, and 92% contained no direct reference to a peer-reviewed research article.

Of some interest, perhaps, is the finding that the number of peer-reviewed research citations in a reference list correlated strongly and significantly ($r=.74, p < .001$) with the number of citations overall. That is, the tendency to use citations was strongly associated with the tendency to draw upon the empirical literature.

We conclude as a result of these analyses that the prescriptive literature exhorts a wide audience to act on received wisdom, rather than to examine the relevant empirical

³ Three works contained the maximum number of such citations (6 citations to peer-reviewed research studies): Campbell & Silver (1999); Harmon & Blanton (1997); and Madden, Slavin, & Simons (1997). The two works in this literature co-authored by the third author of the present study (C. Howley) included no connections to the peer-reviewed empirical literature.

literature or consider problematic issues and reach independent judgments. This familiar tendency has particularly disturbing implications in the case of mathematics education for rural places.

Not only is the prescriptive literature inattentive to empirical findings, it tends overall (and with a few exceptions) to reflect a deficit model of rural mathematics education. This perspective, which informs a cosmopolitan agenda of school improvement, may well represent an instance of the more general reformist view that *mathematics education* is deficient, rather than representing a special attack on the deficiency of *rural* mathematics education per se. Nevertheless, as we argue below, the deficiency view may tend to limit the ability of rural schools and communities to foster mathematics education practices that embed local meanings and respond to local circumstances.

The Cosmopolitan Agenda

Typically, the recommended remedies involve practices that are construed by educators as applicable universally. For example, the professional consensus promotes a standards-based mathematics curriculum as everywhere preferable to a so-called “traditional” curriculum. Similarly, constructivist pedagogy is authoritatively announced as preferable to traditional (i.e., didactic) pedagogy in all schools. Nevertheless, this orthodoxy seems quite unworthy of a progressive, constructivist perspective. Ironically, the orthodoxy of constructivism leaves little room for local people to construct the meanings of mathematics (and mathematics education) on their own terms.

With the probable exception of those that advocate “place-based curriculum,” most of the documents represented here seem tacitly to construct rural lifeways as an impediment to good education. The more generous and inclusive perspective—that curriculum and instruction ought to be supportive of *rural versions* of the “good life”—is an idea that is rarely entertained in this literature. (Documents representing the work of the Alaska Systemic Initiative are notable among the few exceptions.) So far as can be judged from this literature, the preferences associated with rural lifeways tend to be viewed as good neither for the residents of rural communities nor for the nation as a whole.

The construction of a future for rural youth perhaps constitutes the most poignant site for the ongoing contest between local and professional versions of the good life. For many rural families, adult life within the community represents the best possible future for young people. Professional educators, by contrast, typically maintain the view that success in the wider world is preferable. As Campbell and Silver (1999, p. 16) aptly note, “schooling that promotes individual achievement as necessary for economic success seems in many cases to undercut the importance of a sense of place and the kinship bonds of rural families.”

Mathematics education, moreover, supports this apparent subversion of rural community in an instrumental way, primarily because it stands as gatekeeper to tertiary education. And in the conventional wisdom, tertiary education represents the most likely route to economic—and, therefore, life—success. Indeed, economic difficulties confronting many rural communities seem to reinforce the view that young adults have no other reasonable option than to abandon the rural communities in which they grew up.

Accepting this alternative as a given, Johnson (1992, p. 134), for example, explained that students from rural areas are “being forced to leave their rural environments, learn an entirely new set of job-related skills, and compete on a national rather than local basis.” Mathematics education thus affords or denies students access to further schooling and productive careers. Unfortunately, when mathematics (via school mathematics) presents itself to in this way rural communities, standards-based mathematics can be misrepresented as a way for students to overcome the shortcomings associated with having been born rural. In impoverished rural places, this eventuality strikes us as both likely and unfortunate. Everyone loses, prospectively: students, communities, mathematics education, the life of the mind, and, quite arguably, the field of mathematics itself.

Alternative Perspectives

Although they receive scant attention in the literature analyzed in this paper, three other perspectives may promote a more harmonious relationship between mathematics education and rural life than is possible from the vantage of the cosmopolitan agenda. The first of these is “place-based pedagogy,” most often presented in the literature examined simply as a palatable way to “ruralize” standards-based mathematics. In this formulation, local knowledge is drawn upon as a method for grounding students’ learning in familiar places and customs. The ultimate purpose, however, of these linkages is to harness the power of place in service of cosmopolitan ends (see Williams, 1973, 1989, and the introduction to this paper).

This version of place-based education is a contested one, however. A stronger articulation of “place-based pedagogy” privileges both locally defined educational aims and locally grounded curriculum and instruction. The Alaska Rural Systemic Initiative (AKRSI) provides the clearest example of this approach in the literature we reviewed. The purpose of the initiative is to “systematically document the indigenous knowledge systems of Alaska Native people and develop pedagogical practices that appropriately integrate indigenous knowledge and ways of knowing into all aspects of education” (Barnhardt, 1999, p. 9). Self sufficiency of indigenous communities, rather than preparation of native youth for jobs in the cosmopolitan marketplace, is its ultimate aim.

A second perspective acknowledges the relative success of rural schools in promoting mathematics achievement and, as a consequence, construes the curriculum and instructional practices of most such schools as acceptable. Because (from this perspective) rural locale does not by itself imply deficiency, rural mathematics education need not be seen systematically to require improvement. Hence the traditional curricula and didactic practices adopted in many rural schools are—on this view—perfectly acceptable, and the rhetorical literature directed toward reforming those educational approaches is, in general, misdirected.

Finally, a perspective that may be especially difficult for mathematics educators to accept nevertheless provides another alternative to the cosmopolitan agenda. From this perspective, rural communities have the right to decide the extent to which mathematics represents valuable knowledge. Determinations about the utility of knowledge, then, come from rural understandings of what constitutes the good life, rather than from cosmopolitan or (what is much the same thing) professional conceptions. This

perspective allows for the possibility that rural communities might refuse to devote much attention to mathematics education.⁴

This unsettling perspective (unsettling, at least, to mathematics educators) need not, moreover, be viewed as a refusal to accept a manifest benefit. A radical version of this point of view would argue that such refusals sometimes represent an informed political stance. If, for example, school mathematics is used systematically to lure rural students away from their communities or to impose diminished identity constructions on rural children and youth, then resisting such education may indeed be in the best interest of families and communities.

Two Conclusions

This analysis of the prescriptive literature on mathematics education directed toward rural schools harbors two disturbing conclusions, one practical and one theoretical. Practically speaking, the relative absence of concern in this literature for connections to empirical research ought to trouble educators and policy makers (and to distress rural community advocates). With a few exceptions (e.g., Campbell & Silver, 1998), the recommendations and prescriptions given exhibit no logically adequate connection to empirical studies—not to the generic mathematics education literature, and certainly not to the thin literature on rural mathematics education. In fact, none of the texts examined noted the sharp need for research about mathematics education specifically focused on the issues inherent in rural context.

⁴ The authors of this paper might not want to live in such a community, and we are not necessarily indicating our own preferences in formulating these alternatives.

The recommendations made seem to represent a default position: the putative need to implement standards-based “best practice” in rural schools and the manifest need to address the varied state-level mandates to raise test scores. The best practices identified in the analysis (e.g., professional development, challenging curriculum, community engagement, and distance-learning technologies) are positioned in nearly every case to support the conventional wisdom of rural deficiency—without empirical support, theoretical depth, or much appreciation (with a few notable exceptions) of the problematic nature of decent practice.

The second disturbing conclusion concerns the lack of theoretical depth in the prescriptive literature, particularly with respect to ideas that have played some role in problematizing educational practices in other fields (see Walkerdine, 1988, for an example in mathematics education). Whereas ideas about social context, which tend to be associated with “critical theory” and “critical pedagogy,” have had a pronounced influence on professional discussions about English education and social studies education, they have had almost no influence on discussions about mathematics education.⁵ Notable in some fields, for example, is a literature critiquing educational practices that treat certain groups as “other” by dismissing their rights to self-definition and self-determination.

The fact that the rhetoric about rural mathematics education does tend to treat rural people as “other” demonstrates, in our view, the need for a critical literature of mathematics education. Analyses of issues in the rural lifeworld—including empirical

⁵ A keyword search of the ERIC database using “mathematics” and “critical pedagogy” yielded a search set including only one document. A parallel search using “social studies” and “critical pedagogy” yielded a search set of 12. Furthermore, “critical pedagogy” is connected to other concepts like multicultural education that have influenced English and social studies education far more than mathematics education.

investigations—could contribute prominently to such a literature (see, e.g., Hackenberg & Mewborn, 2003). Moreover, local initiatives to develop versions of mathematics education that serve the interests of rural communities might form part of a wider effort to free mathematics itself from an unfortunate tendency to serve to the cosmopolitan agenda of global economic competitiveness. Such wider effort would position mathematics itself as a potential source of meaning available to all groups of peoples and mathematics education as a set of practices enabling groups of people to incorporate mathematics into lifeways that make sense to them.

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