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Reflections from a Working-Class Scholar Who Resists And Embraces Scholarship In Mathematics Education

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Reflections from a Working-Class Scholar Who Resists And Embraces Scholarship In Mathematics Education

Although I didn't exactly set out to do it, I have studied both reform and resistance in mathematics education in various ways over the past decade. For my dissertation I studied working-class students' resistance to mathematics instruction aligned with the NCTM *Standards* (1989; 1991). Questions raised from that study prompted me to examine issues of equity and reform utilizing nationally representative, large-scale data. The resistance I encountered when discussing some of my work on equity prompted me to study resistance in a new way, focusing on the ways in which scholars frame discussions of equity. Additionally, local circumstances prompted me to study students' and parents' resistance to a reform-oriented high school curriculum.

As I have traveled along my career path, I have become aware of the increasing distance I have traveled away from my working class roots. I have tried to keep track of the occasional jolts of insight into this process that I have had along the way, so that I can share them with others who are making a similar journey.

My sense is that many scholars who study rural education are interested in the topic because they, themselves, have come from rural roots or from other settings in which life in academia was a relatively foreign concept. At an AERA session on social class and education recently, a speaker remarked that in order to meet her fellow working-class scholars, she attends the Rural Education special interest group meeting, because there is no working-class special interest group. Certainly, issues related to rural education have important intersections with social class issues.

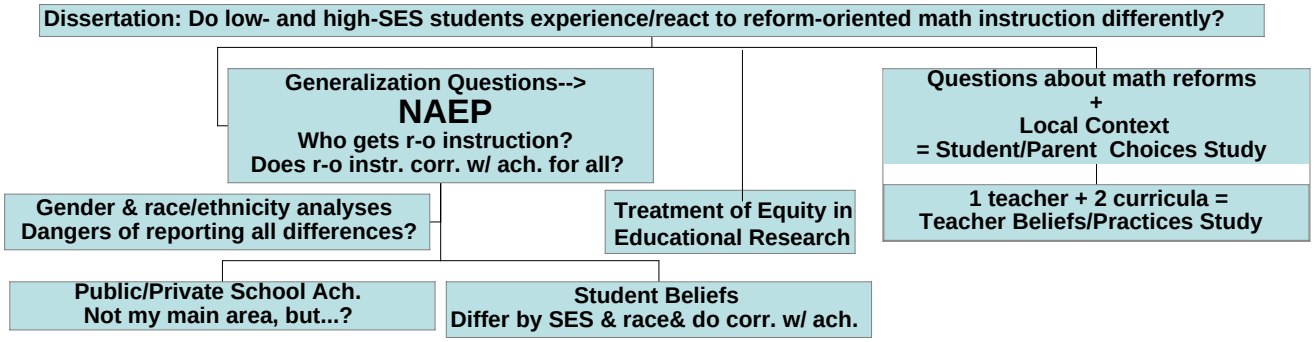
Instead of giving a formal presentation of a single study, today I'm going to talk from a more personal standpoint, summarizing the highlights of my most relevant studies to the conference topic

of reform and resistance, while also telling a story of how my research has evolved and what I have learned along the way. I hope that my reflections will be helpful, at least in some small way to you if you are also a scholar who feels you are entering a somewhat foreign land. If nothing else, it might comfort those of you who are bothered by not being on a more well-planned, linear scholarly path; you will see that at least you have some company if you are more the meandering type.

Low-SES Students' Resistance to Reform-Oriented Curriculum and Instruction

If one were to look at my research path in the way one examines a family tree, it would look something like this:

Figure 1: Research path in "family tree" form



My first study, from which the other studies have directly or indirectly followed, began with the question, "Do lower- and higher-SES students experience and react to "reform-oriented" mathematics instruction differently? If so, how?" Several factors prompted me to ask this question in the third year of my doctoral program at Michigan State University. During the previous two years, I had the privilege to work with the Connected Mathematics Project in writing and piloting materials and preparing teachers to use the materials. In that context, I worked and studied with many central players in the NCTM reforms. Having read Anyon (1981) and Heath (1983) in my

doctoral courses, I began my dissertation study with concerns that lower SES students were too often taught to be followers instead of critically thinking leaders, and I was enthusiastic about the reformers' goals of developing reasoning and problem-solving skills in *all* students. I was optimistic that I, unlike the biased teachers I had read about in my doctoral seminars, would hold high expectations for all, with the belief that lower SES students *can* succeed in mathematics, just as I had succeeded.

I was very aware of how my own mathematical abilities had opened doors for me—for example, I received a major scholarship solely on the basis of my ACT score, which was pulled up substantially by my math score. Although I didn't realize it at the time, in retrospect, I now see that the rules of the math game were clear to me in high school – particularly when compared with my attempts to analyze the "use of color in MacBeth" in literature class, or when I needed to know the difference between a democrat and republican in my Government class. In math, I could just memorize the formulas and do the problems, and the fact that at home we did not have many books and we gave little attention to national politics, did not hamper my ability to perform well. Although the rules of the math game were primarily about memorization and procedures, the rules were somewhat equally transparent (albeit arguably meaningless) for all students. But when I began this study, I was not thinking about those issues.

I had piloted the CMP materials in a 6th grade classroom the previous year, and was generally pleased with the results. I held high expectations, I prompted my students to learn through problem solving and discussion, and most students were actively engaged. But the few students who did not seem to engage as I had hoped, also appeared to be the students of lowest SES. The following year I requested the opportunity to pilot the 7th-grade trial materials in a more socioeconomically diverse, but primarily white, school, allowing me to examine differences between low- and high-SES students with little variation in student race.

I had assumed that I would find important SES differences in parental support for completing homework or students' familiarity with the contexts used in the problems. I didn't. I did see other patterns. First, I should note that there were many aspects of instruction that did *not* appear to be problematic from an equity standpoint, such as the use of cooperative groups or graphing calculators. However, there were two disparities that became apparent in students' experiences with both the curriculum and my pedagogy. The first theme involved students' reactions to receiving less explicit guidance from the teacher and textbook than they received in traditional classrooms. The second theme related to the expectation that students would abstract intended mathematical content embedded in "real world" contexts.

Theme 1: Teacher/textbook guidance

Typically, in my lessons I introduced a problem from the curriculum, students worked on the problem in groups, and then we had a summarizing discussion in which I intended to highlight key mathematical ideas. As the teacher, I guided our discussions with questions, inserting terminology, definitions and other conventions when necessary.

Students differed in their comfort with the trial CMP materials. More low-SES students made comments such as, "I used to do really good in math…Some of the [CMP] questions I don't understand at all" (Sue) or "I don't like this math book because it doesn't explain EXACTLY" (Dawn). In contrast, the only students who expressed a preference for CMP were of high-SES, with comments such as "This year we're doing stuff that I like…Before we just sat there with 100s of problems on a page" (Rebecca).

Whereas most higher-SES students said that our whole-class discussions exposed them to different mathematical ideas and that part of their role was to analyze those ideas, more lower-SES students talked about their role in discussions as obtaining or giving right answers. This distinction

was strong in the multiple forms of data (three interviews, several surveys) gathered from students, and is exemplified by students' responses to the final survey given, as shown in Table 1.

Table 1: Students' Answers to the Question "Do You Participate Much in Class Discussions? Why or Why Not?" (From Final Survey)

Student	Response
Lower SES:	
Rose	Yes, If I know what I'm talking about. But if I'm confused I just listen.
Sue	Sometimes — only if I know I've got the right answer.
Dawn	No, because I don't like to be wrong in front of a whole group.
Carl	No, because I always feel awkward.
Higher SES:	
Guinevere	Yes, because I need to get my point across.
Samantha	Yes, because I want other people to understand my ideas. I like arguing.
Rebecca	Yes, because I do.
Benjamin	Yes, because I like to let people know what I'm thinking.

Differences in the two groups of students' conceptions of their own and the teacher's role seemed to relate, in part, to differences in their confidence in both contributing to, and analyzing the ideas shared in our discussions. As Table 1 indicates, "Rose" and "Sue" said they only contributed to discussions if they were confident in what they had to say. "Dawn" and "Carl" said their feelings of inadequacy kept them from participating.

The issue of confidence recurred in the data in relation not only to how students participated, but in their own perceived ability to make sense of discussions. More lower-SES students consistently said that having a variety of ideas proposed in discussions confused them. For example, Lynn explained:

> Sometimes people say things that aren't true, like wrong ideas, and I get those stuck in my head, and I have all these different ideas going and it's confusing.

Most lower-SES students said they preferred more teacher direction — they wished I would just "show how to do it" or "tell the answer." For example, Sue explained:

> I learn better from just like the teacher instead of the whole group…When everyone is there they give their opinions…and it just confuses me.

In contrast, more higher-SES students said they could sort out which ideas were sensible and which were not. Six of the seven students who consistently said the discussions were helpful to them were higher SES. Rebecca's response was fairly typical of higher-SES students:

STL:	Did you learn from our [whole-class] discussions?
Rebecca:	Yeah, I think it helps me learn more things. Instead of just like doing it on your own, I can know everybody's opinions and take it into consideration.
STL:	Do you find it confusing when you have all those different opinions out?
Rebecca:	Not really…some of 'em aren't true, and some of 'em are, and I can figure out which ones are true and which ones aren't and stuff.

Given the confusion that some students expressed, I probed their understanding of what happened when people could not agree on an idea. I found that more high-SES students understood my use of "hints:"

STL: How do we figure out which ways are right and wrong?

Guinevere: Hints.

STL: What do you mean?

Guinevere: You say, "Well I don't know if that would work."

STL: Why do you think I do that?

Guinevere: So we don't learn the wrong thing and think it's right.

STL: Why don't I just tell you, "She's right and he's wrong"?

Guinevere: So we can figure it out.

Guinevere understood my intentions as a facilitator of mathematical discussion: I wanted to help students figure things out for themselves, but I did not want them to flounder too much and end up learning "the wrong thing." After several higher-SES but no lower-SES students spoke in interviews about my use of "hints" or "clues," I began to wonder if the way I inserted information into the discussions might have been more helpful to the higher-SES students, who seemed more attuned to my assumptions about our roles.

Hence, while more higher-SES students expressed confidence in their abilities to make sense of the mathematical discussions and problems, more lower-SES students said they were unsure of what they were supposed to be learning, and many said they wished that I as the teacher would just tell them "the rules" so they could have more time to practice.

Theme 2: Abstracting mathematics from contexts

In addition to the first theme of "authority/direction", a second theme involved students' abstraction of mathematical ideas from contextualized problems. Specifically, whereas the higher-SES students seemed to approach the problems and discussions with an eye toward the over-arching, mathematical ideas I intended to teach, the lower-SES students more often became deeply

engaged in the context of the problem at hand and missed the intended mathematical point. This difference was particularly apparent in students' approaches to some of the "real world" problems in the curriculum. Whereas more higher-SES students complained about seeing the same mathematical ideas repeatedly with different story lines attached, more lower-SES students complained that they did not know what mathematics they were supposed to be learning.

As an illustration, in a pizza sharing problem designed to help students learn about fractions, more lower-SES students expressed real-world concerns, such as who might arrive late to the restaurant, and they talked about sharing pizza in terms getting "firsts" and "seconds." These students were sophisticated in their consideration of multiple, real-world variables, but did not encounter the intended ideas about fractions on their solution paths.

As another example, students were asked to compare the volumes and prices of three popcorn containers sold at a movie theater. Rose, a very bright low-SES student, had no trouble finding the volumes from the given dimensions, and then she used solid "common sense" reasoning to argue that, since the prices went roughly in order of size, "It depends on how much popcorn you want." Although Rose's reasoning was more sensible from a "real-world" standpoint than a more typical "school" approach, she missed the intended experience of working with volumes and comparing unit prices.

In general, the higher-SES students seemed to enter my classroom with more of the beliefs and discursive skills that were assumed and rewarded by the pedagogy and curriculum. More lower-SES students expressed confusion about our roles in this discussion-intensive, problem-centered classroom, and expressed frustration and anger regarding the new curriculum. Although some differences were likely attributable to students' prior mathematics achievement, this was not a complete explanation.

Searching for explanations

To try and make sense of the data, I went to literature from other fields, including sociology and anthropology. Some of this research is heavily contested and has been criticized for promoting overly simplistic dichotomies and stereotypes. However, from my standpoint, avoiding the subject is detrimental for lower-class students, whose strengths and needs are then ignored. The distinctions to be discussed are, of course, generalizations, and we must also be mindful that people have multiple group affiliations such as those relating to ethnicity, gender, geographic region, as well as social class.

Some scholars have suggested that differences in occupations and societal position have helped shape differences in social class cultures. Although working-class jobs often require conformity to rigid routines, middle-class occupations allow more autonomy and intellectual work (Kohn, 1963, 1983). Similarly, scholars have found working-class parents to be more overtly directive when instructing their children, whereas middle-class parents tend to utilize questioning, discussion, reasoning, and playfulness in child rearing (Duberman, 1976; Hart & Risley, 1995; Lareau, 2002; Walkerdine, 1998). More middle-class parents have been found to guide their children's problem-solving by asking questions that help children focus on the structure of problems, whereas working-class parents have been found to focus more directly on solving immediate problems in specific contexts (Bruner, 1975; Duberman, 1976; Heath, 1983; Hess & Shipman, 1965). Research also suggests a relationship between class and perceived locus of control, with more middle-class people believing they have control over their futures than working-class people, who are more likely to believe that luck or authority figures determine their fate (Banks 1988; Lareau, 2002).

Bernstein (1975) argued that because members of the lower classes depend more on nearby friends and family, such families tend to use language with implicit and context-dependent meanings. This language makes sense in contexts in which common knowledge is assumed to be

shared. Bernstein's theory has been criticized being overly simplistic, but as Hymes (1996) notes, such dichotomies can also be useful as "symptoms of recognition of an issue; first approximations in addressing it" (p. 55). In her attempt to understand how Bernstein's theory might apply to children's thinking, Holland (1981) found that middle-class children tended to categorize pictures in terms of transsituational properties (e.g., grouping foods made from milk or that grow on trees), whereas working-class children tended to use more personalized, context-dependent meanings (e.g., grouping foods they eat at Grandma's house). It is important to note that neither Bernstein nor Holland imply that children could not speak or think differently. Their point is that children tend to be raised with a particular orientation. More recently, Cooper and Dunne (2000) found that class disparities were particularly large on "realistic" items on the British national assessment, because lower-SES students tended to take the contexts more seriously than the test authors intended. Walkerdine (1990) also observed working class children becoming engrossed in mathematical contexts used in school (such as shopping) but not gaining the intended mathematical knowledge. She argued that the wealthy have the luxury of performing calculations as a theoretical exercise (e.g., considering how much money would be left if a particular item was purchased), whereas such calculation problems are more real for the poor.

Taken together, this literature and the data from my study suggest some ways in which learning via problem solving and teacher questioning might be more aligned with middle-class students' preferred ways of learning. This ultimately raises the question of whether reform-oriented instruction should then be avoided with low-SES students. My answer has consistently been "no." Such avoidance would only further the patterns that Anyon (1981) identified, with low-SES students receiving training for menial jobs, and high-SES students receiving preparation for high-status positions. It is important to note that my study did not show that low-SES students learned *less* in a reform-oriented environment than in a more traditional classroom. In fact, one could argue

that lower-SES students have more to gain from problem-centered, discussion-intensive instruction than do higher-SES students. What I take from the study is that we cannot assume that all students will "naturally" thrive in such an environment. (See Lubienski 2000a; 2000b for additional details on this study.) We need to be aware that by changing the rules of the math classroom, we might be creating particular difficulties for lower-SES students, and we must find ways to address those difficulties (e.g., see Lubienski & Stilwell, 2003).

Large-Scale Looks at Reform, Achievement and Equity

My dissertation study raised many more questions than it answered. The small-scale nature of the study left me feeing frustrated in that I had examined one classroom very closely, but I wanted a broader sense of what was going on nationally under the current wave of NCTM reforms. Based on the literature I had found, I felt I was basing my claims on more than just my single classroom, but I still had questions about broader instructional trends and outcomes. Hence, I turned toward data from the National Assessment of Educational Progress (NAEP).

I focused on Main NAEP data, which is nationally representative and utilizes multiple-choice, short-answer, and extended constructed response items from the five areas of mathematics recognized by the National Council of Teachers of Mathematics (1989, 2000): Number, geometry, measurement, algebra, and statistics/probability. Another important strength of this dataset is that it offers student, teacher, and administrator survey data regarding a variety of student and school characteristics.

To help the reader interpret the results discussed here, some information about NAEP scores is necessary. NAEP mathematics results are reported with scale scores, with differences in 10 or 11 points representing a moderate effect size of .3-.4, or in rough, unofficial terms, a difference of "one grade level."

The details of my various examinations of NAEP regarding race/ethnicity, SES, and gender have been recorded elsewhere (Lubienski, 2002; Lubienski, in press; Lubienski & Crockett, in press; McGraw, Lubienski & Strutchens, 2006). Here I will simply highlight some of the more interesting findings I've come across over the past few years.

First, between 1990 and 2005, 4th and 8th-grade test scores rose rather dramatically—25 points at grade 4, and 16 points at grade 8. Grade 12 rose 6 points between 1990 and 2000, and no more recent data are available at this time. Despite the overall good news, there were striking, persistent disparities between White students and their Black and Hispanic peers— gaps of 20-40 points.[1] Moreover, there was some evidence that these gaps widened slightly during the 1990s, and then narrowed a bit since 2000, raising questions in political circles about the relative effects of NCTM and NCLB.

Given my primary interest in social class, I examined the extent to which race-related gaps diminish when the fact that white students are disproportionately of higher SES is accounted for. Quite frankly, I have been troubled at the extent to which substantial score gaps persist even after controlling for SES. One way to see this is to use the rough variable, free and reduced lunch, and examine the extent to which racial/ethnic disparities persist within and across categories (see Table 2). This examination reveals the persistence of large gaps within each category – for example, the 21% of White 8th graders who qualified for lunch scored 23 points higher than the 64% of Black 8th graders who qualified. But even more disturbing is the fact that at 4th, 8th and 12th grades, White and Asian students who were eligible for free/reduced lunch scored roughly equal to or higher than Black and Hispanic students who were *not* eligible for lunch. Findings such as these prompted me

[1] For the sake of consistency with NAEP data, I am using NAEP's terms for racial/ethnic groups. I do acknowledge that these terms are not necessarily the best or most accepted terms.

Table 2: 2005 NAEP Scores by Race/Ethnicity & Lunch Eligibility	4th		8th		12th (2000 data)	
	Lunch	No Lunch	Lunch	No Lunch	Lunch	No Lunch
White	234 24%	250 66%	273 21%	292 71%	289 6%	308 64%
Hispanic	222 74%	235 21%	257 66%	271 27%	278 42%	287 36%
Black	216 71%	230 24%	250 64%	264 31%	268 34%	276 42%
Asian/PI	238 32%	258 57%	279 30%	303 60%	286 15%	325 52%
American Indian	221 64%	238 30%	258 64%	276 33%		

Note: Percentages are of students within each racial/ethnic category who qualify (or not) for free/reduced lunch. For example, 24% of White fourth graders qualified for free/reduced lunch. Shaded cells indicate sample size too small to produce reliable estimates.

to both make race/ethnicity more focal in my subsequent NAEP analyses and to create more sophisticated SES composites that go well beyond lunch eligibility.

Lest the persistence of the race-related gaps confirm pessimist or racist suspicions that Black and Hispanic students simply cannot match white students' math achievement, it is important to note that the 2005 scores of Black (220 points) and Hispanic (226 points) fourth graders were equal to or higher than the 220 points white fourth graders scored just 15 years before. In other words, if white/Asian 4th graders' achievement had held constant these past 15 years, achievement gaps would now be closed. Overall, these trends convey the idea that curricular and pedagogical changes can impact students' scores, but general instructional shifts geared toward *all students* appear unlikely to seriously impact achievement gaps.

There are many other NAEP results related to reform and equity that I have reported elsewhere. Summarizing the data very briefly, there are more similarities than differences in students' mathematics classroom experiences (at least according to the rather rough, self-reported NAEP survey information), but there are some ways in which high-SES and white students are appearing to experience a greater amount of reform-oriented instruction than their less advantaged peers. For example, high-SES white students are significantly less likely to agree with the statement, "Learning math is mostly memorizing facts" than are Black, Hispanic and low-SES students. Additionally, disagreement with this statement correlates positively with achievement. However, because of the cross-sectional nature of NAEP data, such correlations cannot be interpreted as causal (Lubienski, 2002; in press).

Another interesting NAEP-related finding, and one that has gotten more press than all of my other research combined, concerns public-private school differences. I found this accidentally while controlling for school sector as a potential confounding variable—a variable that was, quite frankly, of little interest to me. It's common knowledge that private schools generally outperform public schools, but what I found using the 2000 NAEP data is that after creating a good SES variable (using multiple measures, including free/reduced lunch eligibility, parent education level, computer access at home, reading material at home) and examining public-private achievement within each SES quartile, the public schools actually outscored private schools within each SES quartile. This finding prompted me to collaborate with my husband, Chris Lubienski, who studies privatization movements in education. Together we looked at the more recent 2003 NAEP data and examined particular types of private schools. Overall the pattern still held—public schools looked surprisingly good when compared to other school types. (For more information, see Lubienski & Lubienski, 2005; 2006) What has been enlightening for me is to see how politicized the research in this area is, and the extent to which some organizations and individuals have resisted our findings.

Having been living in the land of mainstream mathematics education, I had become overly optimistic about the extent to which those concerned with education are "all in this together," seeking at least some sort of truth about teaching and learning through research. However, having entered a much more politicized terrain of national-level educational policy makers, I now realize the extent to which the land of mainstream mathematics education is, in many ways, remarkably amiable. For example, within mainstream mathematics education, it is rare for uninformed or misleading attacks to be purposely put forth to promote a particular agenda, while such behavior appears to be much more typical in the national policy arena.

One interesting finding from this public-private study that is relevant to this conference resulted from our examination of school location as a potentially confounding variable. A relatively small percentage of private schools are located in rural areas; the most likely private school type to be located in rural areas were Conservative Christian schools. The multi-level analyses conducted revealed the net effect of school location, after the student and school-level demographics were taken into account. Rural schools had a small (2-3 points) but persistent negative coefficient, as did being located in the west. Being located within a large city and in the south however, did not correlate negatively with achievement after demographic differences were accounted for. (Again, see Lubienski & Lubienski, 2006 for more details.)

Critiques of the Treatment of Equity in Education Research

After searching the literature for mathematics education research that would help me make greater sense of patterns in my dissertation data and in the NAEP data, I began to notice some ways in which the research was lacking. In 1999, I worked with a student on a systematic search of all articles indexed in the ERIC database between 1982 and 1998 (Lubienski & Bowen, 2000). Using hundreds of ERIC descriptors, we compared the number of articles published on various equity-

related topics in both mathematics education journals and in education research journals more generally. This exploration confirmed my suspicion that relatively little research had been conducted on social class and on race/ethnicity within mathematics education. Specifically, while 11% of mathematics education research articles pertained to gender, only 4% pertained to race/ethnicity, and 2% related to social class. Only a handful of articles examined the intersections of any two of these three topics, with exactly three articles including attention to race/ethnicity, social class and gender (and these articles were essentially calling for more research on this intersection, as opposed to reporting research). We also noticed that most of the work on equity in math education focused primarily on achievement outcomes, as opposed to processes that might contribute to those outcomes.

Over the past decade, new voices have drawn more attention to issues of race/ethnicity and social class in mathematics education, including the ways in which students' home communities intersect with school mathematics. More researchers are grappling with the multiple levels of students (e.g., Nasir, in press) within schools (e.g., Gutierrez, 2003), and within larger community contexts (e.g., Civil, 2002; Martin, 2000). Additionally, still others have raised more fundamental questions, such as why all students should learn mainstream mathematics, and whether the mathematics we teach, itself, should promote deeper considerations of social justice (e.g., Gutstein, 2003). Hence, I believe if I performed the same study today, the results would be somewhat different.

Despite the fact that my research on social class and mathematics education was most foreign and threatening to mainstream mathematics education scholars, I actually encountered more resistance to my research among those who study equity in education. Some audiences raised questions about how SES was operationalized (e.g., "If a child's mom is a college graduate but the dad is a factory worker, how did you categorize the child?") and thereby tended to miss the main

point of the research I was presenting. Other audiences became upset by what they viewed as my tendency to "essentialize" students and for appearing to walk too closely to a "deficit" perspective when discussing the possibility that low-SES students' might tend to prefer a more traditional teacher role. Some were quick to interpret my dissertation research as implying that reform-oriented teaching should not be used with low-SES students. Still others took issue with my focus on achievement gaps, arguing that standardized measures privileged white, middle-class males, and that reporting the gaps are essentially promoting the idea that white, middle-class male knowledge is some sort of "gold standard." In thinking through these issues, I began to realize the pragmatic side of myself. I tend to criticize the injustices of our current system, while also believing it important to prepare marginalized students to thrive within that system.

The critiques of my work prompted me to write an article that raised critical questions about the education research community's lack of attention to social class disparities (Lubienski, 2003). I argued that the very real disadvantages that low-SES students, in particular, must face are being glossed over in our attempts to frame all diversity as positive. While it is easy to see ethnic and gender differences in positive terms, it is less clear how huge disparities in wealth and power are worthy of celebration. I also raised concerns about emphasizing only inspiring success stories of students and teachers who overcome the odds. Although such stories can be helpful, I would argue that closely examining students' and teachers' barriers to success is also important. Too often teachers are blamed for low achievement of their low-SES students, without acknowledgement of the many barriers such students and their teachers have to overcome. Ultimately, I fear that the current, narrow stance of the educational research community is causing us to lose credibility with teachers, policy makers, and the general public.

One Community's Resistance to Mathematics Education Reforms

Another way in which I have studied resistance in mathematics education is in the context of one small city in Iowa, where students and parents were offered a choice between a traditional high school curriculum, and a more problem-centered, integrated approach (Lubienski, 2004). This district had switched to a reform-oriented middle school curriculum several years before, prompting much controversy that was fueled, in part, by a decline in middle-school scores on the computation portion of the Iowa Test of Basic Skills as the new curriculum was beginning to be piloted in some classrooms. (According to some district leaders, the drop was too early to be attributable to the new curriculum). Despite district attempts to address parents' concerns, and despite the complete rebound of computation scores, dissension remained. However, the district has continued to use reform-oriented curricula at the elementary and middle school levels.

Hoping to avoid controversy but wanting to move toward *Standards*-based instruction at the high-school, district leaders decided to offer parents, students, and teachers a choice between the "traditional" sequence (Algebra I, Geometry, Algebra II, Pre-Calculus) and the *Core Plus* sequence integrating algebra, geometry, pre-calculus, and statistics (and is therefore referred to in the district as "Integrated Mathematics"). Accelerated middle school students beginning high school mathematics in 7^{th} or 8^{th} grade were also given the choice.

Information about the two options was sent home to parents in school newsletters, presented via local-access television, and presented at parent meetings. Despite school leaders' efforts to promote the Integrated sequence, over 80 percent of students (and/or their parents) chose the traditional sequence (Lubienski, 2004). Survey data revealed that college preparation was the most important factor for roughly one half of parents, including 70 percent of parents with limited formal education. Additionally, although college-educated parents were more likely than other parents to discuss the options with teachers, they were the least likely to be influenced by teachers' comments. Many

parents were concerned that colleges would not recognize “Integrated Mathematics,” or that the sequence would be too much like the middle-school curriculum, which parents and students criticized for involving too much group work, lack of attention to “basics,” and too little explicit direction. Parents who chose the traditional sequence expressed more concern about college preparation, whereas parents who chose the *Standards*-based sequence placed a higher priority on student understanding and enjoyment of mathematics. Overall, many parents and students in the district held strong, persistent anti-reform beliefs. Although many reformers have a “if they try reform-oriented instruction they will like it” attitude regarding parents and students, the parents and students in this district are choosing traditional largely because of their experiences with reform-oriented instruction in earlier years.

Not only have parents and students had the opportunity to choose their curriculum in this district, the teachers have also had some choice as to whether they teach integrated and traditional math curricula. However, some teachers have taught both, literally switching from one curriculum in first hour, to the other in second hour. This situation raised some interesting questions – would teachers actually switch their teaching style to match the curriculum? Or would a teacher’s beliefs about “good teaching” permeate the teacher’s pedagogy regardless of the curriculum used? Former colleagues and I closely studied one teacher, Jackie, who taught both curricula each day (Herbel-Eisenmann, Lubienski & Id-Deen, in press). Jackie was a leading proponent of *Standards*-based mathematics instruction for years, even in the face of much criticism from parents. However, she was now teaching a group of students who had consciously chosen traditional instruction. Survey data collected across three years revealed that she did, indeed, change her teaching drastically to match the curriculum. For example, while 3% of her Algebra students said they work in groups “almost every day”, 100% of her Integrated students reported daily group work. And while 67% of the Algebra students reported that Jackie lectured for the majority of the class period, only 8% of

the Integrated students reported this. In interviews, Jackie revealed an awareness of these differences. She reported that she consciously switched her teaching to match the structure of the curricular materials, and to meet parents' and students' expectations. She explained these factors as follows:

> One barrier [to reform implementation] is parent reaction – if they don't know what you are doing and why you are doing it, that can cause some problems. Also, it is difficult for me to redesign curriculum materials that are not *Standards*-based. Time is a huge factor in that, but so is the knowledge that many of the students who have chosen to take algebra make the choice because they want a traditional approach.

Jackie struggled with balancing her own beliefs about quality instruction, and the views of parents and students:

> If I wanted to teach Algebra as a *Standards*-based course, I'd have to design everything from the ground up…and I probably <u>should</u> do that, but then here are all these parents who didn't want that. So what is my obligation here?"

Ultimately, the resistance of parents and students to reform-oriented instruction has made it difficult for the district to consistently offer the Integrated sequence due to limited enrollment. At this time, it is unclear what the final story of reform and resistance in this district will be.

Reflections Across Various Studies of Reform and Resistance

As I consider my work thus far, I am left with lingering questions about paths taken and not taken, and the wisdom of possible future directions. I sometimes wonder if I shouldn't be on a more linear path, and I question the extent to which I should pursue interesting opportunities/findings that branch away from my intended path. On the other hand, in most cases,

the detours I have taken have been interesting and productive. I also continue to wrestle with balancing the harm and good that can come from particular forms of research on equity. I certainly do not have this all figured out yet.

Ten Pieces of Advice for New Scholars in Mathematics Education

Still, I have figured out some "rules of the game," as someone who has moved from being a working-class kid to a tenured professor. I want to close by sharing some of my observations and advice, in the hopes that others who are blazing a similar path might have a slightly smoother transition. In that interest, I offer my top ten pieces of advice for new scholars in math education:

1. Follow your heart. For example, when selecting a dissertation topic, pay attention to what gets your blood pressure up, or what makes you cry, or what makes you mad or scared. This could even mean changing your dissertation topic in mid-stream, if you find that what matters most to you is something other than what you had originally set out to study.

2. Follow your personality. For example, once you have chosen an issue you want to study, your personality might dictate whether you are examining that issue with a case study or a large-scale data set – or both, or something in between. Don't force yourself into a work style or mode of research that does not fit you. As a personal example, I did a very small-scale dissertation study. However, I have found that the more pragmatic side of me finds the philosophical conversations that tend to occur among my qualitative colleagues —conversations about redefining terms and constructs, for example—sometimes feel too close to naval gazing and too far from realities of the poor for my taste. Although I know in my head that philosophical advances are very important, my impatient personality enjoys the thrill of hitting a

bunch of buttons and being able to see trends that are national in scope. However, I am then also frustrated by the lack of meaning attached to the large-scale data I use. So I am still trying to figure out my personality and find ways to mesh what I do with who I am and who I enjoy talking to. It is true that specific research questions tend to fit best with a particular study design and method. But there is room within any general research topic for a wide variety of specific research questions and methods. So again, pay attention to the ideas and modes of working that mesh with who you are.

3. Recognize your advantages and disadvantages. If you come from the working class or lower-middle class, my biased guess is that you probably worked hard and persistently to get where you are today. I think that part of my own obsession with hard work comes from my early fears of having to work fast food or factory jobs my entire life – probably something that my upper-class colleagues didn't give much thought to, which could be why they seem more intrinsically motivated and more patient than me. I must admit that in comparison, I sometimes find myself being relatively extrinsically motivated at work, and being less patient for those who talk much but don't get tasks done. Some might argue that this has much more to do with my own individual personality than my social class background, but I am not convinced.

Children raised by salaried professionals are accustomed to work permeating their existence – being part of leisure as well as office time. My family, on the other hand, comes from a tradition of doing what you have to do at work and then leaving it there. They tend to assume that I have the "summer off" because "Why would you do research or anything else in the summer if nobody is paying you to do it?" Such a perspective can go a long way toward keeping a tenured person grounded. On the other hand, this perspective can hamper efforts

toward tenure if it keeps you from doing research in the summer or from integrating your personal interests with your work.

Additionally, I have found special advantages and disadvantages that stem from being a working-class math major, in particular. When I encountered my first graduate education courses, I found that I was relatively strong on making clear, logical arguments, but weak in terms of my familiarity with fancy words, broad literatures and elegant styles of writing. Thankfully, I had several wonderful professors help me in all of these areas, but hopefully not so much that I can no longer write plainly and clearly.

4. Say "no" often. Get a life, or keep the one you have. As with all professors, I am often asked to take on administrative tasks and roles, to lead this committee or to run that program, to attend this conference, or attend that meeting.. I have two young daughters, and I like to see them regularly. They are my impetus to keep the amount of service I do under control. Or to negotiate out of teaching if I am needed for major service-related responsibilities. Be smart. Protect yourself from administrivia invasions. Or say "I'll do it if you give me a course release." This is particularly important if you are pursuing tenure – you must protect your research time. Just say no – even to things like summer teaching if you can afford to avoid it.

And on that note, take a real vacation. Every summer. Get away long enough to get perspective on life and how little your stresses at work matter in the scheme of things. This takes me about three weeks. When I have reached the point that I no longer feel the pull toward checking email, I know I have succeeded.

5. Collaborate with those who complement your disadvantages - but start small. For the first few years of my career, I solo-authored pretty much everything. But then when my research

started taking me on various detours, I found myself conducting research in areas that were beyond my expertise. I realized that I could both learn a lot and publish more if I teamed up with people who were experts on the literature in whatever area my data was taking me – such as public-private schooling, or teacher beliefs. However, start small. Working with others can be wonderful or it can be a nightmare if you are trapped on a 5-year project with someone who just doesn't mesh with you. So before you co-PI a major grant with someone you barely know, try to start by writing a conference paper together. If that goes well, you can build up from there.

6. Be bold - ask advice of senior scholars you don't know. Those who know the rules of the academic game do this all the time. If you don't do it, then you will be disadvantaged. It's really OK to email a professor you don't know and ask a simple question, such as "Do you know anyone who has done work on this topic?" I, personally, spent much more time than I should have just wandering around the literature of social class cultures because I didn't have the brains or guts to ask for help when I needed it.

7. Review- conference proposals, articles, grant proposals, and so forth This is a wonderful way to learn the unwritten rules of the academic writing game. For example, when you review for the *Journal of Research in Mathematics Education* (JRME), you not only get to see how your review compares with the editor's decision, you also get to see the 2 or 3 other reviews of that article. Similarly, if you review grants for the National Science Foundation (NSF), then you have a chance to see what winning and losing proposals look like, and you get an insider's feel for what matters in a proposal. So sign up now, as a graduate student, to become part of the JRME reviewer pool – you can do it online through the NCTM website. You may also write to

NSF program officers and tell them you would like to review. You might or might not be contacted, but it is worth a try. And anyone can sign up to review conference proposals for the American Educational Research Association –reviewers are needed each fall .

8. Appreciate the field of mathematics education. It's a place where informed critique and resistance is relatively OK After my dissertation research essentially bit the hand that had been feeding me all through graduate school (by raising critical questions about the curriculum project I had been working on), I feared that I might have burned too many bridges to be accepted within mainstream mathematics education. However, I have seen evidence that, despite the fact that NCTM *Standards* zeal can blind them at times, and despite the fact that they have been a little slower than others to grapple deeply with equity concerns, the mathematics education research community is generally well-intended and relatively fair. Although perhaps not everyone feels this way, I have grown increasingly confident that within mathematics education, hard work and intellectual honesty will usually pay off in the long run. Unlike some of the more political arenas I've been in lately, I really do see mathematics education scholars as unusually focused on determining what is best for students, as opposed to what is best for their own political agenda. Although it is unwise to rant at mainstream mathematics education scholars or to read bad intentions into their actions (e.g., taking a "they don't care about equity" stance), I do think that if you show that you understand their position and intent, you can safely raise critical issues that need to be addressed.

9. There are many jobs in math education – think about what job you want. Life is not necessarily better in academia, nor is it necessarily better in the most prestigious academic institutions. I have been half of the proverbial "two-body problem" for many years now. If it

were not for the need to be located somewhere with jobs for both my husband and me, I would probably still be at the teaching college where I went after graduation ten years ago. When I began my career, I didn't "get" that there were differences in institutions – that there are research-intensive places of relatively high "prestige," and then there are other colleges with higher teaching loads. Coming from where I was, a college professor was a college professor. Now that I DO get that distinctions are made in academia, I will say that my favorite of the three jobs I've held was at the institution that would be considered by many to be of "lowest status." As I've gone up the "prestige" ladder , I have noticed a growing distance between my own background and those of my students and colleagues. I have noticed a growing sense of entitlement on the part of students, making it harder for me to relate to them or to feel fulfillment from working with them. On the other hand, there are perks at research-intensive places, such as more research support and lower teaching loads, but you will need to judge for yourself what type of institution best suits you. The other thing to consider is that once you are in a position, it is easier to go *down* than *up* the prestige ladder, so beginning at a research-intensive place can help you keep more options open.

Another major consideration for mathematics educators entering academia is whether to work in a math department or an education department. Personally, I have found that my personality better matches the math department (e.g., fewer faculty meetings in which we draft "mission statements"), while my research interests tend to mesh better with education faculty. Although you cannot always predict where you will land, it is good to begin thinking about your preferences while you are in graduate school so that you can obtain the best preparation for whatever position you hope to hold. And again, I do not assume that you need to go into academia. Balancing teaching, research, and administrative duties within academia can be

difficult. However, academia also offers much freedom in terms of what I do and when I do it, and particularly as a mom, that freedom has been extremely valuable.

10. (There really isn't a tenth). It just seemed weird having a "top 9" list. So I'll end with a cliché – *enjoy yourself!* Truly, try to make decisions based on the work you will enjoy and find fulfilling, as opposed to living up to others' expectations for your future.

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