In Focus…

Inequity in Mathematics Education: Questions for Educators

Julian Weissglass

Many years ago I encountered a diagram (Figure 1) that may be familiar to you. It was used to help teachers understand that student learning depended upon the relationship between the teacher, the student, and mathematics. Although I found it helpful in thinking about my teaching, I eventually realized that there are many more triangles that affect student learning. One can draw triangles with students, teachers, parents, school board members, legislators, etc.

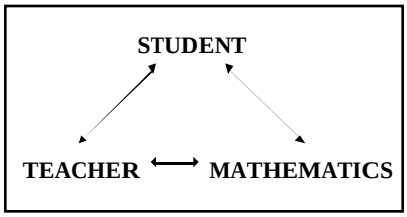

Figure 1. The relationship between the teacher, the student, and mathematics.

Figure 2 is another way of acknowledging that there are many factors that affect student learning and the well-publicized acheivement gap between students from different ethnic and socio-economic groups. The student/teacher/mathematics triangle is located in a classroom, in a school, in a district, in a community that is situated in a larger society. People in this community and in the larger society hold beliefs, attitudes, values, and often deep emotions about a variety of issues—teaching, learning, assessment, the nature of mathematics, the nature of schools in a democratic society, race, class, gender, sexual orientation, culture, and language—to name a few. In this article I will pose some questions and offer some thoughts about how some of these beliefs, attitudes, values, and emotions affect inequity in mathematics education.[i] The first question concerns mathematics and culture.

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Is mathematics culture free?

Some people say that mathematics is a set of eternal truths that humans discover. Others maintain that it develops from human social interaction—as all other forms of knowledge do. For example, Paul Ernest points out, "The basis of mathematical knowledge is linguistic knowledge, conventions and rules, and language is a social construction" (1991, p. 42). It is not my intent to settle this dispute in this article. If mathematics is not culture free, however, then one might wonder:

Would mathematics be different if male European culture had not become the dominant force in the world?

Since mathematics develops in part to solve the problems of society, the culture of a society at least influences the course of mathematical development. Although this influence may seem far removed from the classroom, as soon as we start talking about mathematics problems, we are close to classroom issues. I think immediately of the distinguished mathematician George Polya (1887–1985), a strong advocate for developing a pedagogy of mathematical problem solving. He wrote "An essential ingredient of the problem is the desire, the will and the resolution to solve it. The problem that you are supposed to do and which you have quite well understood is not yet your problem. It becomes your problem, you really have it when you decide to do it." (1962, p. 63) This comment leads me to another question:

How does a student's culture, class, and gender affect whether the problem becomes her or his problem?

The first time I taught a class in mathematics for future elementary teachers, I chose a book that used counting problems to motivate the study of number systems. Many of the examples consisted of counting the number of different poker hands. These problems did not interest my students, 95% of whom were female. Mathematically the book was very sound, but it did not work for my students. The lesson for me was that just because *I* think a mathematical problem is fascinating does not mean that my students will find it so. If I do not enable my students to see mathematics

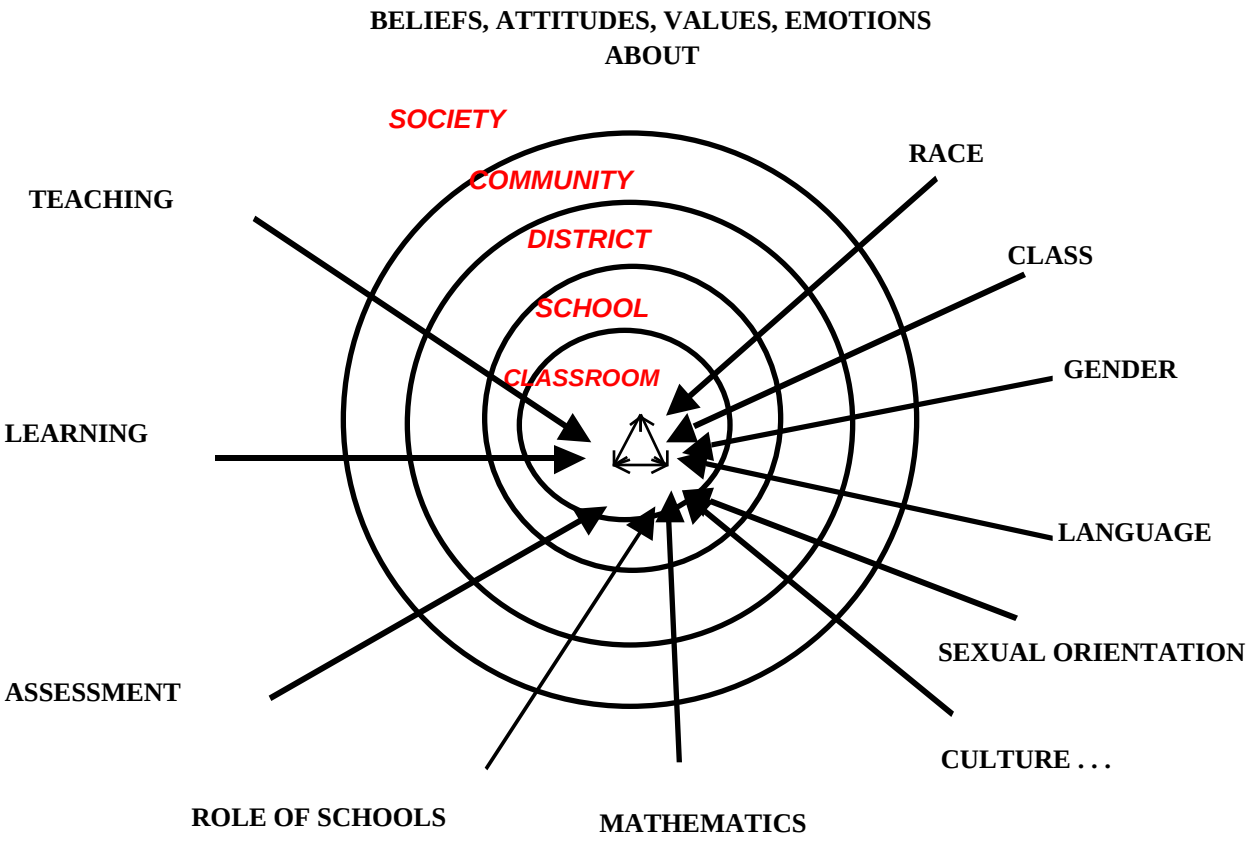

Figure 2. The many factors that affect student learning.

as useful to solve problems that are important to them, I lose a powerful motivational tool—and often lose lots of students. Since I do not want to lose students, I ask:

How do teachers and curriculum developers present problems that are likely to become the students' problems?

This question is closely related to culture, because the culture you grow up in affects what problems engage you. As Steig Mellin-Olsen put it, the probability that a topic "is recognized as important by a pupil is dependent on how he relates it to matters influencing his total life situation" (1987, p. 35). Mellin-Olsen gives three criteria for facilitating the development of this relationship: (See Weissglass, 1991, for a review of Mellin-Olsen's book.)

1. Mathematics is presented both with regard to the individual history of the student and the history of the culture from which the student comes.
2. Learning a skill occurs in the context of a wider project of interest to the learner.
3. Learning occurs within the context of cooperation. The gains of the individual feed the gains of the group.

Although young people are inherently curious about mathematics when they enter school, most do not maintain this curiosity. So we can ask:

How do educators' culture, class, and gender affect their ability to develop and communicate problems so that students desire to solve them?

Herein lies a major challenge. Growing up in U.S. society often causes white middle class children to be misinformed or ignorant about history and the lives of people with different backgrounds than themselves. Since most curriculum developers come from this pool, the concerns of racial and ethnic minorities are often ignored in curriculum. Even the most progressive curricula usually do not relate mathematics to the concerns of students who are living in poverty. Curriculum developers often choose problems that are "safe" and uncontroversial, routinely neglecting issues related to social justice. As Kastberg pointed out in a previous issue of this journal, the writers of the NCTM *Principles and Standards for School Mathematics* (2000) "ignore the power that mathematics can have in

debate and discussion of issues critical to the elimination of social and economic inequities in the United States" (Kastberg, 2001, p. 18).

Sometimes students are told blatant falsehoods. For example, attempting to situate an algebra lesson in a historical situation, the authors of a highly-regarded eighth grade mathematics text wrote, "When Mexico ceded California to the United States in 1848, California was a relatively unexplored territory with only a few thousand people" (Lappan, Fey, Fitzgerald, Friel, & Philips, 1998, p. 5). In fact anthropologists estimate that there were approximately 150,000 indigenous people in California at that time. Furthermore, to say that "Mexico ceded California to the United States" without mentioning that the U.S. military was encamped outside Mexico City ready to conquer the whole country is misleading. It is akin to saying that in the 17th century large numbers of Africans came to North America to help grow cotton, without mentioning slavery.

Because I suspect that curriculur materials might change if the community of curriculum developers were more diverse, we can also ask the following:

How do we increase the percentage of people of color in curriculum development groups?

Responding to this question is beyond the scope of this article, but I conjecture that it will require an effort similar to the one I recommend later for schools.

If you accept that culture, class, and gender affect teachers and students in the math classroom, then you are ready for the next question:

How do racism and classism affect the school experiences of students?

Since racism and classism are words that have different meanings for people, let me define what I mean by them.[ii]

> *Racism* is the systematic mistreatment of certain groups of people (often referred to as people of color) on the basis of skin color or other (real or supposed) physical characteristics. This mistreatment is carried out by societal institutions or by people who have been conditioned by the society to act, consciously or unconsciously, in harmful ways toward people of color.
>
> Similarly, *classism* is systematic mistreatment based on socioeconomic status. This mistreatment includes prejudice, discrimination, disrespect, or neglect of rational needs (food, clothing, shelter, communication, opportunities to learn, etc.)

The racism and classism pervasive in U.S. society influence the attitudes that people develop. Teachers carry these attitudes with them into their classroom. For example, they may have different expectations for individuals from different groups. But the situation is more complex than that. I cannot, in this article, fully explain how racism and classism and other forms of systematic mistreatment work in schools, but let me at least point out that they can be blatant or subtle, personal or institutionalized, conscious or unconscious.

The perception of whether an act is blatant or subtle will vary from person to person. If a teacher or a textbook author limits themselves to problems or situations that avoid social justice issues, someone might say that that is subtle classism. On the other hand, a person who is suffering the effects of classism might see that action as a blatant. Similarly, a policy at the institutional level can contribute to the systematic mistreatment of a group even though no one consciously attempted to hurt them. For example, California implemented a class size reduction policy a few years ago. It caused an immediate teacher shortage and many experienced teachers from inner cities in California took jobs in the suburbs, probably because they thought it was easier to teach there. The result was that students in inner city schools were being taught by less experienced teachers. The effects on poor students and students of color were severe—an example of unconscious institutionalized racism/classism. There is a general principle at work here. Whenever policy deliberations do not include an informed consideration of how racism/classism operate in society, the policy developed will probably not be for the long-range benefit of people of color and people in poverty and will often work to their disadvantage.

There are many examples of the blatant racism in the history of the United States—slavery, lynching, segregation, discrimination in housing. It was perfectly respectable for academics (including eminent scientists) in the 1920s and 1930s to join the eugenics movement, which was based on an ideology of racial superiority (See Gould, 1981; Tucker, 1994). For example, Edward East, a Harvard geneticist, wrote: "Gene packets of African origin are not valuable supplements to the gene packets of European origin; it is the white germ plasm that counts" (1927, p. 199). But these pseudoscientific ideas have not disappeared. In a well-publicized book in 1994, the authors wrote "Putting it all together, success and failure in the American economy and all that goes with it, are increasingly a matter of the genes that people inherit" (Herrnstein & Murray, p. 91). While discussing this book a mathematics professor told me, "Anyone who is intelligent has made his way out of the working class."

We like to think things have gotten better, and I believe that in many ways they have—but I am white and middle class. Two examples from California, separated by almost 70 years, suggest that perhaps racist practices and policies have just become subtler. In a 1923 address to the Los Angeles Unified School District principals the Superintendent, Susan B. Dorsey, said "We have these Mexican immigrants to live with and if we can Americanize them, we can live with them." (García, 2001, p. 51). In 1991, a superintendent of a school district in northern California said, "We've got to attend to the idea of assimilation and to make sure that we teach English and our values as quickly as we can so these kids can get in the mainstream of American of life" (p. 51). Many people have a different perspective on culture. César Chávez, for example, said, "Preservation of one's own culture does not require contempt or disrespect for other cultures" (Chicano Studies Research Library, 1996).

Racist/classist practices do not have to be overt. Ignoring issues of race and class are widespread. For example, at the National Summit on the Mathematical Education of Teachers (co-sponsored by the National Science Foundation [NSF], the Exxon Mobil Foundation, and the Conference Board of the Mathematical Sciences) in November 2001, only one of the titles and abstracts made even a passing reference to the challenges of teaching "algebra for all". None mentioned the challenges of teaching mathematics to a culturally diverse student population or to language minority students. None addressed how teachers' expectations and belief systems affect the teaching and learning of mathematics, or any of the other issues that are related to the achievement of under-represented students in mathematics. Were these omissions subtle or blatant, conscious or unconscious? From my point of view, the silence was deafening.

Evaluation (assessment) methods are another area where racist/classist practices may not be overt. I wonder:

How much of the assessment system is driven by (unconscious) race and class bias?

Ubi D'Ambrosio, the Brazilian mathematics educator, points out, "… mathematics has been used as a barrier to social access, reinforcing the power structure which prevails in the societies (of the Third World). No other subject in school serves so well this purpose of reinforcement of power structure as does mathematics. And the main tool for this negative aspect of mathematics education is evaluation." (1985, p. 363) Many mathematics educators find this statement puzzling. How can evaluation (assessment) be used as a barrier to social access? Consider the following:

1. The nature of the instrument may incorporate cultural values and practices—such as being able to respond quickly on timed tests or being good at figuring out how to eliminate answers in multiple choice questions.
2. Previous experiences with being asked questions and riddles and being rewarded for the right response, might be valued in upper-class and middle-class homes more than it is in working class or poverty-stricken homes.
3. The test-taking environment might work to the disadvantage of students from different cultural and class groups by causing different levels of anxiety.

In regard to the third point, social psychologists have shown that the performance of members of nearly any stereotyped group can be negatively affected by manipulating (sometimes very subtly) the conditions of the testing environment (through instructions or questions given to the test-takers) to bring to consciousness or sub-consciousness one's membership in that group. For example, Steele and Aronson (1995) found that African American college students performed significantly worse than Whites on a standardized test when the test was presented as a diagnosis of their intellectual abilities, but about as well as Whites when the same test was presented as a non-evaluative problem-solving test. Other researchers (Croizet & Claire, 1998; Shih, Pittinsky, & Ambady, 1999) produced similar results with different groups. Social psychologists use the term *stereotype threat* to describe this phenomenon. I prefer the term *internalized oppression*—the phenomenon of people believing in the messages they receive from society and, as a result, acting in hurtful ways to themselves. A Latino principal talking on a Personal Experience Panel at an institute conducted by the Equity and Mathematics Education Leadership Institute (EMELI, n.d.) sheds some light on the process:

> …it happened slowly and you know what's going on but you can't understand it. …like the SRA, the reading classes. …there's different colors [for different levels]. I was always in the lower one. I was treated a little bit different again because I was in this lower group and I started noticing a lot of my buddies were in the same group I was in and a lot of the other kids that were usually quiet were in the higher groups and you start kind of feeling a little bit less. You start feeling less about yourself. …as

> I went into high school, they have the tracks A, B, and C. And C is just one step above Special Ed. And again, I was in the C group and my buddies were in the C group with me. You know…people treat you differently. As I got into college I always felt inadequate, not being capable to do these things.

Experiencing racism (or other forms of mistreatment) outside of school can also affect school performance. A Japanese American teacher speaking on a Personal Experience Panel recounted a memory when the parents of a white girl he met did not allow her to date him. He continued:

> That's pretty much the age when my whole attitude toward achievement changed. Before then I had been very competitive…striving to be the top student by taking at least eight classes a day and going to special GATE type programs on weekends and summers. I was president of many extracurricular clubs. I ran for student body offices, played in the jazz band, did athletics, and gave speeches in every oratorical contest I could find. A year later, my final schedule consisted of coming to school at 11 AM for two classes and basketball practice. I went out with the boys every evening and weekend. …I was very lucky not to be expelled for drinking (as my two buddies were). (See Weissglass, 1997, for the more complete story.)

So I ask:

Can we change racist/classist practices in schools and eliminate (or at least alleviate) the effects of racism and classism on students?

I think we can, but good intentions, hard work, excellent curriculum, or research, will not be sufficient. Significant change in people's beliefs, attitudes, and practices only comes through a complex process of sense-making, reflection, and re-evaluation of existing practices and understandings. This process of re-evaluation is facilitated by being listened to and releasing emotions about the experiences that formed our beliefs, attitudes, and behavior patterns.

Shirley Chisholm points out, "Racism is so universal in this country, so widespread and deep-seated, that it is invisible because it is so normal" (1970, p. 133). Therefore, we need school communities where it is safe enough for the invisible to be made visible—where Whites can listen to people of color talk about how they and their ancestors have experienced racism and where people of color can listen to Whites talk about how seeing racial prejudice has affected them. Listening to each other's stories and emotions helps people identify what needs to change within their institutions and themselves. Being listened to will help them heal from the hurts of racism. Professional therapists are not necessary, nor are there enough of them to do the job. It is one of our responsibilities as educators to heal ourselves from the damage racism has done. However, there is a tendency among educators to dismiss healing from hurt as too "touchy-feely" to belong in academic institutions.[iii] But consider that this country has spent hundreds of millions (perhaps billions) of dollars in the last two decades on attempts to decrease the differential success in mathematics between students from different ethnic groups without any major change on the national level. It is clearly time to risk new approaches.

The National Coalition for Equity in Education (NCEE, n.d.) has developed a theory and a set of structures and approaches that help educators productively address racism, classism, and other forms of bias.[iv] Three (of the twelve) assumptions underlying the work of NCEE are:

- No one is born prejudiced.
- All people are deeply hurt by growing up in a racist and classist society.
- Many of the assumptions, values and practices of people and institutions hinder the learning of students of color and students from low-social economic classes.

Let me emphasize the first assumption. I believe that human beings are good. No one would hurt another person or participate passively in a hurtful system unless they had been hurt. Nevertheless, unequal access to resources, violence and threats of violence, miseducation, lies, stereotypes, and disrespect (some of which are carried out, and others accepted, by educational institutions) cause great harm to people of color and people living in poverty. If we avoid facing this we are silent bystanders—contributing by our silence to the perpetuation of racist and classist practices.

I propose that we adopt a new paradigm for our schools: *schools as healing communities.* People in such schools will undertake a wide range of

anti-bias work. Educators will identify how their unconscious bias is affecting their students and challenge any low expectations they or their colleagues hold. Parents and teachers will work together to support children's learning. Members of the community will identify how bias is institutionalized in policies and practices and they will work for change. Teachers will question their curriculum and pedagogy and make it more engaging to students of different cultures. Schools will teach the history of how oppressed peoples have been treated in this country. They will support students and their families to challenge internalized oppression. Students will talk about and heal from how they experience unfairness and discrimination. A healing community will have as its highest priority people caring about students and their learning. True learning, as contrasted with rote memorization for rapid recall, will increase.

Achieving such communities will require leadership—a different kind of leadership than in other reform areas. The issues related to racism, classism, and other forms of bias are complex and emotional. Some people, for example, will not recognize racism or classism. Some may deny that they interfere with their relationships ("I don't see color"; "I treat everyone the same") or affect institutional or governmental policies. People of color may feel hopeless or cynical about the possibility of change. They may be skeptical of Whites making a commitment to combat racism. Students and teachers may be fearful of talking honestly about racial or class issues. Leaders will need to understand the personal, social, and institutional roots of inequities. They will be able to raise controversial issues while building unity, relate well with people from different backgrounds, help people recover from hopelessness and powerlessness, and deal constructively with their own and others' emotions. These skills and knowledge are not routinely developed in schools or colleges or in professional development.

Creating healing communities will require resources. Not allocating these resources will be even more costly in the long term. It is easier for educators to hold a workshop celebrating diversity, develop curricula, buy "test-prep" programs, pressure teachers, or write reports and vision statements than to talk about personal experiences with race and class. But any reform effort attempting to reduce the achievement gap that does not get at the roots of racism/classism will not be likely to succeed over time. If, as a nation, we develop healing communities where people can speak honestly about racism/classism and heal from their hurts, we can change biased practices, attitudes, and policies. If we can communicate caring to students, and help them recover from racism/classism, they will be able to achieve their full human potential. If we do all this, we will accomplish more than reducing the achievement gap in mathematics. We will create a better society.

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[i] If you are reading this article with a group of people, or you have someone nearby, I suggest that you pair up and each spend a few minutes talking about the beliefs, attitudes, values, and emotions about the topics in Figure 2 that most affect you in your work.

[ii] If you are reading this article with a group of people, I suggest that you pair up and give each person get a chance to talk for two or three minutes about how she or he feels when she or he hears the word racism.

[iii] I discuss why the culture of schools does not respect emotional release in Weissglass (1990).

[iv] The theory and approaches, as well as examples of stories told by educators on Personal Experience Panels, are described in Weissglass (1997). The way the theory and structures is used in equity work is described in Weissglass (2000). The evaluation of a project based on this approach (IRA, 2001) is available on the web.