Sabbatical Mini-Report # 10
Race and Culture in Mathematics Education

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This report is general in nature; theory and provocation are given the priority over specific classroom applications.

Outline

Classroom & Cultural Issues

For group work, be aware of factors that influence participation and equal access. See Webb and Palinscar, pg 859.

> *There is ample evidence that ethnic background and race operate as status characteristics in multiracial groups in the classroom. White students tend to be more active and influential than minority students, while minority students tend to be less assertive and more anxious, to talk less, and to contribute fewer ideas than white students.*

Here is a mysterious finding about attention spans (Maynard, pg 43): Relative to Euro-American babies, Zinacantec Maya infants are born with extended visual attention spans (cited Greenfield, et al 1969).

The most provocative approach to analyzing education is from a viewpoint called "Critical Race Theory". Critical Race Theory begins with the assumption that racism exists within the institutions and structures of the society, and then seeks improvements (see Blaisdell, pg 8). Critical Race Theory (CRT) views "deficit theorizing" ("achievement gap") as a majority attempt to explain and/or silence minorities; see Love, pg 2. The article by Love includes a very good "story" to explain an alternate approach, and is worth the time for careful reading.

CRT has been applied to analyze mathematics classrooms. One of the experts is Dorinda Carter at Michigan State University; see the reference. Carter was a presenter at a special Colloquium at Michigan State University in September 2006 on the "Social Context of Mathematics".

Some validity of CRT can be seen locally. Due to "Schools of Choice" in Michigan, the Lansing School District loses its most able students to the suburbs, resulting in a district with even lower measures of average performance … and even more of those with resources take their students to the suburbs. A study along these lines was done in North Carolina in a similar situation; see Godwin et al.

Another approach deals with a concept called "stereotype threat", a phrase coined by Claude Steele. See the references for Ben-Zeev et al and Beilock et al. According to this concept, we (educators) sometimes create conditions that activate stereotypes of

minorities – resulting in lowered performance. The concept has been validated in some studies, such as those described by Ben-Zeev et al and Claude Steele.

A body of research is accumulating on direct cultural issues in mathematics education, and education in general. See the references for Nasir to begin seeing some of the results. One striking finding is that communities where schools are performing poorly often have a cultural "default trajectory" that students will not finish school. These schools often have less than 50% of a 9th grade class graduate from high school.

Culture: Testing, Standards, and NCLB

This is a period of increasing use of testing, with the results being used to grade school districts and countries. These comments are directed at domestic (not international) testing programs, in general; the focus in this section is on what our country does. (International testing issues are addressed in the next section.)

Many people discuss the "achievement gap", using the phrase to describe (and explain) the differences in score distributions between groups (primarily racial or ethnic groups). A positive note was given by Schoenfeld (online pg 5):

> *When Standards-based curriculum are implemented in consistent ways (curriculum, assessment and professional development are aligned), the "performance gap" between whites and underrepresented minorities can be narrowed.*

However, there are numerous critics of the "testing craze" relative to race and equity. In Michigan, we have a documented problem; see this data from Amrein (online, notes 21 & 22):

> *Approximately 80% of the test-takers in an affluent Michigan neighborhood earned scholarships while only 6% of the test-takers in Detroit earned scholarships. One in three white, one in fourteen African American, one in five Hispanic, and one in five Native American test takers received scholarships.*

The critics of testing have substantial data to support concerns about how testing is being used. The interpretation of this data is the subject of debate; for a critical race perspective, see the Love article. Another view is stated by Woodrow (pg 18);

> *"TIMSS is thus a way of 'passing the buck'; taking away from government responsibility for economic failure and laying it at the door [of] individuals who simply are not performing well enough."*

Woodrow is suggesting that the political process of high-stakes testing involves those with power (national leaders in particular) placing the source of the problem at the local level (such as the neighborhood school). However, the situation at the neighborhood school is much more complex – financial survival and physical safety may be primary issues, due to other political or economic decisions.

Woodrow also suggests that the primary rationale for "being first in the world" in mathematics is given with an economic basis … to be globally competitive, when the

available data on economies and education do not support this. Mathematics achievement usually follows economic progress, not the other way around. (See Woodrow pg 14-16.)

One last note on national testing programs: Amrein cites a principle of the social sciences, very similar to the corresponding principle in the physical sciences … Heisenberg's Uncertainty Principle for the social sciences (Amrein note 11, online)

> *"The more important that any quantitative social indicator becomes in social decision-making, the more likely it will be to distort and corrupt the social process it is intended to monitor."*

International Issues

There are two large international testing programs for mathematics: TIMSS and PISA. TIMSS is the acronym for "Trends in International Mathematics and Science Study"; PISA stands for "Program for International Student Assessment". The focus of each program is somewhat unique, with TIMSS dealing more with skills and PISA focusing more on application. The data for TIMSS comes from a broad variety of countries, while PISA focuses on "developed" countries. Therfore, TIMSS has less variety in content but more variety in countries; PISA has more variety in content but less variety in countries.

The impression of the media is that the United States ranks low on TIMSS; in some areas of the results, that might be true. However, here are two findings that are much more positive:

> TIMSS-R (1999) showed that Korea and Japan (with very high math performance) had the lowest levels of positive attitudes about mathematics. (These are 8th grade level results. See Gates and Vistro-Yu, pg 41)
>
> TIMSS (2003): 8th Grade performance of United States students rose from 492 (1995) to 504 (1999) to 506 (2003). African-Americans gained significantly more than other groups. (See NCES, online)

Gates and Vistro-Yu also point out that Asian performance in mathematics is not all good: The 'confucian influence' cultures (as opposed to Hindu or Islam) do better on timed written examinations … but less well with creativity (pg 56).

The TIMSS 2003 data is interesting; before we accept the media statements (from politicians or reporters), we should evaluate the results for ourselves.

In the 2000 PISA study, USA youth were at the average level in many measures. (See Lemke et al 2001, pg 24, online.) In the 2003 PISA study, the USA results were slightly below the average performance; see Lemke et al 2004, pg 12-14, online. For a analysis of the content of the 2003 PISA mathematics instrument, see Neidorf et al (online). PISA focuses on societal uses of mathematics, not 'school mathematics'; the media do not mention the PISA results … perhaps because the content is not 'school' based.

For a review of international testing studies and their validity, see the reference for Clarke.

Two final comments here are general, not dealing with testing. First, authors make a distinction between internationalization (connections and commerce) and globalization (a cultural shift). Atweh et al (pg 189) state:

> *"Here we take the stand that while certain effects of internationalisation and globalisation processes may be good, others may be catastrophic and should be contested." Some groups benefit, while other groups suffer.*

Second, some researchers are exploring the detailed differences in mathematics education between the United States and other countries. One specific report by Judson compared Japanese and American students; here is a summary (Judson and Nishimori, pg 26-32):

> *Japan sorts high school students … math/science; humanities/social science (no more math in high school). Japan's national curriculum avoids calculator usage. Students may be better at algebraic work, and may be better at function concepts.*

CONCLUDING POINTS

Race (and culture) directly affect our classrooms by their influence on communication and perception. Classroom design needs to consider these effects in order to minimize the negative impacts. The current extreme emphasis on testing and accountability might make this more difficult.

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