

Towards a Grand Unified Theory of Equitable Science

Angela Johnson

St. Mary's College, Maryland

VEXATION

If I am lucky enough to be presenting this at Crossroads in September, it will be while I am well into my sabbatical. I want to devote this year to thinking about the vexation and ventures I lay out below; my primary objective is to use my time at Crossroads to obtain ideas about what to incorporate into my two ventures and where to go with them. I am vexed nearly beyond endurance by the tendency among educators to try to close achievement gaps by fixing students rather than fixing the system. My ultimate goal is increasing social justice and educational equity.

In my Crossroads-enriched life, this means pushing to increase the participation of people of color and white women in STEM professions. I can see three ways to do this: 1) change students, 2) change classrooms, or 3) change science. It seems to me that we in science education are unlikely to make major changes in science—that is the task of others. So many of us have been focusing our efforts on changing students, when in fact the easiest (or only?) thing for us to change is ourselves. Changing how we teach and the materials we use—and teaching pre-service teachers to do the same—seems to me the most sensible place for us to focus our efforts. That so many of us are instead intensely focused on blaming or trying to change students vexes me, to put it mildly.

Deschenes, Cuban and Tyack (2001) have documented how blaming students, rather than focusing on the mismatch between students and school, has been part of American culture since the 18th century. In the 1960s, Kenneth Clark wrote about how teachers and social scientists belonged to “the cult of ‘cultural deprivation;’” many Black children were taught by teachers who “do not believe that they can learn, do not expect that they can learn, and do not act toward them in ways which help them to learn” (Ravitch, 2000-01, page #?). To confirm that this tendency to blame students (and parents) is still present today, one need only look at the online comments following any article about achievement gaps in the public schools.

Before launching into my ventures, I should clarify my end goal. I would like to see a national system of science education such that hard-working, interested, able students from any background could enter a college science class (the kind of science class for science majors, not the kind for poets) and succeed. Right now most people who succeed in this kind of college science class are white and affluent, yet I know from my own experiences that white people and affluent people don't have a monopoly on hard work, interest in science, or intellectual ability. I want that which so many people believe we already have: A level playing field in science: a scientific meritocracy. I am not talking here about science classes which produce citizenry able to make wise political, economic and personal choices (although I would certainly love to see this). I'm talking about entry points into and multiple routes through science available to all students willing to work hard, and lead not only to basic science literacy but potentially to college and science-based professions.

I am interested in increasing a very particular kind of social capital—the understanding among science teachers of how to alter their own teaching to better serve all kinds of students. Increasing that social capital among teachers requires figuring out why it isn't out there already and then sketching out the capital itself—just what sorts of knowledge a teacher would need in order to solve this problem, once they acknowledge the problem exists. Hence the two ventures: A venture about getting teachers to be willing to seek out this particular capital, and then a venture about making the capital itself “sticky” (Gladwell, 2002).

Thus, two ventures. The first venture is to study why so many people find it so natural and so easy to focus efforts on changing our students instead of changing ourselves (even though anyone who has ever been in an ill-suited romance knows that the effort to change another person is seldom fruitful). My feeling is that with better understanding, the clearer it will be to plan how shake people loose from this belief. The second venture, then, is to give teachers somewhere to go once they've been shaken loose: to work with what we already know about effective, equitable science classrooms, to try to make this information as palatable and as widely available as possible.

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St. Mary's College, Maryland

Venture #1: Getting people on board by understanding why they aren't already

Our subconscious processes, overt cultural beliefs, and cultural traditions all suggest to us that it is “natural” that children of color won't thrive in school, especially in science, and thus to keep us from examining our own practice when they don't thrive in our classrooms. Gloria Ladson-Billings (2006) says “our supreme reliance [as Americans] on individuals means that we look at students as individually responsible for their success in school. We lack complex understandings of how individual, family, community, school, and societal factors interact to create school failure for some students. It is much easier to explain students' failure by looking at something internal to the students than endemic in this thing we call school culture” (p. 106).

What I would really like from Crossroads participants: What other obstacles do you think keep science teachers from looking at their own practice as a cause for achievement gaps in science? What strategies or evidence have you used to persuade people to be willing to do this?

Venture #2: Grand Unified Theory of Equitable Science

I wonder if it would be possible to build some sort of Grand Unified Theory of Equitable Science, to which teachers could turn for ideas once they abandon their efforts to change students and focus upon changing themselves. I would like very much to hear from other Crossroads participants about what they think might fit into this theory. Here are some elements I would want to include:

The importance of integrated schools and classrooms, and of reasonable, equitable funding for all schools, rather than what we have now, which is not even meeting the standards of separate but equal schooling. From the 1960s through the 1980s, in the years when schools were becoming increasingly integrated, Black-White achievement gaps narrowed steadily. Subsequently, as federal supports for school integration were dismantled, gaps quit shrinking (Anderson, 2004; Kozol, 2005).

A focus on enrichment rather than remediation for all students, in all subjects, especially in science. The volumes of work of Steele and others on stereotype threat (see for example Aronson, 2002; Steele, 1997) and the many evaluations of effective college support programs for students of color (Fullilove & Treisman, 1990; Johnson, 2007; Murphy et al., 1998) have convinced me that this is crucial. I am confident that there is a similar body of work on high school, middle school and elementary school students, showing that under-represented students perform better in environments which respect and challenge their intelligence and provide them with rigorous content.

Culturally relevant pedagogy. My own favorite approach to this follows the work of Gloria Ladson-Billings (1994, 1995) but there are many, many sound approaches; I'm also partial to Sonia Nieto's work on the dispositions of teachers who are effective in multicultural settings (see, for example, Nieto 2003, 2003b). I've been particularly interested in similar work in science, including, but certainly not limited to, Eileen Parsons' use of Wade Boykin's work on Black Cultural Ethos in the context of science classes (2008; Parsons et al., 2005), Amy Cox-Peterson's and Terri Patchen's exploration of the relationship between constructivism and culturally relevant pedagogy (2008), and Bhaskar Upadhyay's work showing that invoking students' funds of knowledge in the context of learning science may lead to longer retention of science and to higher standardized test results in science (Upadhyay & DeFranco, 2008; Upadhyay, 2009).