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Voices Inside Schools

Historical Perspective as an Important Element of Teachers' Knowledge: A Sonata-Form Case Study of Equity Issues in a Chemistry Classroom

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Abstract

In this article, middle school science teacher Zachary Sconiers and university researcher Jerry Rosiek introduce the sonata-form case study, a narrative structure designed to document teachers' understandings of how subject matter and sociocultural influences intersect in the classroom. Written in collaboration with the Fresno Science Education Equity Teacher Research Project, this case study is told from the perspective of Jerome Jameson, a fictional chemistry teacher, whose story is based on Sconiers's actual teaching experiences. Also integrated into the narrative are Sconiers's in-depth reflections on the connections between his commitment to science education and his commitment to promoting educational equity. The sonata-form case study is followed by an afterword, written by Rosiek and Sconiers, that describes this unique methodology for teacher inquiry in full detail. The writing process for the case study was extensive and iterative: the two authors worked closely over the course of a year to develop the narrative, with Rosiek taking the lead on revising and editing. With this case study, Sconiers and Rosiek highlight the critical need for a new form of educational research, one that "builds bridges between the discourses of educational excellence and educational equity, as well as between theory and practice." (pp.370-404)

Respect for Violent Chemical Reactions

I pull on the white lab coat as students come stalking, stomping, and stumbling into the room. They are eighth graders - lanky, shouting, full of piss and vinegar. Hormones have set them to roiling, one after the other, seemingly at random over the last three years, leaving them at a variety of sizes and stages of development by the time they reach me. Their heights range from under four feet to six feet; their social development ranges from childlike to more adult than they need to be. Some of these boys act as if they are ready to be men, posturing fearlessness and independence, but this does not completely mask their mounting apprehension about the future. And the girls, rushing so fast to be women, also play tough, some experimenting with their "wow" power, others confused by it, but most too young to hide the flashes of childish joy and perplexed hurt that show through their emphatic gestures. All of them are spilling into this husk of a science classroom, where the gas lines don't work, the sinks have been dry for years, and the slate tables may very well have their parents' names carved into them. I found this white coat under a pile of boxes in the back. It is small around my shoulders and short in the arms, but I hope it will create the desired effect of making me look scientist-like. I get the handful of respectful "Hello Mr. Jamesons" as I pull on the goggles with Plexiglas lenses so scratchy I can barely see through them (can't let them catch onto that). Usually I greet students individually at the door as they come in, then I announce the day's activities and insist on their collective attention. But today I have a show planned. They will give me their attention without my asking.

I pull the burner, the beaker, and the Erlenmeyer flask full of potassium chlorate solution out from beneath the desk. Nicole is taking roll, an assignment she assumes with enthusiasm, sometimes too much enthusiasm - occasionally I have to quiet down her quieting down of other students. Four are missing today, she tells me as if she were announcing the arrival of the president of the United States. James is missing, and so is William. These two insist on calling themselves Rapdog and Be Mellow (which he spells "B. Mello" on his homework - when he turns homework in). I saw both of them this morning talking through the school fence to some older child, maybe from the high school. (It looked like Gary T. who, I've heard, has dropped out and has been warned about coming to the middle school campus.) These two miss class frequently. At this rate of attendance - it is still early in the year - they will not pass my class or any class. "At risk." If I didn't hate the way that term was used by other teachers to write off Black students, I would think it was made for these two young men. They are more than able. James is sharp. But if someone doesn't help these boys find a constructive way to use that ability, then they are not going to make it through high school. Nicole finishes writing up the attendance sheet and posts it outside the door. I turn on the gas and pop the striker over the propane torch. A bright orange streak flowers and sputters up high enough to startle me. Some students who see it laugh, and the class, more or less, begins to pay attention.

Today we start with a lesson that will alert you to some important lab safety considerations, I announce. We will be working with dangerous chemicals, and there are some basic things you need to understand. I maneuver the ring stand over the leaping flames, which spread out to form a flickering sheath around the test tube. Please move away from the first two rows, I instruct the students who have begun to approach the desk. When they hesitate, fascinated by the pyrotechnics I have put on display, I take on a serious tone. This is potentially explosive material. And I mean it. They need to understand that the exotic attraction of the fire needs to be tempered with respect. So, everybody needs to move back, but pay attention. You will be working with these materials soon, and I want you to be able to learn what you need to learn with a minimum of casualties.

A Community of Inquiry Lesson

Last night I stayed at school until seven o'clock placing six white powdery substances into labeled ziploc bags: baking soda, silver chloride, calcium oxide, citric acid, corn starch, and flour. I made five sets of five liquid reagents in individually labeled dropper bottles - hydrochloric acid, hydrogen peroxide, iodine, phenolphthalein, distilled water. And I made a set of mixed powders - five sets of six different mixes in small ziploc bags labeled only with numbers. The known substances are set up in neat rows on a table to be distributed. The unknown mixes I have placed on my desk under a large bell jar, for dramatic effect.

After the safety demonstration, I ask them to open their folders and take some notes. Gesturing to the jar, I tell them that their assignment for the next week is to determine what each of the unknown mixes in the bags is and to come to agreement as a whole class on the identity of the substances that make them up. *Once everybody in the class has come to agreement, then I will give a grade to the whole class, I explain.*

"What if we are wrong?" Then everyone gets a poor grade, or, if there is time, I may permit you to try again. But there probably won't be time. "What if we can't agree?" Then you should probably do more experiments, show them to each other, talk a lot. If you can't agree then you probably don't know, and that will count as a wrong answer. Don't worry. You will agree. The answers will be obvious. When it's all over, and everyone has an A, then we will vote on which lab group helped the class the most; that group will get the No-Bull prize for chemistry this month. This elicits a few snickers.

I gather them around the table with the known samples. *You will start with these substances, I tell them. Your first job is to figure out how all of the known powders and liquids react to one another. "Known" means that you know their name ahead of time. Let's try an experiment.* I pull on my gloves and instruct, *Louis, pick a powder, any one will do.* He hesitates, then offers "baking soda." *Excellent. Now pick a liquid reagent. Again, any one will do.* He reaches down and pulls out a bottle of the hydrogen peroxide and clacks it down in front of me. *Good.* I put on my goggles and ask everyone to step back. I place a small scoop of the baking soda in a mortar bowl. I pull out the dropper, place several drops of the peroxide on the powder and . . . nothing happens. I stare for a minute as if I expect something to happen, then I take off the goggles. *O.K. So what did we learn?* "Huh? I thought it was going to explode. I don't get it. Nothing." *No, we did learn something.* Eventually Twanda answers, "That baking soda and peroxide don't interact?" *They do not react. That is what I saw. Is that what we all saw?* General assent.

Let's try another experiment. This time I will pick, say, hydrochloric acid. Again I put the baking soda in a clean mortar bowl. I pull the goggles on and squirt several drops of .005 molar HCl on the powder. It begins to fizz and froth. "Whoa. What was that?" *Louis, what were those substances?* "Baking soda and . . . some sort of acid." *Hydrochloric acid. And what did we learn about them?* "That they react?" *How do they react?* "By fizzing like a Coke." *Do we all agree with that description?* *O.K. Louis, will you go write that on the board for us? Here, take the bottle, so you can spell the name of the acid correctly.*

I begin wiping out the bowls. *Easy enough?* I ask them. *Who can tell me how many different combinations will need to be tried?* No answer. *Think about your math. There are six powders and five liquids, so how many combinations?* Nicole offers hesitantly, "Thirty?" *That's right, six times five. All thirty combinations have to be tested before we can even begin to look at the unknowns and shoot for the No-Bull prize. Please get out your notebooks and write this term down.* The students fan out back to their seats. *Baseline data.* I flick on the overhead projector and a six-by-five table with the powders listed across the top, the liquid reagents listed down the side, and the words "BASELINE DATA" at the top appears on the dry-erase board. *Baseline data, I explain, is building a starting point with information. It's like trying out for the team before you can play in a game. It's like buying a dress before you can go to the prom. It's like filling your car with gas before you can go on a long trip. Baseline data is what you need to start an experimental investigation. That's what we will be looking for today and tomorrow. When you think your group has discovered a piece of baseline data, come tell me. We will schedule you for a class presentation and if the rest of the class agrees with you, we will put it on the table.*

Go ahead and get into your lab groups, now please.

Inquiry, Anxiety, and Resistance

The next day I find myself feeling impatient for students to get into the lab. This is the most involved inquiry lesson I have given them so far and it is already going more slowly than I expected. Yesterday the students seemed hesitant with the materials, slow to pick them up and unused to handling them. They have let me know in a variety of ways that they are not used to this kind of teaching. Comments like "I don't get it" and "What are we supposed to do?" were common. I tried to respond to all of them, but I know I didn't reach everybody. I have also heard, "This isn't the way our other science teachers do it, and I thought you were the teacher, why can't you tell us the answer?" Their experience with science up until this point has been limited to information and worksheets. The open-endedness of my instructions is causing some anxiety. Many are hesitant to stand by their results, even when they are clear.

Today I plan to revisit the idea of baseline data and reassure them that any discovery is a good one, if it can be repeated by another group. I also want them to notice how one powder may react vigorously with a solution while a similar-looking powder may not react at all, and to make that the beginning of a question in their mind. One of my long-term goals is to teach the distinction between chemical and physical changes in the states of matter, an important and basic scientific distinction. Just after the tardy bell rings James and William walk in with their hats pulled low, trying noticeably to avoid my notice. *Hats off gentlemen*, I instruct them. William complies as they amble along the wall to the back of the class, but James is in his seat when I remind him again by gesturing to my head. "Oh yeah. I was gettin' to that." *I will need to see your re-admit slips before the end of class*, I tell them, knowing full well that they do not have them. I suppose it is possible that they heard about yesterday's fireworks and are here to check it out. Whatever their reason, I'm glad. I want to talk with them. After attendance I do a quick modeling of the one powder/one solution experiment and clean-up, remind them of the safety lesson from the day before, and ask them to come pick up their lab packets.

My hopes for the lesson are raised when two groups volunteer to present results at the end of class. But any optimistic visions I had for the day's progress quickly fade when I notice some students actually mixing powders ahead of time, and then testing them - an understandable error, given the fact that the final trials will be with mixed substances. As soon as I am done setting them straight, I notice another common error. Once a substance does not get a reaction, some of the students are adding the next solution on top of the just-tested sample. I wouldn't have caught this had Louis not claimed that sugar was reacting with phenolphthalein solution, a substance that turns red in the presence of a base. They had drenched the sugar with a basic solution first, then added the phenolphthalein, which reacted with the base, not the sugar. This will come out in the class presentations, but I don't want them to be set up for public failure. I express skepticism and encourage them to share their results with other groups before signing up to present.

Louis, however, doesn't seem satisfied with my answer. I notice peripherally that the group in the back is getting distracted. I want to go over to them, but Louis persists. "What if they steal our idea?" he exclaims. "You know how they are." *You all get the same grade*, I point out, still looking toward the back. "Yeah, but I want the No-Bull prize." To which Tanisha replies, "You need the Full-of-Bull prize." *It's a good question*, I say to the group. *Professional scientists face similar issues. Try looking at it this way, Louis. They might steal your idea. But it's a bigger problem if you are presenting wrong ideas to the class than if you are presenting fewer ideas. One good insight and a lot of sharing can win your group the No-Bull prize.*

When I finally approach the group James and William joined - a crowded table of six surly-looking young men (group size is supposed to be four) - they have stopped working completely. They had had a promising start. William poured iodine on each one of the powdery substances, following James's instructions, and they correctly picked out the starch. He set the two side by side in the middle of the table.

Then Mark poured the phenolphthalein solution on top of each of the powders. When two of the powders turned reddish. James became confused; perhaps he had assumed each powder would react with only one liquid and he could pair them up. Instead of taking that confusion as the occasion for further inquiry, they intellectually fled the scene. First James quit offering instructions. Soon thereafter William pushed the whole tray of powders to Daron, who mixed some of the powders together randomly and poured the reagents on them until he got bored. Eventually they abandoned the effort altogether and began to distract the more persistent, if no more systematic, groups working on either side of them. I sit down at their table and begin asking questions about their results. When they only reluctantly respond, I direct my questions to specific individuals, starting with James. *So, Rapdog, why did you stop experimenting? You got it all figured out?*

James responds positively to my using his "tag." He turns back to the table and responds that their chemicals had been "stepped on too many times and they wouldn't work anymore." James is older than the other boys. They follow his lead to a large extent, which is why I addressed him first. I ignore the drug reference and stick to the science lesson. *How do you know it was "stepped on?"* I ask. "I don't know. I can tell. I've got skills." He slumps in his seat and looks away as I raise my graying eyebrows. *What sort of skills do you have. James? Skills that help you tell different chemicals apart without testing them? That could be worth a lot of money! Do you use your sense of smell? Sense of taste? Or some other sixth sense?* I am joking with him, but I am also pushing him. He isn't as together as he is pretending to be.

"Yeah taste. I like to taste it," he says, still not looking at me. *Really? You can do it by taste? Here, tell me what this is by taste, acid or base, weak or strong.* I push the baking soda his way. He looks at the white powdery substance in the bowl. "Nah," he rolls his head and looks away again. *If you had been here yesterday, James, you would know that the first safety rule is not to let your skin touch any of the substances. They could burn you. So no tasting, if you want to keep your tongue.* He doesn't respond. *So where were you yesterday?*

"I was sick." I can tell he is getting annoyed at having been singled out. *You couldn't have been too sick, James. I saw you and William in the yard yesterday morning. You could have come in to class. I lower my voice. Do you know you and William have already missed eight days in six weeks? Eight unexcused absences. What's up with that? At this rate you will not pass eighth grade.* "I was busy." *With what, James? With Gary T.? What is he going to get you, except trouble?* My posture and my voice lean into James. *You are smart, James. You are a leader. Other people look up to you. You could do better. You know it. So what are you doing?* I pause. The other boys are listening now. *Hmm, James? What are you doing?* He shifts uncomfortably in his seat, then starts talking at the wall. "Maaannn, you stupid. You Black, but you just like those other teachers that come here." My heart winces at this remark. I pause before I ask, *What is that supposed to mean, James?* "I 'on know." I wait. "Saint C say crap like this ain't going to get us paid." Saint C? I don't recognize the name. I make a mental note of this, but don't let it distract me. *But you can get paid, James. Scientists make good money. And you could be a scientist, if you wanted to be.*

"Pfft," James snorts a laugh and looks at me. "B. Mello here gonna be a scientist? Mario gon' be a scientist? You on crack, Mr. J." James holds my eyes for a moment that is abridged by his own insecurity, before he rolls his and looks away. He is wrong. I know he is wrong. But he is confident in at least the impossibility of my convincing him of this. How many Black scientists do I know? How many Black scientists from the inner city? And still here I come, in my high-water lab coat, pretending to be a scientist, but we both know I'm just pretending. I respond weakly, *You must be mistaking me for this Saint C character. I don't do that stuff. Besides, what does this Saint pee-wee know?*

Now it is James's turn to win. "C! Saint C," he insists, the little boy coming out in his voice. "An' he got money, bitches, ride, style, and he got people coming to him. Who you got coming to you?" You're just a teacher, I finish the statement in my mind. Who respects that? Who pays for that? I don't even get job

security. "You don't know anything you ol' Tom looking-" *That's enough*, I tell him. I can feel my anger rise. Who is this young man to be talking to me in this manner? I shouldn't let it affect me. "What?" he asks. As I stand up, students at other tables are starting to pay attention to our conversation. *That's enough*. I repeat, *we'll continue this conversation later, after class*. That James is starting to get disrespectful doesn't surprise me. Pushing him and his friends to look at a simple science inquiry lab, specifically at how quickly they gave up on it, gets us perilously close to looking at the sense of futility that pervades their experience of school. It is easier to lash out. What unsettles me is the anger I am feeling. I intended to challenge their way of looking at things, and here they are challenging mine - effectively. What do I have to offer them? How prepared am I, or this school, to do what it takes to assist these young men in building a better future? Really, I stare at James for what seems like longer than I should, searching for a worthy parting comment. All I can think about is the path that has led me to this classroom, and how much some part of me has wanted to avoid a moment like this.

Reflections on Maintaining High Expectations for Everyone in Inquiry-Based Science Teaching

Why not send James to the office for such insolence? someone might ask. I doubt that anyone would have blamed me had I done so, not even James's friends. The main answer is that after twenty years as a teacher I almost never send students out of the classroom for discipline, so I am out of the habit. The deeper reason, perhaps, is that I feel for James. I can see myself at his age when I look at him. I understand what it is like to believe it makes no sense to try, that none of the teachers "get it," nor can they be trusted to back up their easy reassurances with teaching that actually reaches my world. To be honest, I don't like thinking about that time of my life very much. It was a hard time. That probably explains some of the anger I was feeling.

Part of my feeling for James has to do with growing up poor; part has to do with being a young man; and part of it has to do with race - that's the part I want to talk about. I do not excuse James's behavior. He is not without choice in this matter. I know this and do not intend to let him lose track of that. What I also know is that James and his friends, like many young African Americans, do not believe the school system is set up so they can make it. Whether it is their counselor's advice to plan ahead for college or the uncertainty of a science inquiry lab, their lack of trust in the school setting inclines them against complete commitment. While this can cause problems, it is not, in my opinion, simply a self-defeating delusion. I think there is wisdom in it. If it surprises you that I say that, it shouldn't. I think such skepticism has historically aided the survival and well-being of African Americans. In many contexts I think this continues to be so.

As I said, I, too, have experienced cautious reserve or even outright suspicion when navigating through large institutions - and this includes public schools. I am not really interested in justifying these feelings to anyone. They are born of my experience and are corroborated by the experience of others in my community. What I am interested in conveying is how my ability to see the world in this way makes a difference in my science teaching. When James resists my science inquiry lesson, I don't see laziness and I don't see emotional pathology; what I see is as intelligent a response as a boy his age can muster to obdurate circumstances. And that is an intelligence I believe I can build upon.

To make clear exactly what I mean by this, I will need to share with you some of my experiences in public schools over the years. These experiences, as well as my knowledge of African American history and my own evolving sense of my African American identity, form the backdrop against which I interpret James's response to my teaching.

Jim Crow Experience: Feeling Separate in an Integrated World

Ever since I was a teenager some thirty years ago, when I first heard about the famous *Brown v. Board of Education* Supreme Court decision, I have looked around me and seen nothing but an empty victory. I

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believed then, as I do now, that America's philosophy of separate but equal has remained a reality despite that decision. It is true that in the South, Jim Crow laws requiring White people and Black people to be educated in separate schools were repealed. But now that the schools are integrated, some other, more insidious law is at work, keeping White and Black people in separate worlds and keeping Black people down. It is individual and institutional racism. It is internalized oppression. It is media images of Black hopelessness and haplessness. It is psychological and economic apartheid. You need only look at the numbers. How many African Americans drop out? How many are in college-bound classes? How many in high school Advanced Placement physics? Even integrated schools are still Jim Crow where educational opportunity is concerned.

I went to high school in Bakersfield, California, a city in the Central Valley, not unlike Fresno, but in a different era. The schools had recently been integrated, which in Bakersfield still meant mostly White. I was physically included at the city's biggest high school, but I was academically and socially on the outside. I remember being sixteen years old and hearing vacuous reassurances from teachers that if I just tried I could fit in, being made to feel like all my difficulties were on me and getting hardened.

I remember the kind of grief I gave my teachers, even the Black ones - especially the Black ones. If a person of color were truly educated by the system, my friends and I thought, then that person had become the enemy. People of color who singlemindedly pursued an education and insisted that we do the same seemed to have abandoned the ways they grew up with. We gave these people nicknames like "Tom," "Sell-Out," "House n--," "Oreo," "Tio Tacos," and every other thing you might imagine. I did not see White people disparaging one another in this manner for getting educated. Only Black people did this (or so I thought), and this knowledge contributed to my frustration and rage. I remember the fights, and the anger that drove me. I finally escaped Bakersfield, and I think I have been avoiding the anger I experienced there for most of my adult life.

Student Teaching: Hope and Harbingers of Things to Come

Despite my attitude toward my high school teachers, I did make it out of Bakersfield through education. An athletic scholarship got me to a local college. A position as an alternate on the 1972 Olympic team took me to Munich and allowed me to see parts of Italy, Austria, and Greece and broaden my perspective on the world. During that time I began to entertain the possibility that with enough determination I could choose my own path through life. I decided I wanted to be a teacher, not just any teacher, but one who could teach anyone, anywhere.

In the teacher education program at Coastal College, my student teaching advisor, as well as most of my junior high students, enjoyed working with me and I with them. I remember my consternation, however, when I realized that the strongest resistance to my teaching came from my African American students. It was as if they had drawn a line in the sand and dared me to teach them anything. The frustration and anger that these students brought to class brought back memories of my own time in public schools. It was clear that they saw me as the "Uncle Tom Sell-Out" who was there to brainwash them so they could be further used by "the man." I worked hard to reassure them that they had a future in this country, that I was not the enemy. But the more I protested, the more I seemed out of touch. It was distressing to watch myself become in their eyes something I had disliked so much myself as a student.

When my term as a student teacher ended, I at least had a good rapport with my students, even if I hadn't convinced many of them they had a future. Since no one expected me to accomplish this, my evaluations were high and my mentors and advisors gave me excellent recommendations. I had become "a credit to my race," one bigoted administrator said to me. I ignored him, and still felt successful. I left the student teaching experience feeling a tremendous sense of possibility. I had a degree. I was willing to work hard. Teachers were in high demand. My future was mine, I thought. I could go where I wanted. Though I didn't say it out loud to myself, I knew that place wouldn't be a predominantly African American school.

The Job Search: Put Off and Pigeonholed

The first person I talked to about job opportunities was a principal in the suburbs of the Fresno Unified School District. I had heard there were several openings for science teachers there. He congratulated me on my accomplishments as we talked about my college career. He said I had performed fantastically in a challenging program. Then he matter-of-factly told me he had no position available for me at that time. He added, as if he felt guilty, "You can go downtown and ask. You will see that nothing is available." He recommended that I not get my hopes up for working at his school and that I should go over to the West Side schools and work with the "colored" kids. "You'd probably be happier there," he told me.

Shocked and infuriated by his assumption, I walked out of his office and went to the district office to inquire about a teaching position. I was given the same story. I was again reassured that a young man with my "background" should look forward to working with the "colored" children. It was implied that I could not make a difference elsewhere. I went to my university advisor with this news the next day. He encouraged me to continue to hold my head up and not to get discouraged. He worked on finding me a position somewhere other than the "West Side," but even he felt compelled to ask why I did not want to teach "Negro children." I tried to explain that if schools were to be truly integrated, this meant the teaching staff had to be integrated, too. I was as good as or better than anybody else, I said, and I wanted to fight discrimination by not bowing to this kind of stereotyping and professional pigeonholing. I thought of it as "breaking barriers." And that was, at least in part, what was driving me.

I applied for teaching positions in Fresno anyway, and in Clovis, a small district that was fast becoming a Fresno suburb. I got no callbacks, not even for West Side jobs. I was told that the district had an excellent opportunity for me to be a teacher's aide and to work in the recreation programs after school and on weekends. I took the job as recreational site supervisor but rejected the teacher's aide job for the obvious reasons.

A Rural School, Ranchers, and La Raza

I did my job for a few weeks, but felt betrayed by the system. I had thought my struggle to get through college and get my teaching certificate would afford me the same access to opportunity as others. But because of my race this was not true. I had signed a contract with Fresno for the year, but quickly decided that I didn't want to wait a year to teach. I began applying to other districts even after the school year had begun. The first district to call me was Tulare Hills, a small rural town in Tulare County. I interviewed with the superintendent, Dr. Elway, as well as with the school board and a panel of principals. They were eager to hire me as a "long-term substitute teacher" because two teachers had already resigned that year. I was told that I would be working at the Tulare Middle School.

This district, I later found out, consisted of Whites, Hispanics, Asians (Filipinos, Chinese, and Japanese), and Armenians, almost everything but a large African American population. As I drove down the freeway the next evening to this small rural town, I wondered where in the hell I was and what I was getting myself into. Fear crept in as I remembered the early morning trips I had made to the fields I had worked in my youth - fields in which Black men traveling alone had disappeared, been assaulted, or worse.

In spite of these anxieties, I found success with the students - or I at least was accepted by them. Once the students understood that I cared about them, my race was rarely an issue in the classroom. I tried to focus totally on the students and they responded. I began to work on the craft of my teaching. Before the year's end I had gained the respect of parents and most members of the community. I was greeted by name at stores and restaurants. I began to feel like a respected member of the community. This gave me a sense of empowerment. I began to feel like I had made the right decision by not capitulating to the Jim Crow personnel policy in the Fresno educational system. In June the school offered me a regular contract for the next year.

Tulare Hills School District, however, was not an oasis of social justice or free thinking. Some of the people I worked with were very racist. Most thought everyone should speak English at school, and a few teachers still punished those who spoke Spanish with swats or humiliation. My job, according to several comments I heard that first year, was to teach "those Mexicans" enough math, reading, and writing to help them be able to work the farms. But I was to tolerate none of "that La Raza crap."

It would be dishonest not to admit that I worried about losing my job. I did worry. I did not know that much about Mexican American politics at the time, but I knew racism when I saw it. It turned out that Cesar Chavez and the union he represented were organizing workers in the area at that time, and local ranchers were upset and wanted it stopped. The organizing had intensified that year, and there had been talk of a student walkout to draw attention to the plight of the workers. Many didn't want to see that happen. I respected Chavez's work and struggle. I didn't intend to suppress anything.

One hot and dusty afternoon, in my third year at Tulare, a board member who also happened to be the owner of a ranch met me in the school locker room after football practice. He had come to ask me what I thought about the rumors of a student walkout planned for that month. Actually, he asked me whether I had "ever heard anything as ridiculous and irresponsible as adults stirring children up like this. If we let this happen, pretty soon students will be walking out for any damned thing." He went on for a while about student protests being a thing of the past and about losing our accreditation for not being able to maintain student discipline, all in a conspiratorial tone that implied he and I were on the same page about this issue. I couldn't get a word in, so I quit trying. He concluded by telling me the only thing we could sensibly do was promise the students they would fail, or be expelled, if they willfully participated in such a disruptive act.

When he was finished, I reminded him that Martin Luther King had organized children's marches against Bull Connor's dogs and firehoses. "But that was different." *I am not sure it is*, I disagreed. I had seen the way the field workers lived - they were as close to slaves as you could get without chains, I thought. I explained to this man that my parents were from the South. *My great-grandfather and great-grandmother were slaves. They left Georgia to start a settlement where the family could be free. Despite overwhelming odds and with a great deal of help from God and many others, they survived. Out of respect for that memory I will do anything I can*, I paused to make sure he was listening, *to help people struggling against a stacked deck. And I will not punish the children of farmhands for taking a part in their parents' struggle in whatever way they see fit.*

His eyes narrowed and glazed over when I said "stacked deck." When I finished he glared at me and said in a flat tone, "I'm sorry to hear you feel that way." When he dug his hand into the pocket of his jeans, I scanned the locker room for the open doors. He pulled out a coin, a nickel, which he flicked with his thumb over the table at me. "Here's for your time, boy. You've told me all I need to know." Then he turned and left. Blood rushed to my face with feelings of rage and memories of past humiliations. *Boy? Redneck, cracker, son of a bitch.* I stared at the empty room for a moment. Let it go, I thought. But the more I stared, the more incensed I became. I stalked out of the locker room after him, and caught up to him at his car.

Pardon me, but I don't believe our conversation is over. "Oh?" he said, opening the door of his pickup. *No, it's not*, and I slowly but firmly pushed the door closed again. *You need to know that it is not acceptable for you to talk to me in the manner you just did. I guess, being a school board member, you must regard the schools as your own private plantation. And us as your employees. Or maybe you just think it is okay to talk to a Black person like you just did. But this is not your plantation. And you are not to talk to me that way ever again.* "Hey now, there is no reason to get upset." I held up my hand. *I am not finished. There is no reason for you to speak the way you did to me, not when I am working for the betterment of all the students in Tulare Hills, and that includes your child, who, despite having at least one rude parent, seems a fine boy - who needs a little help with his science, and who gets that help from*

me. I have the degree, sir, you don't. I do not have to take being talked to in that manner. "Why are you getting this way, Jerome? There's no need . . ." I would prefer you address me professionally. Mr. Jameson will do. And I am getting this way, sir, because if I don't it'll keep coming. You know I am right about this. You'll feel entitled to treat me and maybe other teachers like this. And you are not entitled. You are not. Am I making myself clear?" Sure. Now, if you don't mind, I need to go." I stepped aside and watched him as he started his truck and drove away.

I was certain after that encounter that I would be fired. The man was a school board member. I brought the incident up later with my principal, who first insisted that I was exaggerating. Then he acted as if he wished I hadn't told him. It was clear I couldn't count on him to support me. In the end I was not fired, but the atmosphere of intimidation lingered. The principal developed the obnoxious habit of greeting me with the phrase, "We're keeping an eye on you, Jerome." I got the cold shoulder from the school secretary, whose husband owned a local ranch. I heard it said that I was a "rabble rouser" at school. The school board member who said those things to me served for another seven years.

Not long after that incident I got married, my family became my priority, and I ended up staying in the Tulare Hills district for a total of thirteen years. During that time I became a father to three children, learned Spanish, continued to support Chavez boycotts and strikes, and saw four principals and more than twenty board members come and go. The students and most of the parents embraced me and I them, but I remained ambivalent about my colleagues and the administration. After I received tenure, I realized that further promotions were out of the question. I would never be made principal in that town, for example, nor even head coach. I wanted more opportunities for myself and my children, who were reaching school age. So, eventually, my family and I decided to move on.

Beyond the Pyrotechnics: Individual versus Institutional Racism

The above story may sound like enough to convince a reader that I have had some personal experience of racism in public schools and therefore may have some extra insight into teaching James and his friends. But such dramatic stories - like the pyrotechnics of the safety demonstrations I did - can become an exotic distraction from a deeper understanding of racism in schools. If the only problem were individual racists, our children could be taught to recognize and avoid them; that, for the most part, would take care of the problem. But there are more insidious forms of racism - the kind of racism that allows an organization or community to overlook the basic needs of one group of people while attending to the needs of others. This sort of malignant neglect, when it happens along race lines, deserves the epithet *racism*. It is this sort of institutional racism that really justifies the wariness I described earlier. I learned a lot about these more subtle forms of educational inequity at my next teaching assignment.

I left Tulare Hills to take a job in Halsburg, another Central Valley school district. The appeal was mostly in the greater opportunity for advancement the district superintendent told me I would have. I could teach and coach at Halsburg Middle School, even put on my own countywide track and field exhibition. The school was much better funded and supplied than Tulare Hills, serving a predominantly middle-class (and predominantly White) community. Their computer lab had cutting-edge educational technology, to which I would have access. The middle school at which I would teach had a new principal who wanted to try new things, especially in the area of science and mathematics education. It looked like a definite improvement over my former position.

The best part of my new position, something I hadn't experienced at Tulare Hills, was the cooperative culture at the school. The first few years I was at Halsburg I was part of a staff that worked together to raise student achievement levels at our site. In three years, we went from being the lowest-ranked school district in Tulare County to being a major success story. Mathematics and reading scores improved as the result of several innovations, an energetic faculty, and a supportive principal. We detracked the science and mathematics classes while maintaining a challenging curriculum for all students. We emphasized "hands-

on. minds-on" science and mathematics teaching in class. I started a Science Olympiad program my second year and was made chair of the science fair committee, which during those early years grew exponentially in size. I learned a great deal in a short time, not the least of which was what teamwork could accomplish at a school. We received several local and state grants to support our curriculum development and outreach. By the third year we were being showcased as a model school in the district.

About that time the demography of the district began to shift. More Spanish-speaking ESL students had moved into the area, as well as a greater number of low-income White students. At first this only made me more glad I was working at Halsburg. I watched as students with low literacy rates and below-average academic records mixed into classes with the most challenging curriculum and found success. It was remarkable. I am convinced lives were changed during those years. The new students were coming in far behind the Halsburg norm, but the gap - especially in mathematics and science classes - shrank significantly in only one year. That same year two ESL students won the local and regional science fair with a project on using organic alternatives to pesticides.

It wasn't long, however, before fault lines around equity issues began to emerge in the school and community. Even though the performance levels of Halsburg's middle-class, non-immigrant students did not change, parents began to complain. Certain prominent members of the school board and administration began to voice reservations about the practice of detracking that they had previously praised. More than once these administrators approached me in private "as concerned parents," they would say, "not as decisionmakers." They told me they were worried that their children were not developing to their "fullest potential" in the heterogeneous classes. They didn't believe in tracking, they would insist. But on the other hand it didn't seem fair that their children should be held back. *Exactly how is your child being held back?* I would ask. *Our curriculum has not changed.*

I wasn't surprised that parents were making such statements. I was surprised, though, to see some of my colleagues persuaded by this reasoning. Janice, our most veteran department member, commented after a meeting with concerned parents, "Well, they have a point." Ken, our department chair, snapped, "What point is that, Janice?" Ken, who had been the architect of the detracked science curriculum, continued, "They admitted our curriculum is challenging. But you heard them. They just don't like the idea of their children in class with 'those' kids."

The whole idea behind detracking, according to Ken, was to get away from a system that diverts the lion's share of the resources to those students who are already successful and then warehouses the rest of the students. In addition to depriving some students of the opportunity to learn, tracking also has psychological effects. It stigmatizes the lower-tracked students, and makes the higher-tracked students proud of themselves at the expense of others. This often happens along race and class lines, but it is not limited to that. I have seen middle-class White students explain their placement in a lower tracked course by saying they were "the dumb ones" or that they "weren't good at math." Detracking was about being fair, about avoiding the creation of labels that weighed on children who could least afford it. Now these affluent parents were turning the rhetoric of fairness on its head. They claimed their children were being done a disservice precisely because they no longer had the unfair advantages they were used to. "Bring back the honors courses" is what they said. But "bring back the inequity" is what I heard.

Ken looked up the scores of the children of the most vocal pro-tracking parents. Many of them were not even in the top third of their class according to their achievement scores. It appeared that parents were becoming concerned about the quality of the classes, not based on a look at the curriculum or a close look at the distribution of achievement scores. They were looking at the students in the class - specifically their dress, their accents, and the color of their skin - and were making conclusions based on that.

In retrospect it was a profoundly disappointing time. My working life was comfortable. The discrimination was never as explicit or dramatic as that I had experienced in Tulare Hills. At some level I could believe

that I had accomplished what I had set out to do. I had proven I could make it as a science teacher in a school with the highest standards. I wasn't the best at Halsburg, but I was comparable, and I was an accepted and valued part of a team that I respected. But the advocates for inequity and unfairness were as present as they were in Tulare Hills, and better organized. Mounting pressure, Ken's resignation as the department chair, the arrival of a new principal who was sympathetic to the idea of an honors program, and a host of other distractions eventually led to the reinstatement of a tracked curriculum. Achievement levels of the lower income and ESL students dropped precipitously. Silently, for reasons as indefensible as any overtly racist act, the school had forsaken these students.

I continued to raise objections to these new policies. Not long after Ken resigned, my room and course assignments were changed against my wishes. The Science Olympiad was taken from me. By my eighth year, most of the things that had initially attracted me to Halsburg were either gone or no longer held their fascination. I began to grow restless.

Returning Home: Why Examining Equity Issues Is No Easier for Me than for Anyone Else

Here the story starts to angle back toward Fresno and my conversation with James and William. As fate had it, word got to me through a friend that Fresno was growing and that every year for the past three years the school district had hired several new science teachers. I visited the new downtown district office and was assured that I would be considered for positions that would be opening in the coming year. I was optimistic. A few weeks later, in June, I got a callback. Carver Middle School needed a science teacher. There had been a large turnover of teachers there, and a science position for which they thought I was "uniquely qualified" had opened up. I discussed what the job entailed, where I would fit into the district salary scale, and so on. Then I asked where this school was located. I was told that it was on Fresno's West Side and that it served predominantly African American and some Southeast Asian students.

I had wondered what "uniquely qualified" meant. At first, I started to decline the offer. I felt a certain despondency, finding myself in the same place I was twenty-two years earlier, with my options not much changed. (At least I wasn't being offered a position as an aide.) Back then I hadn't wanted to be pigeonholed as a "colored teacher who could only teach colored children." I wanted to prove to myself and to everybody else that I could teach anybody, regardless of race or creed. For twenty years I set about doing exactly that. But here, once again, people took one look at me and, without consulting me, they wanted to segregate me.

I didn't decline the offer immediately. I didn't accept it either. I wasn't sure why, but I told them I would think about it. Maybe I wanted out of Halsburg more than I was admitting to myself. Or maybe the confidence that came with my two decades of experience took the edge off the insult and resentment I was feeling. This time it occurred to me that I really didn't have anything left to prove by seeking employment elsewhere. Nonetheless, I found I was still reluctant to take such a job. I was still ambivalent about teaching in a predominantly African American community. I reflected on this a lot. I prayed about it.

A disturbing thought arose in my consciousness as the hot dusty days of that Central Valley summer unfolded. I was barbecuing hamburgers in my back yard one evening, watching my children play in the dusk light, and found myself thinking about growing up in Bakersfield. I thought about the possibility of teaching in Fresno, and had to admit to myself that I didn't feel a hesitancy about teaching any other group of kids. I had taught rural, suburban, and urban students, low-income and high-income students, Chicano and Mexicano, White, Southeast Asian, Russian, and Armenian students, all with relative success. So why did I have this issue with teaching on Fresno's West Side? Then it occurred to me. Was I a bigot? Was I a bigot toward my own people?

How else could I explain to myself that I was repulsed by the idea of teaching in a predominantly African American school? One reason I thought that I was reluctant to go back to serving an all-Black community

was lack of information. I had been away for too long. I was afraid of not understanding the students well enough to be able to influence their attitude toward education. And what if I failed? Despite the hassles I was trusted and respected throughout the districts and counties in which I had worked. Did I want to risk my reputation as a successful teacher in a community where I felt success was not relatively assured? But why would I think success was any less assured in an African American community?

There was something more going on, something that made me both want to think about it and not want to at the same time. It wasn't just a lack of information about the African American community that I was worried about. Lord knows I knew far less about the Mexican American community before I moved to Tulare Hills. There was something else - something with more emotional and spiritual force - that I felt in the eyes of African American students and parents that I did not want to deal with.

I felt like I was being pulled by a hidden dual relationship with my Blackness, a "bondishment" to my people and a desire to achieve in a White society as an individual. I had hoped that my achievements, in some small way, would open the way for other African Americans to succeed. But looking back on twenty years of teaching, I had to admit to myself that my presence at Tulare Hills or Halsburg hadn't changed other teachers very much. It didn't change those communities in a way that would make it easier for another African American to teach there. I think I helped some of my students, maybe even reduced the racism in a few members of the next generation, but the barriers remained. As long as I fit in and didn't make waves, I was accepted and valued. But as soon as I spoke from my experience, as soon as I let my understanding of things, of racism, guide my actions and my voice. I was a threat to the status quo - and therefore I was made to feel threatened.

I felt a familiar anger close at hand, one I had experienced as a young man in school, that lucid anger at how this society will not accept the Black man as a Black man, with all the history and insight into hypocrisy that entails. There is a truth in that anger, I know, a truth I associate with the Black community. Not wanting to face that anger meant not wanting to face that truth. When I thought about it that way, it became clear to me that even as I was trying to break barriers, I was also running from the African American communities in which I had been raised. And now part of me was afraid of going back, of being exposed for that flight by African American children and their parents.

A military jet peeled through the summer sky, leaving a white streak that divided the darkening evening stratosphere into two equal and infinite parts. I suddenly felt behind the times, not ahead of them. I was aware that a change had surfaced in Black America over the last twenty years. Jackie Robinson's philosophy had been superseded by Malcolm X's in the popular view. It was no longer good enough for one African American to achieve for the good of all. Staying in the community was the high road, our preacher had said one Sunday.

I realized that all the doubts and fears that had put me to flight from Bakersfield in the first place had now come full circle, and here I was facing them again. I began to recall my father's sermons about Jonah, who ran away from God's command to go to the people of Nineveh and give them a message of repentance. Jonah ran away over and over again, but everywhere he turned he was brought back to the call the Lord had put before him. Finally, the biblical Jonah turned and faced his fear and carried out God's command. Like Jonah, I now felt there was a call I had been avoiding.

Seeing smoke through the kitchen window, my wife had to yell at me "Jerome! They're burning!" She came outside and walked up beside me, looking at the grill. "What were you doing?" I looked down at the charred briquettes of meat that I had intended to be our meal and she looked at me. "Are you O.K.?" *Yes. I'm O.K.* I told her I was thinking about next year, about teaching in Fresno. She wrapped her arm around mine and looked at the grill, the coals still glowing red. *I'm sorry, sweet, I apologized, I guess we're going to have to cook something else for dinner on this grill.* "I'm not sure we have anything else in the refrigerator, Jerome. We'll have to go to the store. I hope it's not already closed."

Heeding the Call: Taking the Job at Carver

After conferring with my family, I accepted the job at Carver Middle school. As I expected, the first thing I encountered when classes began was suspicion from the African American students. They didn't trust me and told me so. A few of the large African American young men assumed confrontational postures towards me. Students ridiculed my rural accent. On the first day a student told me, loud enough for the class to hear, that I talked like a "Tom."

My ability to speak Spanish endeared me to the ESL students, but it surprised the African American students, and I think it made them mistrust me even more. One child commented, upon hearing me translate a math problem into Spanish for a student. "Man, you ain't no n-- speaking Spanish like that." I agreed with him. I told him I did not use the word n-- because that word had slave connotations and was used to demean Black people. *I am here to teach science to everyone.* I explained to him. *And I am willing to use any means necessary to pass on the knowledge I have to you and everyone in here.*

It has been a bumpy start. Equipment has been scarce. Until I met Roy, the computer teacher and wrestling coach, I had few colleagues with whom I could discuss my concerns about making connections with my African American students. I am, however, slowly finding my stride at Carver.

The Value of Historical Understanding to the Teaching of Science

That brings me more or less up to the present - to James, William, and my chemistry-lesson. I know it was a long story, and if I could have told less, I would have. But I could think of no other way to convey the type of understanding that enables me to see the behavior of James and his friends in a dignified and hopeful way. I looked at them that day through a lens that was shaped not in college psychology classes, nor even in discussions of philosophical or religious principles, but in the lens grinder of personal experiences. These kinds of experiences are not something peculiar to me. If they were, I do not think there would be much value in sharing these stories with other teachers. Although I would not presume to speak for all members of any group, I do not believe it is stretching things to say that the experiences I have described are part of a larger experience of a whole community of people. I am not the only person who has met personally with discrimination, intimidation, and willful neglect inspired by my race and the race of my students. This is part of a common experience of people of color, especially African Americans, in this country. This experience is real. It is irreducible. It is not going away. It lives in the stories that we tell one another and that we tell our children. Children see it in their parents' experiences. It often frames the way we encounter people, institutions, and situations as much as race frames the way we are encountered. This is neither pathology nor paranoia. In my opinion it is a realistic and intelligent response to a continuing history of oppression, a response that aids survival more often than it hinders learning. And it is a reality teachers need to understand and deal with constructively if they are to teach African American students successfully.

That is one part of what was going on in the classroom that day between James and me. The other part was a science lesson - a challenging, student-centered inquiry lesson intended to move students closer to thinking like chemists. Some parts of the science curriculum, too, are irreducible in my opinion. Some parts of the physical world and the optimal ways of investigating them are not going to change. Students need to learn that similar-looking substances can behave quite differently and that the molecular structure of matter explains these differences. They also need to have that knowledge demystified by being taught how to go about investigating a phenomenon like molecular structure.

This means doing more than simply telling students what a scientific investigation looks like - *So Rutherford shot electrons at a thin sheet of gold, and they ricocheted back in a pattern that disproved the "plum pudding" model of the atom.* It means more than having them move mechanically through a cookbook-style chemistry lab - *It says add three hundred milliliters of .001 molar hydrochloric acid to*

one gram of baking soda and note the reaction. "Wow! It fizzes!" Really teaching scientific thinking entails bringing students to the brink of their own knowledge, letting them look at the limits of what they know, and then helping them see the value of systematically, even tediously, expanding their understanding through empirical tests.

This may at first seem a straightforward matter. For those of us familiar with science, the value of scientific discipline, skepticism, and patience has become self-evident. But for young people, whose only encounter with science is as a fetishized subject in movies, this cannot be taken for granted. They do not come to class with an understanding that science involves long periods of uncertainty and ambiguity. Nor do they come with a trust that submission to the discipline of inquiry will relieve that uncertainty. If students new to science embrace the uncertainty of a science inquiry, they do so based mainly on their sense of trust in the school setting or in the teacher personally. This is different from the more general trust we think of as making life agreeable in schools and elsewhere. Thus, I believe the new high-standards, inquiry-based approach to teaching science is trust intensive.

Here is where we can begin to see the encounter between a continuing history of oppression and the learning of science in a way that neither compromises the subject matter nor regards the child as "damaged goods." If trust in a setting is necessary in order to take intellectual risks, and if such risk is necessary to develop a real understanding of the scientific craft, then we need to determine the conditions for establishing such trust and whether they are the same for all students.

It is reasonable to assume that different students come to class with different levels of trust in adults, in teachers, and in schools in general. It is equally reasonable to assume that a variety of factors contribute to their levels of trust: individual experiences with schools and teachers certainly, perceptions of difference and a sense of belonging, parental attitudes about school, and the stories told about teachers and schools in the students' community. While the first of these concerns the students' biographies, the latter three trace their ultimate causes to a history larger than the students' personal experiences. Many young women, for example, have further to go in feeling they belong in a science class than do young men. This is not personal idiosyncrasy. Popular images of scientists are unrelentingly male; the history of Western science is a history about the work of men; the large majority of contemporary science professionals, because of a lack of opportunities afforded to women in the recent past, are male. Young women's feelings of marginalization in science classes have historical ballast. African Americans have a unique but similar history in public schools because, with respect to science learning, popular images of scientists are unrelentingly White. A similar story could be told about the experiences of many Mexican American science students. Images of Latino scientists are even rarer than those of females and African Americans in U.S. popular culture. In addition, language differences often box Latino students out of full participation in the learning of science concepts. When teachers do not take this into account in their assessment and pedagogy, students not only can become frustrated, but can also recognize the unfairness and become demoralized. Compound this with stories of exclusion and humiliation at the hands of public school teachers going back for generations - some of my colleagues in Tulare Hills actually spanked children for speaking Spanish in class - and low academic motivation and high dropout rates among Latino students are not so surprising. Native Americans, perhaps more than any other group, have cause never to entrust their children to a public school curriculum. The brutality with which the Bureau of Indian Affairs has historically dealt with the children of Native Americans beggars the contemporary imagination - students removed from their homes, forbidden to speak their language or practice their religion. In these schools, scientific ideas and attitudes were presented as the civilized alternative to Native American ways of life.

The point I am trying to make is that real history underlies trust issues in the classroom and weighs on the experience of learning science. Just as certain scientific truths aren't going to change anytime soon, neither will this history - and its cultural legacy - change. These two realities come crashing together in moments like that between James, me, and the baking soda. I frequently see students become unsure of themselves when they do not "get it" right away. My experience has been that some students project their own worst fears onto the uncertainty of an inquiry lesson. They mistakenly see their frustration as evidence that they

are "dumb," "lazy," or that they aren't a "science person" or "school person." Experiences of ethnic, class, and gender marginalization can intensify these perceptions.

I know this cuts against the grain of much of the rhetoric we hear these days about hands-on, constructivist, and inquiry-based science teaching. I often hear that such approaches will increase the participation of disenfranchised students. This does happen in my classes, at least initially. Hands-on projects are usually more interesting than lecture or demonstration lessons. They can also seem less threatening, especially if it is emphasized that the stakes are low, that "there is no one right way to do scientific inquiry." But the fact is that there are better and worse ways to do scientific inquiry; there are competent and incompetent ways to use scientific controls, define variables, and design experiments. Eventually students need to get critical feedback on these aspects of their work from someone. When these higher standards are imposed without a pedagogy in place that insures traditionally underserved students will be given the opportunity to learn, these students are pushed further toward the margins.

I am not suggesting that we give up on high standards in science teaching, nor that we give up on certain students. I am suggesting that we have a problematic situation where equity in science teaching is concerned, one that requires us to think about it in more nuanced terms than a single teaching technique. I think a historical perspective helps in this matter. By looking at science education equity issues against the backdrop of history I do not in any way retreat from a rigorous treatment of science as a subject matter. At the same time, it allows me to look at certain acts of student resistance and avoidance - acts that would otherwise seem like insolence or inability - as intelligent responses to a broader reality. That is an intelligence I can work with.

To make clear what I mean by this, I want to return to that encounter between James, me, and a chemistry lesson, looking at it now in light of the stories I have told you.

James and a Science Lesson Revisited

"Saint C say crap like this ain't going to get us paid." *But you can get paid, James. Scientists make good money. And you could be a scientist, if you wanted to be.* "Pfft." James snorts a laugh and looks at me. "B. Mello here gonna be a scientist? Mario gon' be a scientist? You on crack, Mr. J."

He is wrong. I know he is wrong. But he is confident in at least the impossibility of my convincing him of this.

I said that James's remarks made me angry. I also said I sympathized with him. This is not a contradiction. I have been where James is and, to be honest, I do not want to go back. I want to reach out and bring him into a more hopeful world, but reaching too far toward him, identifying too strongly with his pessimism, puts me off balance. I know that may sound strange, my being nearly fifty years old, a professional and an educational leader - what do I have to fear? The answer is nothing, at least not concretely and immediately, and certainly nothing from James. My reaction is to something bigger than James; it's like a tug of war between James's view of the world and my own. It is a contest between a world where everything is a racket and a stacked deck and the only game available to an ambitious young African American man is outside the mainstream, and a world where opportunity to make a difference not just for ourselves but for each other is available amidst a European American majority. Despite my successes, in my most self-honest moments I have to admit I am not sure which world is the more true.

I describe this as a feeling I would rather avoid, but I also regard it as an advantage to my teaching. If I were to phrase it more positively, I would say I have a respect for James's skepticism about the promise of equal opportunity in school settings. Having this perspective allows me, when he talks as he did to me, not to see it as a sign of psychological dysfunction or moral depravity. I see it as a response, in this case misdirected but never wholly unjustifiable, to a continuing history of oppression. And my cautious desire

is to see this anger momentarily redirected, but never "cured," never "fixed," never "worked out." I do not aspire to see indiscriminate optimism in my Black students (or any student). I think that would amount to miseducation.

Such an outburst, however, demands a response of some sort. Sending James to the office might not be the best thing to do. But to not respond, just to avoid his pessimism and his confrontational attitude would be to leave James on his own. This is exactly what he expects. Since I don't believe children make it out of such cycles of disaffection and distraction alone, to let him be is to effectively lower my expectations for him. It is to say that limited achievement is the most I can expect from him or, worse, that it is what he deserves for copping an attitude. I am not this young man's therapist, but I am his science teacher. That means to me that I need to teach to his frame of mind, not to the frame of mind I would like him to have. My challenge as a science teacher is to figure out how I might understand James's resistance to a science inquiry lesson without indulging emotions like pity or resentment that would lead to lowered expectations for him and his friends.

So how did this understanding change my behavior toward James and his friends? I believe that had I not recognized the personality, posture, and volatile nature of my own past in these young men, I would have written up a referral, or, had the confrontation gone further, I would have phoned the office and had security come down and remove him from class. Instead, because I had respect for James's misgivings, I took responsibility for how his remarks made me feel. I recognized that they weren't about me, but were a response to something much larger than me.

When I went home, I continued to think about James and his friends. But I didn't think about how "bad" they were, or how "lazy" they were, or to whom I could refer them. What I thought about was how I could make a connection with them - how I might honor their lack of trust in the school setting but still present a science inquiry as an experience worthy of their effort. If convincing them to trust the school setting was not likely to happen, I at least needed them to trust me - a prospect, I realized, that might take some time. In the weeks that followed I spent time in the gym with James and his friends. I made a point of displaying the breadth of my scientific knowledge. I listened to their stories without judgment, all the while continuing to insist they attend class and learn science for their own benefit.

I became more attentive to the uncertainty that my inquiry labs caused; I talked to students up front about the experience of uncertainty; I tried to offer reassurances that such feelings were to be expected before their frustration became acute. When James sat down at another lab later in the year, I told him to think of a science lesson as driving the lane in a basketball game. *Do you know which way your opponent is going to defend, before you approach him?* I asked. "No, I have to make my move and draw him out. Then I know which way to go." *A science lab is the same way, I told him. You don't know which way it is going to go, before you start. But if you do it right, you can draw it out, then you know which way to go forward.* This analogy seemed to help him.

Finally, I thought about James's and William's skepticism about having a science career and their attraction to Saint C. Realizing they felt that mainstream professions weren't accessible to them, I reconsidered offering the possibility of a science career as motivation for staying away from Saint C. Comparing a career that seemed out of reach to the opportunities he represented would only strengthen his stature in their minds. Instead I deployed their cynicism against Saint C. One afternoon after playing basketball his name came up, and I began asking questions. I asked whether Saint C did a lot of planning for his work. Were they included in this planning? I asked if he allowed them to handle his money. I suggested that it was good business for him to keep them in the dark about his plans, since they could be potential competitors someday. *The longer you keep the competition ignorant, the longer you stay in business,* I remarked. *This isn't any different, I told them, from the system of slavery that didn't allow slaves to become educated. It is also like being assigned to the menial jobs in a company, because you only have enough information to work for those in charge.* Not long after that discussion James and

William began visiting me at lunch occasionally.

Conclusion

I could say a few things more, but I will stop there. I have no happy ending to report, no "Stand and Deliver" climax where gang members make it into college and whole classes pass Advanced Placement tests. James's and William's attendance rate improved, at least in my class. As the year progressed they persisted longer at their science labs than in those first few weeks, but this was true of most students in the class. James and William also continued to perform below the class average. In the end I can't claim evidence of an academic transformation. I can't even say my interpretation of their behavior is the true one. All I can confidently say is that it changed the way I thought about and responded to these two young men. I think, however, that this is significant.

I do not think the type of historical perspective that I am advocating will be a silver bullet solution for science education inequities. It is not going to magically transform our classrooms by turning dropouts into college graduates, C science students into A science students, math-phobic students into engineers, or even quickly close the gap in mathematics and science achievement statistics for cultural and linguistic minority students (no single thing is going to do that). In fact, the first most notable effect of taking a historical perspective may be negative; it may make us uncomfortable by increasing our empathy for experiences of student hopelessness without providing clear, concrete ways to respond to those feelings. However, if this perspective places a pause between a student's resistance to a science inquiry lesson and the diagnosis that they are somehow flawed, then it opens a space where more authentic connections *might* be made with traditionally underserved students. Even if it only opens up new possibilities for promoting science education equity, I offer that its value is wholly justified.

Methodological Afterword

The Sonata-Form Case Study: A Methodology for Teacher Inquiry

Over the past twenty-five years, Zachary Sconiers has worked as a science teacher in Southern California. He has been involved with science education reform since he began his career, working with organizations like Project AIM, the Lawrence Hall of Science, Sandia Laboratory, and the Woodrow Wilson Foundation. Sconiers also has been an educational equity activist throughout his career. He has acted on these convictions in a variety of ways, most recently through the research that produced this document and by establishing an award-winning engineering magnet school that serves a traditionally underserved community in Fresno, California.

Over the last ten years, Jerry Rosiek has maintained a continuous reflective engagement with the experience of teaching specific subject-matter concepts to traditionally underserved groups of students - first in his work as a mathematics teacher in rural south Texas, then in research collaborations with student teachers at Stanford University and Portland State University, and more recently with groups of experienced teachers in Fresno and the state of Alabama. From that engagement has emerged a method for conducting research on teachers' practical knowledge, a conception of the nature of that knowledge, and a format for representing that knowledge. The preceding case study by Sconiers and Rosiek is an example of this format. What follows is a brief explanation of the research methods and priorities that produced this case study and others like it.

Research as Collaborative Reflection and Writing

Sconiers and Rosiek produced the case study as part of their work in the Fresno Science Education Equity Teacher Research Project (Fresno Project). This project was sponsored by the Fresno Unified School District¹ and the California Science Project. The Fresno Project was designed by Jerry Rosiek and María