

Radical Equations: Math Literacy and Civil Rights

Reviewed by Neal Koblitz

Radical Equations: Math Literacy and Civil Rights

Robert P. Moses and Charles E. Cobb Jr.

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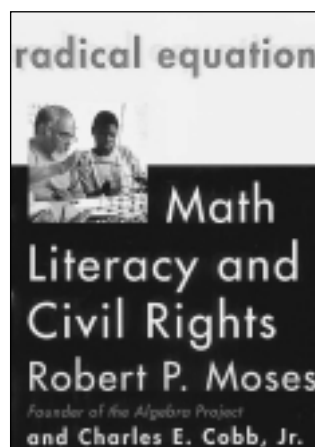
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In this book, Robert Moses (assisted by journalist Charles Cobb Jr.) tells the story of two arduous campaigns in which he has played a leadership role: the voter registration drive in Mississippi in the 1960s and the efforts to increase success rates in math among black children. Early in the book, Moses explains the link between the two:

In today's world, economic access and full citizenship depend crucially on math and science literacy. I believe that the absence of math literacy in urban and rural communities throughout this country is an issue as urgent as the lack of registered black voters in Mississippi was in 1961...[M]ath literacy—and algebra in particular—is the key to the future of disenfranchised communities. (p. 5)

The book is divided into two parts. Part I gives a vivid picture of the civil rights movement in Mississippi in the years 1961–1964. Moses not only

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conveys the drama of impoverished black Mississippians confronting the violence of whites determined to prevent them from voting, but also candidly and convincingly describes the difficult strategic and tactical decisions of organizers such as himself who were trying to transform these rural black communities into an

effective political force.

In Part II Moses describes the Algebra Project, which grew out of his efforts to improve the teaching of math in his own children's middle school in Cambridge, Massachusetts, in the early 1980s. Alarmed that his oldest child would not be adequately prepared for the college-prep track in high school, Moses volunteered to teach beginning algebra to her and several of her more advanced classmates. He later expanded the program to include other schools in Cambridge and Boston. As word spread of the success of the Algebra Project, Moses was able to start similar programs in Chicago, Milwaukee, Oakland, San Francisco, Atlanta, and elsewhere. In 1992 he returned to his old battleground, Mississippi, and from there launched the "Southern Initiative", directed by David Dennis, a

friend of his from the civil rights movement. At its peak in the mid-1990s, the Algebra Project served almost ten thousand middle-schoolers.

As Moses explains, “Our aim is to change the situation that currently exists, where large percentages of minority students who get through a high school and get admitted to a college have to take remedial math in order to get to the place where they can even get college credit mathematics courses” (p. 16). To achieve this objective, Moses believes that one has to start at the middle-school level and help the children over certain conceptual obstacles so that they are ready for the abstraction and symbol manipulation of an algebra course. One such barrier is negative numbers. Moses discovered that most middle-schoolers found operations with negative numbers to be confusing and unrelated to the real world. In order to convince them of the practicality of negative numbers, Moses takes the kids on a subway ride. Interpreting the number of stops traveled inbound as a positive integer and the number of stops outbound as a negative integer, he shows how addition and subtraction of signed numbers have meaning for their subway trip.

Moses’ program has had some impressive results. According to a study by Frank Davis and Mary West of Lesley University, 92 percent of Algebra Project graduates in Cambridge enrolled in upper-level courses in ninth grade—twice the rate of students not in the project. Davis and West found similar comparative data in San Francisco, and in West Tallahatchie, one of the poorest communities in Mississippi, Algebra Project students scored well above the district mean on the state’s algebra test.

But *Radical Equations* does not emphasize such statistics. It is not intended as a scholarly treatise; in the words of the authors, it is a “very personal book” (p. 22). Moses describes his struggle for the Algebra Project as eloquently as he describes the civil rights campaigns of his youth. Some readers might be put off by Moses’ angry and impassioned tone when writing about the failure of schools in minority communities:

Math illiteracy is not unique to blacks the way the denial of the right to vote in Mississippi was. But it affects black and other minorities much, much more intensely, making them the designated serfs of the information age just as the people that we worked with in the 1960s on the plantations were Mississippi’s serfs then...In our time, across the country, it is black, Latino, and poor white students who are trapped at the bottom with prisons as their plantations. (pp. 11-12)

But I do not think that Moses’ words are too strong. Many other writers with first-hand knowledge of inner-city and rural schools have used similar language to describe the educational deprivation there (see, for example, [4]).

Some readers might also find Moses’ analogy between the voter registration movement and the math literacy movement to be a little strained. But here again I think that Moses is expressing a deep truth that frequently goes unrecognized in discussions of math education: social aspects are often more important than anything else. The best lesson plans and the best textbooks in the world will not do much good if students do not respect their teachers, if their peer group is constantly telling them that studying math is “uncool”, if teachers are burnt out and demoralized, if parents and local community leaders are uninvolved in the schools, and if national political leaders approach educational issues irresponsibly and demagogically.

Many pages of the *Notices* and other journals have been devoted to the fierce debates between “reformers” and “traditionalists” (see Allyn Jackson’s excellent, evenhanded report on the “math wars” [3]). But to many of us who spend time in math classrooms these debates seem largely irrelevant—orthogonal to the reality of the public schools.

For the past eight years I have been teaching a rather unconventional math course for our majors who plan to become middle and high school teachers. The five-credit course includes a “lab” consisting of visits to an inner-city school in Seattle. Each week we present math enrichment material to several sixth or seventh grade classes. The topics range from cryptography to graph theory to arithmetic games to a proof-without-words of the Pythagorean Theorem. After one of us briefly explains the topic, we pass out worksheets and circulate among the kids, helping them individually or in small groups.

Like Robert Moses, I believe that the middle school years are critical for interventions of this type. This is the age when many minority students (and also girls) turn off to mathematics, develop negative attitudes, and start falling badly behind. The kids we work with (about 75 percent of whom are black) see a side of mathematics that is more interesting than their usual schoolwork, get more personal attention than their teachers could possibly give them, and in many cases start to look up to the university students as role models. In addition, my teacher-prep students get to experience a real-world classroom environment.

I, as well as my students, have learned a lot from these school visits. The central lesson has been that in math education, social issues are often more important than purely curricular ones. Thus, to me it is not so surprising to see the former civil

rights activist and community organizer Robert Moses, rather than a mathematician or a professor of education, as a leader in math education reform.

When I began visiting schools in the early 1990s, what I found most unexpected and disorienting were the frequent interruptions that teachers have to put up with during a fifty-minute math class: announcements over the public address system, telephone calls to the teacher during class, messengers with notes from the main office. Someone interrupts class to pick up attendance sheets. Someone else interrupts to bring in a late student or pull a student out of class for some reason. It is no wonder that “attention deficit” has reached epidemic proportions among American middle-schoolers. When the school administration shows little respect for the integrity of the class hour, the children inevitably get the message that the academic content of the lesson is not very important.

One incident stands out in my memory as a sad and poignant illustration of the lack of common sense in our schools. One day a boy named Jamaal was wanted in the main office. Jamaal looked alarmed, and his classmates all stared at him. Had he done something terrible? What was in store for him? Jamaal was escorted out and fifteen minutes later was brought back to the class. His return caused even more commotion among the sixth graders than had his departure. His friends, burning with curiosity, had lost all interest in the math lesson. Jamaal had tears in his eyes and was trying hard not to cry in front of the others. I later learned from the teacher that Jamaal had been pulled out of class to be told that his grandmother had just died.

Writing a decade ago, educational researchers Stigler and Stevenson [9] compared math classes they had observed in Asia and in the U.S.:

American lessons are often disrupted by irrelevant interruptions. These serve to break the continuity of the lesson and add to children’s difficulty in perceiving the lesson as a coherent whole. In our American observations, the teacher interrupted the flow of the lesson with an interlude of irrelevant comments or the class was interrupted by someone else in...47% of all fifth-grade lessons...In fact, no interruptions of either type were recorded during the eighty hours of observation in Beijing fifth-grade classrooms. The mathematics lesson in one of the American classrooms we visited was interrupted every morning by a woman from the cafeteria who polled the children about their lunch plans and collected money from those who planned to eat the hot lunch.

Interruptions, as well as inefficient transitions from one activity to another, make it difficult to sustain a coherent lesson throughout the class period.

Part II of the book under review is most interesting and convincing when it treats the social aspects of math education. Moses has great insight into ways to motivate young people. Like Uri Treisman at the university level [10], he highlights the crucial role of peer influence and peer group interaction. Particularly inspiring is Moses’ account of the steady stream of Algebra Project graduates who return as “math literacy workers” (in conscious analogy with the voter registration workers of the 1960s). Less than a decade older than their students, they can speak to the middle-schoolers in the language of youth culture and convince them that studying math is “cool”. They can also help them form small groups to explain the math to one another.

Another social factor that Moses is acutely aware of is teachers’ attitudes. The Algebra Project has become most firmly established in those school districts such as Cambridge, Massachusetts, and Weldon, North Carolina, where the teachers not only have agreed to the plan, but have become active lobbyists for it. Moreover, in some cases they have helped design or modify the lessons so as to fit in with their particular students. Moses comments that the process of working out the details of the curriculum “gave participating teachers greater appreciation for the kind of self-reliant education efforts the project was trying to encourage in students. Teachers also gained a deeper sense of their own authority” (p. 118). Elsewhere Moses speaks of teachers feeling a sense of “ownership” of the material. This idea of involving teachers directly in curriculum development is close in spirit to the “lesson study” approach that the Japanese use with great success (see [8]).

Moses stresses the need to draw in the family and the community—again, by analogy with the civil rights movement. He gives a wonderful example of how this can be done:

With the help of Southern Echo, a community organization founded by [civil rights movement] veteran Hollis Watkins, a math games league had been developed in Indianola [Mississippi]. At tournaments students competed in games built around factoring numbers, writing equations, and other calculations. Parents participated as scorekeepers. In August the league was told by the superintendent of schools that it could no longer use the middle school without his permission. Letters were written and ignored. But when parents

got the backing of the local steelworkers union, the superintendent backed down. Recognizing their power, parents now pressed him on why science labs were not available at the middle school. (p. 146)

Moses comments that “the only ones who can really demand the kind of education they need and the kind of changes needed to get it are the students, their parents, and their community, which largely remains silent on issues like this” (p. 151). Thus, it is the job of a math literacy campaigner to organize these groups. And it is precisely in the South, where Moses and David Dennis had had the most experience tapping into the rich community structures, that the Algebra Project has had the most sustained impact.

Despite my admiration for what Robert Moses has accomplished, some parts of the book bothered me. The treatment of pedagogy is disappointing. A belabored and tedious discussion of how addition and subtraction of negative numbers can be taught using direction along with distance on a trip occupies fully twenty-one pages of the appendix.

Moreover, Moses is impatient with anyone who does not immediately embrace his five-step method of experiential learning. His respect for teachers’ autonomy does not appear to extend to those who do not buy into his approach. If a teacher wants to cover arithmetic operations with negative numbers in a traditional manner, without taking the class on a field trip and without extensive class discussion, that is unacceptable. In Warren County, North Carolina, David Dennis decided to terminate the Algebra Project after encountering teacher resistance to the materials that Moses had developed. “I really think the program is fine,’ the teacher told him [Charles Cobb], ‘but with the kind of pressure we have on us, my classes and my students need more structure and discipline. We just can’t have all that back and forth in here and get anything done.’...And ‘I have seen some success with the traditional way, so I’m going to stay on this traditional path and maybe I’ll see some more’” (p. 159). Instead of respecting and trying to accommodate such teachers, Moses and Dennis speak regretfully of the scarcity of teachers that causes the district to be stuck with the recalcitrant ones: “...the teachers refused to do the project although the school district had embraced the project. The school district was confronted with the choice of either strongly reprimanding or firing the teachers. But if they fired the teachers, or the teachers quit in anger, the district would not have had any teachers to replace them. This is a problem throughout rural areas, where it is always difficult to find and keep teachers” (p. 158-9).

Visiting middle schools over the years, I have seen some dedicated and effective teachers who,

like the Warren County teachers, prefer traditional curricula. I have also encountered excellent teachers who use innovative materials, based on the 1989 NCTM *Standards* [5] and similar in spirit to the Algebra Project curriculum. And I know some teachers who like to combine both, some days using a lecture-and-drill approach and some days using a loosely structured, constructivist, self-discovery method. Why does one have to choose a single pedagogical philosophy and condemn everyone who does not adopt it?

Moses seems to believe that his curriculum provides the only way to motivate minority students. This is not true. Some teachers have had success with other types of *Standards*-based textbooks, and some even manage to get good results while defying NCTM recommendations. The most famous example of the latter type of teacher is Jaime Escalante, the hero of the movie *Stand and Deliver*, who took his mostly Latino students in East Los Angeles all the way from pre-algebra through the advanced placement calculus exam.

Moses’ dogmatic insistence that teachers use a single set of curricular material is hard to understand. When he started teaching in the Martin Luther King School in Cambridge in 1984-1985, he used a textbook by John Saxon, an ardent traditionalist and fierce critic of the NCTM (see [7]):

I settled on Saxon’s *Algebra I* because I liked the way it reviewed concepts and processes through questions at the end of each chapter. The questions always included problems introduced in previous lessons. This helped ease my worries about how to get at fundamental concepts from the material. (p. 96)

If Moses himself was successful with a traditional textbook before he developed the Algebra Project material, why is he now unwilling to work with teachers who prefer the older approach? Like many converts to constructivist pedagogy, Moses is intolerant toward those who prefer other methods.

A few years ago I learned about a program that also used Saxon’s books and had an objective very similar to that of Moses’ Algebra Project. Called the Garfield Challenge Program, it was created by the two calculus teachers, Virginia Burton and Jack Babani, at Garfield High School in Seattle. In the early 1990s, disturbed by the small number of minority students in the advanced track, they started an intensive six-week summer workshop for promising minority ninth graders. Their purpose was to boost the youngsters’ mathematical knowledge so that they could jump into the higher track.

The Garfield Challenge Program was very successful. During the few years of its existence, several dozen minority students moved into the

advanced math sequence. The project got favorable coverage in the local press, and some of us at the University of Washington were particularly interested in the program's potential to enlarge the pool of highly qualified minority applicants to the university.

But unfortunately, the program was a victim of the vicissitudes of funding. It is easier to get "seed money" for a new project's first few years than it is to get continuing funding for a program with a proven record of success. And money is more readily available for curricular experimentation than for programs that use traditional methods and older materials. Most likely that is why the Garfield Challenge Program, despite its documented success in getting minority students into the advanced track, died for lack of funding.

Just because a program is widely acclaimed, it does not follow that it will be able to get long-term support. In recent years the influence of Robert Moses' Algebra Project in Northern cities has been on the wane [2, 11]. Moses' explanation is that there is more competition from other programs in those cities, whereas in the South the Algebra Project is usually the only game in town. He also says that in the major urban school systems "the basic idea is that the math reform should be driven by people who are credentialed through the universities" [2], and the Algebra Project's leaders are not based in the universities. In addition, it seems to me that Moses might have had more success in Northern cities if he had been a little more flexible and had been willing to work with teachers and administrators who wanted to use curricular materials other than the ones that Moses developed. Whatever the reason, it is unfortunate that Moses' math literacy campaign has taken root in relatively few school districts.

This is a difficult time for math education. Politicians of both political parties have decided on an education policy centered around annual high-stakes standardized exams. Teachers are increasingly being pressured to teach to the test and neglect good pedagogy. Since little is being done to improve working conditions for teachers, the teacher shortage, especially in math, is bound to get worse. Now more than ever it is important that rational voices be heard and that we listen to people like Robert Moses who have concrete programs that grapple with the educational crisis in this country.

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