

Good Reasons for Holding the Eighth-Grade “Algebra for All” Policy Is Not (Comparatively) Justifiable

Frederick S. Ellett, Jr.
University of Western Ontario

Erin Wilding-Martin’s nicely crafted essay sets out to explicate and critique Paul Ernest’s philosophy of mathematics education.¹ In a democracy committed to equality and pluralism, Ernest holds that society should not *require* all students to take (theoretical) mathematics courses, but should encourage *some to choose to do so*. Wilding-Martin is concerned that Ernest’s policy might continue or increase *unjustifiable differences* among various groups and individuals. In my judgment, I think that many of Wilding-Martin’s claims can be justified, and I think that several other claims are plausible. I want to focus, however, on the core issue: *requiring* all students to take (theoretical) math courses.

It seems that Ernest and Wilding-Martin use a critical theory approach. I, however, rely on John Dewey. For Dewey, freedom is “the power to frame purposes, to judge wisely, to evaluate desires by the consequences; the power to select and order means to carry chosen ends in operation.... The ideal aim of education is creation of power of self-control.”² As Dewey makes clear, one’s “impulses and desires” need to be ordered by one’s intelligence. In Jürgen Habermas’s critical theory, a person’s being a *practically rational* agent is source of the *obligation* to take ideology critique seriously.³ Yet, what Habermas sees as the practically rational agent is what Dewey sees as the free (and intelligent) agent.

What is mathematics without a surprise quiz? *Question 1* (Q1): There were 90 employees in a company last year. This year the number of employees has increased by 10 percent. How many employees are in the company this year? *Question 2* (Q2): Alba needed to know about how much the sum of 19.6, 23.8, and 38.4 is. She correctly rounded each of these numbers to the nearest whole number. What three numbers did she use?⁴

It should be clear that Wilding-Martin is not (yet) concerned about university coursework. Most university engineering students take applied math courses. Given program limitations and the difficulties of the theoretical mathematics that typically “ground” engineering, it would be indefensible to require all engineers to take theoretical math courses. In the social sciences, almost all students take an applied statistics course. Again, for similar reasons, it would be indefensible to require all students to take the probability theory that “grounds” statistics.

The issues, then, are joined at the *secondary school* level. Notice that the Wilding-Martin policy implicitly raises questions about the views of several well-known philosophers of education: Howard Gardner, Amy Gutmann, Paul Hirst, and Meira Levinson. For each of these thinkers allows for lots of student choice in secondary schools.⁵ Gardner is the most “extreme” because he advocates six quite distinct “pathways.” So, then, can a policy that *requires* all secondary school

students to take a (theoretical) math course be justified? Let us first ask: what assumptions might Wilding-Martin be making about learning achievement levels in elementary schools?

In order to get in position to evaluate Wilding-Martin's stance, consider the Clinton-era policy that urged all eighth-grade students to take algebra. In 1990, only about one in six students enrolled in an algebra course; by 2007, the enrolment had hit 31 percent nationally.⁶ Is this a justified program?

Since the mid 1980s, there have been several important developments.⁷ First, (F1) behavioral geneticists have shown that heredity accounts for a good deal of the variation in student's cognitive capacities. Second, (F2) behavioral geneticists have shown that heredity accounts for roughly 50 percent of the variation in student personality characteristics (such as being impulsive, being easily bored, and being aggressive).⁸ Third, (AM3) have developed standard-based assessment procedures which provide valid and rather fine-grained assessments of student learning.⁹ Finally, (GST) sociologists have plausibly argued that students actively sort themselves into social groups by identification.¹⁰ For example, in studying sixth- and seventh-graders in a school called Wexler, it was found that although the city school was mixed in terms of social-class structure, it was race that had become salient. At Wexler, black kids and white kids had identified with different (racial) groups that had different norms. The whites were seen as the academic achievers; the blacks were seen as academic resisters.¹¹

The first development (F1) implies that not all students are capable of learning algebra. The only way to know is to have the student (really) try to learn arithmetic and math. (Remember Wilma Rudolph!) The second (F2) implies that some students will have a hard time controlling their impulses. The student has to find out if she is impulsive and then take the necessary steps to counteract this disposition. (Contrary to Dewey, some students will find it hard to exercise self control.) The third (AM3) offers teacher, parents, and especially students clear learning standards. These standards will enable the student to exercise (direct) responsibility for his (her) learning. The final development, group socialization theory warns teachers that it will often be quite difficult to get a student to see and take the steps needed to make oneself "more free." (I presume that learning basic arithmetic (and some theoretical math) will enable students to become "more free" to live a good life.)

Suppose we look at grade eight students who are taking an advanced math course (algebra I, geometry, algebra II). Are all the students in these classes actually good at math? Let us consider those students who are at the (lowest) tenth percentile (and below) as measured by their performance on the NAEP math test.¹² Remember the two questions (Q1 and Q2)? The first question is comparatively difficult, for the average correct is only 36.5. Those in an eighth-grade advanced course average 48.7, but for the tenth percentile group the average is only 9.8. The second question is easy, for the results are 85.2, 87.9, and 37.1 respectively.¹³ Such data, however, suggest that there are at least a few students in the advanced courses who are at the fourth-grade level (some perhaps at the second-grade level).

I think the following is “more justifiable” than this eighth-grade “Algebra for All” policy. As early as possible, make it known to teachers, parents, and especially students that by eighth grade various advanced math courses will be available. For almost all students, taking these courses will greatly enhance their freedoms to live a good life. But to be able to take these courses, students must master the basic arithmetic and lower level math needed to succeed in these courses. All students start at the lower levels where the teachers have the time and use (clear) rubrics that will enable all students to know what they have learned and what they will need to learn (and what steps to take). If by grade six (say), the student is still at the fourth grade level, then the student cannot take these classes.

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1. Paul Ernest, *The Philosophy of Mathematics Education* (London: Falmer, 1991).
 2. John Dewey, “The Nature of Freedom,” in *Experience and Education* (1938) (New York: Collier Books, 1963), 64.
 3. Kai Nielsen, “On the Status of Critical Theory,” *Interchange* 23, no. 3 (1992): 265–84.
 4. Tom Loveless, *The Misplaced Math Student: Lost in Eighth-Grade Algebra* (Washington, D.C.: Brown Center on Education Policy, 2008), 7, http://www.brookings.edu/reports/2008/0922_education-loveless.aspx.
 5. Howard Gardner, *The Disciplined Mind: What All Students Should Understand* (New York: Simon and Schuster, 1999); Paul H. Hirst, “Liberal Education and the Nature of Knowledge,” in *The Philosophy of Education*, ed. R.S. Peters (Oxford: Oxford University Press, 1973), 87–111; Amy Gutmann, *Democracy and Education*, rev. ed. (Princeton, N.J.: Princeton University Press, 1999); and Meira Levinson, *The Demands of a Liberal Education* (Oxford: Oxford University Press, 1999). Hirst’s “liberal education” is not Levinson’s version.
 6. Loveless, *The Misplaced Math Student*, 2.
 7. I start here because Wilding-Martin draws on the work of Jeannie Oakes. See Jeannie Oakes, *Keeping Track: How Schools Structure Inequality* (New Haven, Conn.: Yale University Press, 1986); and Jeannie Oakes, *Multiplying Inequalities: The Effects of Race, Social Class, and Tracking on Opportunities to Learn* (Santa Monica, Calif.: RAND Corporation, 1990).
 8. See Judith Rich Harris, *The Nurture Assumption: Why Children Turn Out the Way They Do*, rev. ed. (New York: Free Press, 2009). The psychological inclination for some to be impulsive is related to what economists call the “discount function,” which refers to those persons who prefer present to future satisfaction. See Joseph Heath, “Sharing the Wealth,” *Filthy Lucre* (New York: Harper Collins, 2009), 254–76. Also relevant is Joseph Heath, “Leveling Down: The Wrong Way to Achieve Equality,” in *Economics without Illusions: Debunking the Myths of Modern Capitalism* (New York: Broadway, 2010), 277–99.
 9. See W. James Popham, *The Truth about Testing* (Alexandria, Va.: ASCD, 2001).
 10. For a defense of group socialization theory, see Harris, *The Nurture Assumption*. Notice that GST is used to explain the black-white SAT test gap in Christopher Jencks and Meredith Phillips, eds., *The Black-White Test Score Gap* (Washington, D.C.: Brookings Institute Press, 2005).
 11. Harris, *The Nurture Assumption*, 233–34.
 12. Loveless, *The Misplaced Math Student*, 5.
 13. *Ibid.*, 7.