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## Moving from Deficiencies to Possibilities: Some Thoughts on Differentiation in the Mathematics Classroom

*Mark W. Ellis*

What the learners conflict with in the mathematics classroom may not only be the mathematical meaning of a particular piece of content or a particular strategy, but the whole act of being taught through processes that ignore, reject or make invisible some students, processes destined to select a few and fail the rest.

—Núria Gorgorió and Núria Planas

**K**ATHLEEN Collins's (2003) eighteen-month case study of Jay, a fifth-grade African American student, documents in detail the ways in which those in authority in his school "pathologized Jay's family structure, his cultural way of being" (p. 194) such that he was labeled as having low ability and was held to lower expectations by his teacher. Even after Collins shared samples of his work that clearly exhibited cognitive strengths, Jay's teacher "still responded to Jay as though he were less than capable" (p. xiii). The teacher's beliefs about Jay's abilities and, consequently, his academic needs were premised on a deficit model and reinforced by labels applied to him by the schooling process, leading her to discount evidence of his achievements as somehow immaterial. Although perhaps unintentional, the actions of his teacher served to limit the possibilities for Jay's success.

A practice exists in the United States of using school as a location in which to label students according to some perceived "ability" and separate them into different levels of coursework rather than see the potential for success that lies in every student (Oakes 2005). As this article's opening quote describes, this approach has led to practices in the mathematics classroom that often keep students from the mathematics rather than get them into it (Ellis 2007). Efforts to reform our teaching of mathematics such that a broader range of students have access to high standards and are supported in reaching those standards are often at odds with this practice or habit of mind. When thinking about the idea of differentiation in the mathematics classroom, how it is undertaken must be carefully considered—what are the assumptions and beliefs from which teachers work to differentiate instruction? This article is intended to stimulate readers to examine the positions from which their own efforts at differentiation are

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enacted. Specifically, notions of ability are examined as social constructions that have a big impact on how efforts to differentiate instruction come to be crafted.

Since the early 1900s, school mathematics in the United States has offered a convenient location for the separation of students by so-called “ability” (Ellis 2008). Although concern about the overall mathematical knowledge of all students has become greater and greater in recent years (Diaz and Lord 2005; National Commission on Mathematics and Science Teaching for the Twenty-first Century 2000; National Council of Teachers of Mathematics [NCTM] 2000; U.S. Department of Education 2003), much of the energy being directed toward mathematics education remains focused on determining students’ placement within a variety of leveled courses, planning and implementing separate curricula, and measuring the resulting variations in learning outcomes (Booher-Jennings 2005; Diamond and Spillane 2004). Although these efforts may be socially sought-after, they are in large part educationally counterproductive (Ayalon and Gamoran 2000; Boaler, William, and Brown 2000; Oakes 2005). As long as outcomes in mathematics achievement as measured by standardized examinations (and the resulting inferences about students’ abilities in mathematics) continue to be correlated with such demographic markers as economic status, race, and ZIP code, the educational mission of schooling—that of supporting all students in reaching their full potential—has yet to be fulfilled.

At issue are conceptions of mathematical ability and students’ potential and the impact that these factors have on teachers’ decisions about how best to serve their students. Ample research has documented the ways in which poor academic performance among low-income and African American and Latino students is problematized such that students’ characteristics and backgrounds are blamed, whereas such factors as opportunities to learn and access to information are ignored (Diversity in Mathematics Education Center for Learning and Teaching 2007; Oakes et al. 1997; Rubin 2008). Such deficit perspectives persist despite teachers’ commonly stated belief that all students can succeed in school (Wilson and Corbett 2007).

## **Activating Students’ Potential**

Hearing talk about students who are of “low ability” or who “don’t care” about learning or who “can’t do math” leads me to think back to my experiences as a teacher of mathematics in low- to middle-income communities with students who were diverse not only ethnically, economically, and linguistically but also with respect to their existing knowledge of mathematics and their preferred learning modalities (e.g., visual, tactile). In my classroom students who did not care to do mathematics, who were not proficient in English, whose abilities in mathematics had been deemed to be low somehow found themselves learning mathematics. The cause of this apparent aberration was grounded in my refusal to base expectations for students’ achievement on the labels applied to them by schools and society.

As a case in point, Alonso<sup>1</sup> was in my seventh-grade mathematics class along with twenty-four other students whose existing knowledge of mathematics was tenuous at best. The class average on their sixth-grade state mathematics examination placed them at the thirtieth percentile, far from what I considered their potential. Alonso's prior achievement in mathematics was well below that of his peers, in the single digits, a result that seemed inexorably linked with his being labeled as having low ability. Although I realized that he lacked *proficiency* with many mathematical concepts and skills, I did not equate this lack with Alonso's having a low *ability* to do mathematics. In fact, as I got to know Alonso, I learned that he had become accustomed to being left alone in class as long as he was not causing a distraction—left alone and not encouraged to learn to do mathematics (see Rousseau and Tate [2003] for research documenting how students from certain groups are “allowed to fail”). For me this neglect was at the root of his low achievement in mathematics.

Over the course of the two years that Alonso and his peers were in my mathematics class, through the seventh and eighth grades, they grew in every way imaginable—physically, socially, and, of course, academically. The class mean on the state mathematics examination increased to the sixty-third percentile, and Alonso's, to the sixty-fifth. Even more important, the students became doers of mathematics who communicated their thinking, challenged one another to justify strategies and outcomes, and strove to make sense of mathematics. This improvement took place in spite of the labels that had been applied to them by the schooling system and by society. These students' progress was made possible by my connecting mathematics with their lives through using contextualized problems; providing multiple pathways to learning important concepts, including the use of visual models; requiring them to achieve proficiency in prerequisite skills while at the same time engaging them in learning grade-level concepts; and holding them accountable for making progress that reflected their potential to make sense of mathematics. Their success was due to the phenomenal response by my students and their supportive families to the challenge to bring their proficiency in mathematics up to and above benchmarks set by the state standards.

Essential to this success was a perspective that a fundamental aspect of a teacher's job is to hold high expectations of every student's potential and to create possibilities for all students to learn in ways that respect who they are and recognize their strengths as learners. Bransford, Brown, and Cocking (2000, p. 6), in their landmark publication *How People Learn: Brain, Mind, Experience, and School*, state quite powerfully,

Learning research suggests that there are new ways to introduce students to traditional subjects, such as mathematics, science, history and literature, and that these new approaches make it possible for the majority of individuals to develop a deep understanding of important subject matter.

1. This is a pseudonym.

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This philosophy lies at the heart of efforts to make mathematics accessible to all students, a concept exemplified by the cases and strategies shared by the authors in this book. Rather than continue the legacy of separation and leveled expectations, teachers of mathematics must learn to recognize and teach to students' strengths.

## Problematizing Differentiation

The *Oxford English Dictionary* (Simpson and Wiener 1989) defines *differentiate* as “To make or render different; to constitute the difference in or between; to distinguish.” The term *differentiate* derives from *different*, meaning “not of the same kind; not alike; of other nature, form, or quality” (Simpson and Wiener 1989). The underlying concept in these terms is that of making comparisons with a standard or norm and recognizing objects that fall outside that norm. That “differentiate” came into common use in the mid- to late-1800s (Simpson and Wiener 1989) is indicative of Western imperialistic and rationalistic thought of an era in which dominant groups sought to bring under control those who were “other” than the norm (Willinsky 1998). Given this historical perspective, care must be taken when using a term such as *differentiation of instruction* if the aim is to give all students greater opportunity for meaningful learning to take place.

Indeed, when examining its use in education, one finds that differentiation of instruction is characterized in multiple and often discrepant ways. One well-known scholar of differentiation, Carol Tomlinson (2000, p. 1), contends, “Whenever a teacher reaches out to an individual or small group to vary his or her teaching in order to create the best learning experience possible, that teacher is differentiating instruction.” The central idea in Tomlinson’s depiction of differentiation is to *vary one’s actions as a teacher to meet the needs of students*. Note that the focus here is on changing instructional practices, moving beyond the standard, or normative, habits that characterize mathematics teaching (e.g., teacher-led lecture and demonstration followed by individual students’ work on rote procedures; see Stigler and Hiebert [1997]; Weiss et al. [2003]).

In contrast with a focus on teachers’ changing actions, Ayalon (2006) describes how differentiation is often viewed from a curricular perspective: “[A] differentiated curriculum enables students to enroll in courses that are congruent with their interests and abilities. The rationale behind level differentiation and formal tracking underscores the diversity in students’ abilities and the need to offer programs that correspond to that diversity” (p. 1188). From this perspective, differentiation involves *changing the curriculum in response to students’ perceived abilities*. Particularly in school mathematics, with its history of providing inequitable access to content on the basis of perceived ability, this latter take on differentiation is all too easily embraced—but should be vociferously avoided! Although teacher educators often frame differentiation much as Tomlinson does—as requiring teachers to respond to students’ needs to make content accessible—in practice the curriculum is often changed because of perceived differences in students’ abilities. I argue that the latter of these responses

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to differentiation is a consequence of the term itself that, together with a belief that mathematical ability is both accurately measurable and unevenly distributed, promotes actions that work against our efforts to create classroom environments in which all students learn meaningful mathematics.

## Creating Possibilities for Students' Success

The challenge, then, is to move one's focus from "ability" to "possibility" by getting to know students' strengths and preferences among learning modalities, then implementing lessons that activate those strengths and build from existing knowledge. Meeting this challenge requires a new stance toward teaching mathematics that is premised on creating possibilities for students' learning, maintaining a perspective that expects students to be successful when provided access to important ideas, and furnishing support as students make sense of these ideas. This sort of differentiation, reflective of Tomlinson's definition, shifts teachers' attention away from activities that construct students as able or unable, directing attention instead toward strategies and situations that allow access for all students to learn mathematics. Too many "Jays" and "Alonsos" in our classrooms fall victim to traditional habits of teaching mathematics. Instead, our efforts to make content meaningful and accessible must activate the tremendous potential that lies within all students.

## REFERENCES

- Alayon, Hanna. "Nonhierarchical Curriculum Differentiation and Inequality in Achievement: A Different Story or More of the Same?" *Teachers College Record* 108, no. 8 (2006): 1186–1213.
- Ayalon, Hanna, and Adam Gamoran. "Stratification in Academic Secondary Programs and Educational Inequality in Israel and the United States." *Comparative Education Review* 40 (2000): 54–79.
- Boaler, Joan, Dylan Wiliam, and Margaret Brown. "Students' Experiences of Ability Grouping: Disaffection, Polarization, and the Construction of Failure." *British Educational Research Journal* 26, no 5 (2001): 631–48.
- Booher-Jennings, Jennifer. "Below the Bubble: 'Educational Triage' and the Texas Accountability System." *American Educational Research Journal* 42, no. 2 (2005): 231–68.
- Bransford, John D., Ann L. Brown, and Rodney R. Cocking. *How People Learn: Brain, Mind, Experience, and School*. Washington, D.C.: National Academies Press, 2000.
- Collins, Kathleen M. *Ability Profiling and School Failure: One Child's Struggle to Be Seen as Competent*. Mahwah, N.J.: Lawrence Erlbaum Associates, 2003.
- Diamond, John B., and James P. Spillane. "High-Stakes Accountability in Urban Elementary Schools: Challenging or Reproducing Inequality?" *Teachers College Record* 106, no. 6 (2004): 1145–76.
- Diaz, Alicia, and Joan Lord. *Focusing on Student Performance through Accountability*. Atlanta, Ga.: Southern Regional Education Board, 2005.
- Diversity in Mathematics Education Center for Learning and Teaching. "Culture, Race, Power, and Mathematics Education." In *Second Handbook of Research on Mathematics Teaching and Learning*, edited by Frank Lester, Jr., pp. 405–33. Reston, Va.: National Council of Teachers of Mathematics, 2007.

- Ellis, Mark W. "President's Choice: Constructing a Personal Understanding of Mathematics: Making the Pieces Fit." *Mathematics Teacher* 100, no. 8 (April 2007): 516–22.
- . "Leaving No Child Behind Yet Allowing None Too Far Ahead." *Teachers College Record* 110, no. 6 (2008): 1330–56.
- Gorgorió, Núria, and Núria Planas. "Cultural Distance and Identities-in-Construction within the Multicultural Mathematics Classroom." *Zentralblatt für Didaktik der Mathematik* 37, no. 2 (2005): 64–71.
- National Commission on Mathematics and Science Teaching for the Twenty-first Century. *Before It's Too Late*. Washington, D.C.: U. S. Department of Education, 2000.
- National Council of Teachers of Mathematics. (NCTM). *Principles and Standards for School Mathematics*. Reston, Va.: NCTM, 2000.
- Oakes, Jeannie. *Keeping Track: How Schools Structure Inequality*. 2nd ed. New Haven, Conn.: Yale University Press, 2005.
- Oakes, Jeannie, Amy Stuart Wells, Makeba Jones, and Amanda Datnow, "Detracking: The Social Construction of Ability, Cultural Politics, and Resistance to Reform." *Teachers' College Record* 98, no. 3 (1997): 482–510.
- Rousseau, Celia, and William F. Tate. "No Time Like the Present: Reflecting on Equity in School Mathematics." *Theory into Practice* 42, no. 3 (2003): 210–16.
- Rubin, Beth H. "Detracking in Context: How Local Constructions of Ability Complicate Equity-Geared Reform." *Teachers College Record* 110, no. 3 (2008). Retrieved September 28, 2007, from [www.tcrecord.org/Content.asp?ContentId=14603](http://www.tcrecord.org/Content.asp?ContentId=14603).
- Simpson, John, and Edmund Weiner, eds. *Oxford English Dictionary*. 2nd ed. Broadbridge, Alderley, Wotton-under-Edge, Gloucestershire, England: Clarendon Press, 1989.
- Stigler, James W., and James Hiebert. "Understanding and Improving Classroom Mathematics Instruction: An Overview of the TIMSS Video Study." *Phi Delta Kappan* 79, no. 1 (1997): 14–21.
- Tomlinson, Carol. "Differentiation of Instruction in the Elementary Grades." *ERIC Digest* (August 2000). Document No. ED0-PS-00-7. Available at [ericece.org](http://ericece.org).
- United States Department of Education. (2003). "Proven Methods: The Facts about . . . Math Achievement." Retrieved October 7, 2003, from <http://www.ed.gov/nclb/methods/math/math.pdf>.
- Weiss, Iris R., Joan D. Pasley, P. Sean Smith, Eric R. Banilower, and Daniel C. Heck. *Looking inside the Classroom: A Study of K–12 Mathematics and Science Education in the United States*. Chapel Hill, N.C.: Horizon Research, 2003. Retrieved August 15, 2006, from [www.horizon-research.com/insidetheclassroom/reports/looking/](http://www.horizon-research.com/insidetheclassroom/reports/looking/).
- Willinsky, John. *Learning to Divide the World: Education at Empire's End*. Minneapolis: University of Minnesota Press, 1998.
- Wilson, Bruce, and Dick Corbett. "Students' Perspectives on Good Teaching: Implications for Adult Reform Behavior." In *International Handbook of Student Experience in Elementary and Secondary School*, edited by Dennis Theissen and Alison Cook-Sather, pp. 283–311. Dordrecht, Netherlands: Springer, 2007.