# NO TEACHER CANDIDATE LEFT BEHIND - A STUDY OF THE LARGEST MATHEMATICS ALTERNATIVE CERTIFICATION PROGRAM IN THE UNITED STATES

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*Researchers from MetroMath@CUNY are conducting a three-year study of the mathematics component of the largest alternative certification program in the United States. The study is multifaceted, with a classroom-based component that includes videotape, fieldnotes, and interviews from 120 lesson observations and a larger systemic component that includes over 500 in-depth surveys and 30 in-depth interviews of alternative route math teachers in NYC. The research adds to our understandings of mathematics education in low SES urban schools and provides insights on the effects of alternative teacher preparation pathways on urban school systems in the United States.*

## INTRODUCTION AND RELEVANCE TO MES

The recruitment and retention of qualified mathematics teachers is a pressing issue facing high-poverty urban schools in the United States (Boyd, Lankford, Grossman, Loeb, & Wykoff, 2006; Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005; Howard, 2003). Alternative certification (AC) programs increase the pool of teacher candidates by allowing recruits to become teachers of record with minimal pre-service training. AC programs have emerged largely as a response to the lack of traditionally trained teacher candidates willing to work in lower SES urban schools (Haberman, 1991; Ingersoll, 2004).

Despite the salience of this issue, little research looks specifically at the mathematics teacher candidates recruited and trained by alternative certification (AC) programs. An online ERIC search or search of other databases shows less than thirty results for AC mathematics teachers. Of these thirty articles, the majority are not peer-reviewed. The lack of research in this area is due, in part, to the difficulty of the undertaking; considerable researcher collaboration is required to study large-scale AC programs and access to data on teacher backgrounds and student achievement is restricted and difficult to acquire.

Most of what the research community knows about AC mathematics teachers comes from large-scale studies that compare AC teachers to control populations of either traditionally certified (TC) teachers or the general teaching population (Darling-Hammond, 2000; Goldhaber & Brewer, 2000; Lackzo-Kerr & Berliner, 2002). These studies investigate the relationship between indicators of teacher quality (e.g., certification status, subject matter coursework, teaching experience) and student achievement. That is, this research speaks to the comparative effectiveness of AC and TC mathematics teachers as measured by student mathematics (and literacy)

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achievement. Taken as a whole, these studies essentially show that similarly experienced AC and TC teachers of mathematics are equally effective. However, no set of qualitative studies exist to complement this research base. We know very little about the nature of teaching and learning in the lower SES urban classrooms. While AC teachers may be bright and energetic, it may also be that both AC and TC teachers are similarly unprepared or ineffective to teach in lower SES urban schools.

## NO NYC MATHEMATICS TEACHER LEFT BEHIND

The New York City Teaching Fellows (NYCTF) program is currently the largest AC program in the U.S. Founded in 2000, NYCTF is a joint program between the New York City and States Departments of Education. The program is designed to provide teachers for "high needs" urban schools in "hard to staff" disciplines such as mathematics. In 2005, the NYCTF program alone provided over 300 new mathematics teachers for NYC schools, over 60% of all new math teachers entering the NYC public school system. The effect of this program is particularly powerful in low SES urban schools that hire most of them. In sum, the differential impact of the NYCTF program on urban math education will be felt for years to come in NYC and other U. S. cities that look at the NYCTF program as worthy of replication.

Like other AC programs, NYCTF is a quick route to teaching. Each summer, over 300 "mathematics Fellows" begin their education in an intensive summer program centered at one of four area colleges. A large portion – over 80% – enter the program having completed minimal college math coursework and are therefore required to attend an additional two weeks of a "mathematics immersion" session. Mathematics immersion reintroduces the Fellows to topics in secondary math and primes them for a math content exam they are required to pass. The six-week session that follows exposes the Fellows to a range of theoretical (e.g., multiculturalism) and practical educational topics (e.g., classroom management). The Fellows also complete 40-80 hours of fieldwork in summer classrooms. In August, successful candidates (most of them) are given transitional licenses and most find jobs teaching in high-needs NYC middle and high schools for the fall. Because they have yet to complete state requirements for full certification, they spend the next two years taking Master's coursework in the evenings while teaching mathematics full time.

## MICRO AND MACRO METHODOLOGIES

The MetroMath project is a 3-year study of the mathematics component of the NYCTF program that uses both micro and macro lenses. The micro perspective is comprised primarily of classrooms observations of eight case study mathematics Fellows. These Fellows are currently in their 2$^{nd}$ and 3$^{rd}$ years of teaching and each has been observed fifteen to twenty times over the past year and a half. We currently have over 200 hours of classroom observations where one researcher videotapes and a second writes up detailed field notes of the observed lesson. We also conduct a

follow-up interview with the mathematics Fellow to understand the lesson from her or his perspective.

The micro component of our study allows us to examine the Fellows' instruction and their relationships with the urban students they serve. Some research suggests that AC teachers may be less prepared mathematically and pedagogically than traditionally prepared teachers (Johnson, Birekeland, & Peske, 2005). Moreover, given that most Fellows end up in schools that serve low SES urban students of color, an important aspect of the NYCTF program is how it prepares Fellows to teach students in the most racially, culturally, and economically diverse district in the U.S. Other researchers posit that AC teachers appear to lack requisite understandings of the urban youth they teach in order for them to develop positive, or caring, relationships (Ng, 2003; Reyes, 2003). By collecting extensive fieldnote, videotape, and interview data, we address these and other issues.

In order to facilitate comparisons across our eight case study Fellows, we follow Stigler and Hiebert (1999) in constructing "lesson overviews" of each classroom observation. The lesson overview is a structured abstract of each lesson. The lesson overviews follow the "workshop" model of instruction that the NYC Department of Education promotes and attempts to enforce. In theory at least, the workshop model promotes student-centered learning, providing less time for lectures and more time for collaborative student learning than traditional U. S. lessons.

The macro view of the MetroMath study comes from analyses of extensive surveys of two annual cohorts of the mathematics Fellows (approximately 300 per year). The Fellows are surveyed prior to becoming the teacher of record to determine their beliefs and ideas about urban classrooms and then one year later after having been in the classroom. In order to complement the survey, and classroom observational data, we have also conducted individual interviews with over 30 mathematics Fellows. In these in-depth interviews, we ask the Fellows to reflect on their training in the NYCTF program, their beliefs about mathematics instruction, and their understandings of urban students' lived experiences and cultures. In sum, this detailed and large-scale data has allowed us to begin to add to a growing body of research on alternative certification and urban mathematics education.

## RESULTS

This presentation will include the demographic and educational backgrounds of the two cohorts and an account of the development of the first cohort over a one-year period in terms of their instruction, their professional identities and their future plans. We also report on variations (or lack thereof) in the nature and structure of mathematics lessons in our case study classrooms and how this relates the typical U. S. lesson as documented by Stigler and Hiebert (1999). Finally, we will present initial results on the mathematics Fellows' emerging identities as teachers of mathematics and of urban youth.

## Some Highlights from the Data Analysis

Mathematics Fellows are drawn from a broader geographic range than the majority of new teachers in NY State. Most are not teaching in the communities they grew up in. For approximately two-thirds of the Fellows, teaching math in a low SES school is a first serious career out of college. Even at the outset of the program, approximately one-half of the Fellows state that they plan to leave NYC public schools within five years. Thus, for many, urban mathematics teaching is resumé building for graduate school or more prestigious careers. In addition, we find that their math backgrounds are not as extensive as had been anticipated at the inception of the NYCTF program in 2000; less than 20% of the 2007 cohort majored or minored in college mathematics and a number of Fellows have not taken math since high school. Their attachment to mathematics is often fleeting; over 30% of survey takers indicated that they would have preferred to teach a subject other than mathematics.

While the Master's coursework appears to provide Fellows with some opportunity to develop their mathematics and pedagogical knowledge, it is less clear that they are developing the requisite understandings of urban youth and their communities. Our study indicates that the constraints of working on a Master's while teaching full time, decreases opportunities to develop relationships with the urban youth they teach. In interviews, many discuss the social distance between their urban students and themselves, having generally come from comparatively privileged backgrounds. Some note that urban students, in contrast to the often privileged students they went to school with, need more explicit forms of discipline and motivation in order to effectively engage with mathematics.

The analysis of the Lesson Overviews shows that it is clear that the workshop instructional model, mandated for use by all teachers prior to 2003-04 (Traub, 2003), has been widely implemented. Over 80% of the surveyed 2$^{nd}$ year math Fellows claim to be using the workshop model to teach their lessons – often while disliking it. As we've observed, seven of the eight teachers involved in our case studies also use this model. However, despite the widespread use of the workshop model – which purported to be a "standards-based" and "student-centered" model –our case study classrooms have remained largely teacher-centered. That is, while the workshop model theoretically was designed to promote interactive and creative student learning, in practice the teachers maintain relatively tight control of how students learn and practice school mathematics.

## THE SYMPOSIUM

Dr. Brantlinger and Dr. Cooley will jointly present results from the survey data, case studies and lesson overviews and focus on the Fellows preparation for teaching and developing understandings of their urban students' lives and communities. This joint presentation will take about half of the symposium time. Following this, a question

and answer period will follow, including feedback and discussion with participants about the effectiveness of AC mathematics programs in urban school systems.

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