

# **A Historical Perspective on the Preparation of Mathematics Teachers in the Areas of Student Diversity the Education of Disadvantaged Students<sup>1</sup>**

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## **Introduction**

Before I discuss the attention given to preparing teachers to address student diversity in culture and language and the education of disadvantaged students, I believe it is necessary to present the context—social and educational events—that influenced educational programs. I have divided this paper into three eras beginning in the late 19<sup>th</sup> Century and ending in the present time. Within each era I briefly present the impact of changes in society and student populations in schools and the actions of teacher preparation programs, generally, and in mathematics education preparation programs.

## **Era: Industrialization, Immigration, and Segregation**

The first era spanned the late 19<sup>th</sup> Century to the mid 20<sup>th</sup> Century. In the latter part of the 19<sup>th</sup> Century, industrialization, and immigration of Europeans to the United States shaped educational programs. Industry needed skilled workers; and large numbers of immigrants, the new working force, were unskilled. The growth of industrialism and immigration caused mathematics educators to discuss reforming the mathematics offered in schools (Ellis, 2005; Kilpatrick & Stanic, 1995). Educators, motivated by changes in society, student quality, and increases in school population, offered students who were viewed as not capable of pursuing higher mathematics a general mathematics curriculum (Kilpatrick & Stanic, 1995). The establishment of levels of mathematics instruction created a tracking system for students in mathematics. It is important to note that at this time schools were segregated by race in the southern regions the United States because it has an impact upon when attention was given to the preparation of teachers for students of diversity in culture and language.

The focus of teacher preparation during this era was on mathematics content in teacher education programs and in school curriculum. From 1920 to 1940, teacher preparation in mathematics concentrated on secondary education. The Mathematical Association of American (MAA) made and the National Council of Teachers of Mathematics (NCTM) joined the MAA in recommendations for the preparation of teachers through reports published in 1923 and 1935 (Swafford, 1995). Swafford (1995) reports that in the late 1950s the typical elementary teacher had no college mathematics course. Preparation for teaching mathematics in the elementary school was perhaps one year of high school mathematics and methods course in teaching arithmetic. The average secondary teacher had between seven and ten college mathematics courses beginning with pre-calculus.

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<sup>1</sup> This historical perspective on teacher preparation in mathematics in the areas of student diversity and the education of disadvantaged students is positioned on events in the United States; however, development of teacher preparation programs for diverse populations in the US may mirror similar development of teacher preparations programs in the world community.

### **Era: The Birth of Multicultural Education**

The second era began in the 1940s and ended in the 1970s. Tracking in mathematics had become a common practice causing most students to be channeled into vocational, consumer, and industrial mathematics courses (Ellis, 2005). In the 1954 Supreme Court Case, *Brown v. Board of Education*, the court decided that separate schooling was not equal schooling. The solution was to desegregate schools segregated by race. Some desegregation occurred after the 1954 decision: however, total desegregation of schools did not occur until after the 1964 Civil Rights Act was passed. This act prohibited discrimination in education and ensured that limited English proficient students would have access to school programs. As a result, large populations of students of color were enrolled in schools that had been historically white or without second language programs. Many of the students were poor. Clashes in culture occurred between teachers and their students; and these students were considered abnormalities in their schools. Terms such as culturally deprived, deficit, disadvantaged, and underprivileged began to be used to describe poor African American, Latinos, and Native Americans students (Goodwin, 1997).

Fueled by the premise of abnormality, university scholars from ethnic studies programs and education departments responded by emphasizing multicultural education as a way of integrating students of color into predominately white schools (Goodwin, 1997). Multicultural teacher education models were developed to prepare teachers to work effectively with diverse populations of students. The American Association of Colleges of Teacher Education (AACTE) established a commission on multicultural education in 1973. The commission issued a policy statement recommending that multicultural programs should be included in standard teacher preparation programs (AACTE, 1973). Goodwin (1997) outlines the development of goals and curricula for multicultural teacher education using components put forth by Gay (1977): Knowledge to help teachers understand ethnic group experiences, attitudes to help teachers examine their attitudes and feelings about students of different ethnic groups, and skill to help teachers translate their knowledge and sensitivity into classroom practice (p.10). Scholars in multiculturalism spurred the momentum toward a multicultural emphasis in teacher education at prominent universities. As a result educators made efforts to include multiculturalism in organizational and instructional programs (Gollnick, Osayande, & Levy, 1980). Then in 1979 The National Council for Accreditation of Teacher Education (NCATE) required colleges and universities applying for accreditation to include evidence of planning for multicultural elements in their curricula (Gollnick, 1992).

### **Era: Mandated Testing and Standards**

This last era began in the 1980s and continues until the present time. Schools in the 1980s were in transition. There were drops in College Board exams scores and growing numbers of illiterate high school graduates causing tests scores to become a measure of quality schools (Kilpatrick and Stanic, 1995). Comparisons of student groups abounded showing that Asian and White students scored higher on standardized test than African American, Latinos, and Native Americans students. Both general teacher education and mathematics education responded to these challenges.

In 1993, NCATE revised its standards for the Accreditation of Professional Units (NCATE, 1993). In this revised draft, NCATE included new indicators that specified a template for addressing issues of diversity. The 2000 NCATE Standard 7 required program frameworks to include diversity dispositions, including proficiencies associated with diversity and technology, that are aligned with the expectations in professional, state, and institutional standards; NCATE used NCTM as the reviewer of content area accreditation.

From 1989 to 1991 mathematics and mathematics education communities responded to falling test scores and gaps in learning among groups with three books that clearly addressed modification of teaching and curriculum to be more inclusive, but modestly addressed cultural and language diversity and disadvantaged students. The National Research Council published the book *Everybody Counts: A Report to the Nation on the Future of Mathematics Education* (1989). The NCTM *Curriculum and Evaluation Standards for School Mathematics* (1989) was published with a vision of school mathematics and NCTM *Professional Standards for Teaching Mathematics* (1991) was published to give teachers standards to guide their instruction.

### **Evidence**

I have no conclusive evidence of exactly when issues of diversity and the education of the disadvantaged began to emerge in mathematics teacher education programs. I completed research searches of educational databases using key words: teacher preparation AND mathematics (math) AND diverse OR diversity OR disadvantaged OR culture OR language. These searches revealed no research in mathematics teacher preparation on diverse learners, diversity of culture and or language, or the disadvantaged before 1997. The 1997 result was a review of a teacher preparation program in Georgia. There were eight other citations, two of which were books, two on teacher education, and one on the teacher education program at University of Wisconsin. The others were essays.

Additionally, research completed by Collins and Guzman (2005) on the preparation of teachers for diverse populations reviewed 99 empirical studies on the preparation of teachers published in refereed journals between 1980 and 2002. Their focus was on “studies on the preparation of teachers for underserved populations, that is, students of color, those from low-income backgrounds, language minorities, and those living in urban and rural settings” (p. 481). All studies were conducted in the United States. Most of the studies did not delineate content area; a few dealt with pre-service teachers and language minority students in general teaching and learning.

My assumption is that mathematics teacher education programs began including issues of diversity and poverty into their programs in the 1990s for two reasons. First the NCTM documents listed above began to address equity and diversity and the *Assessment Standards for School Mathematics* (1995) and the *Principles and Standards for School Mathematics* (2000) were tied directly to equity and diversity. The goals of the programs and the instructional strategies match the learning preferences of diverse populations (Malloy, 2004). Second, since 1979 NCATE has prompted schools of education to first

plan to include multicultural education and then in 1993 and 2000 to include evidence of diversity dispositions within their accreditation portfolios.

### **Conclusion**

I would like to share three thoughts that have surfaced as I researched and wrote this paper. First, empirical research in teacher preparation of a content area requires large instructional programs in mathematics. In the state of North Carolina, only four teacher preparation programs at 16 universities have more than 25 secondary mathematics graduates a year. It appears that most research reviewed by Hollins and Guzman (2005) used pre-service students in a program across content areas. Within programs across all content areas the graduates could easily exceed 100 students. Second, because teacher education programs with multiple content areas usually share general methods, educational psychology, and foundations courses, it is possible that students receive preparation for diversity and disadvantaged students within their total program. There is a plethora of journal articles and books available that provide knowledge in the areas of learning preferences, learning differences, cultural and linguistic knowledge, and cultural pedagogies. Mathematics education scholars who write about and complete research on diverse learners regularly refer to the work of scholars including Shade, Hale-Benson, King, Ladson-Billings, Delpit, and hooks, regularly. These scholars are not mathematics educators, but their works are cited on webpages for foundations, educational psychology and mathematics methods courses. The third point is that I completed a Google search for the words mathematics teacher preparation "mathematics teacher preparation" and diverse and university and received 780 results. In a brief review, most were from universities and were not repeats. It appears that pre-service mathematics programs today may be including diversity in their programs.

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#### Final words

In reading through the books and articles on teacher preparation, there are common themes in the topics recommended for preparing teachers for diverse populations: Learning about students and communities, learning about self, and learning about how to learn from teaching (Banks, et al., 2005). These resemble the work of Cochran-Smith, who is one of the authors, from her 1995 AERJ article on a teacher preparation program called Project START. I have attached a summary of the components of her program

below. Perhaps they can be of some assistance as you think about research in teacher preparation.

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Banks, J., Cochran-Smith, M., Moll, L., Richert, A., Zeichner, K., LePage, P., Darling-Hammond, L., Duffy, H. McDonald, M. (2005). Teaching Diverse Learners. In L. Darling-Hammond & J. Bransford, (Eds.), *Preparing teachers for a changing world*, (pp. 232-274). San Francisco, CA: Jossey-Bass

## **Components of Systematic and Self-Inquiry in Teacher Education<sup>2</sup>**

### **1. Reconsidering personal knowledge and experience**

Personal knowledge begins with student teachers' histories and includes tacit assumptions students personally make about the behaviors of students, parents, teachers, and the pedagogy deemed most appropriate for learners who are and are not like themselves. Students, along with members of the community, write personal narrative essays about their lives and experiences that have shaped their views of race, culture, and diversity.

### **2. Locating teaching within the culture of the school and the community**

Students do research projects to gather information about the schools and communities that they will come to know over the course of the year. Students try to understand their schools from the people they talk with – teachers, parents, children, and community members. They learn the history and norms of teaching and learning at the school and the attitudes, values, beliefs, and language uses of the community and along with historical, political, and social relationships to the school.

### **3. Analyzing children's learning opportunities**

Students analyze the learning opportunities that are or are not available to children within various academic tasks and social participation structures, particularly those of scripted and unscripted programs of instruction. Students formulate research questions about how students have an opportunity to learn within a lesson that they observed and one that they modified from the observation.

### **4. Understanding children's understanding**

Students need to learn to teach in a culturally and linguistically diverse society. Thus they have to *understand children's understanding* or explore what it means to know a child, to consider his or her background, behaviors, and interactions with others, and try to give reason to the ways the child constructs meaning and interpretations, drawing on experiences and knowledge developed both inside and outside the classroom. Students develop research questions about ways to support a particular aspect of one child's

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<sup>2</sup> From Cochran-Smith, Color Blindness and Basket Making are Not the Answers: Confronting Dilemmas of Race, Culture, and Language Diversity in Teacher Education, AERJ (1995).

development in the classroom and then gather multiple data sources in order to describe, or come to know, that child from various perspectives.

### **5. Constructing reconstructionist pedagogy**

Students learn to construct and use reconstructionist pedagogy--pedagogy intended to help children understand and then prepare to take action against the social and institutional inequities that are embedded in our society. Students raise questions about the status quo and take action to change it. Students can learn that teaching skills to survive the system can be taught to children of all races, cultures, and SES.

Education. Schools. Teachers. Universities. Students. Record numbers of young people from the most disadvantaged backgrounds in the UK have won places to go to university this year, according to the admissions agency Ucas. More than a fifth of 18-year-olds (20.4%) from areas of the country with the lowest rate of participation in higher education have confirmed places at universities across the country, up from 19.4% last year. This week the education secretary, Gavin Williamson, gave his backing to a review of university admissions, including a fresh look at whether school leavers should only apply for places after receiving their A-level results. Some historical moments in the ICMI history of formation of mathematics teachers Barbro Grevholm, University of Agder. The historical development of mathematics teacher education. inclusion in the university system of the education from education for an elite to education for all, a massification of education with. He says, in a free translation, that in the preparation of future teachers you must distinguish between the scientific preparation and the professional preparation (Loria, 1933, p. 9). The education of teachers is seen as consisting of two separate parts, the scientific part, which has to be the mathematics education at university and the professional part, which probably means what was seen as.