

Journal of Mathematics Education at Teachers College

Spring – Summer 2010
Inaugural Issue

A CENTURY OF LEADERSHIP IN
MATHEMATICS AND ITS TEACHING

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The *Journal of Mathematics Education at Teachers College* is a publication of the
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This issue's cover and those of future issues will honor past and current contributors to the Teachers College Program in Mathematics and Education. Photographs are drawn from the Teachers College archives and personal collections.

This issue honors NCTM 2010 Lifetime Achievement Medalist, Dr. Henry O. Pollak, who has completed 22 years as a member of the Program in Mathematics and Education at Teachers College. Dr. Pollak has contributed so much to the mathematical preparation of the Program's graduates and to the communities of mathematics and mathematics education professionals in the United States and throughout the world.

David Eugene Smith, also pictured on the front cover, was the founding professor of the Teachers College Program in Mathematics and Education. Like Dr. Pollak, Professor Smith was widely respected by both mathematicians and educators.

Aims and Scope

The *JMETC* is a re-creation of an earlier publication by the Teachers College Columbia University Program in Mathematics and Education. As a peer reviewed, semi-annual journal, it is intended to provide dissemination opportunities for writers of practice-based or research contributions to the general field of Mathematics Education. Each issue of the *JMETC* will focus upon an educational theme. Themes planned for the 2010-2011 issues are: *Teacher Education, International Education, Curriculum, Technology, and Equity*—all centered upon mathematics and its teaching. The *JMETC* will have a distinctive niche in the world of education publishing. Our readers are educators from pre K-12 and college and university levels, and from many different disciplines and job positions—teachers, principals, superintendents, professors of education, and other leaders in education.

Manuscript Submission

We seek conversational manuscripts (2500-3000 words in length) that are insightful and helpful to mathematics educators. Articles should contain fresh information, possibly research-based, that gives practical guidance readers can use to improve practice. Examples from classroom experience are encouraged. Articles must not have been accepted for publication elsewhere. All manuscripts may be submitted electronically at www.tc.edu/jmetc. This system will help keep the submission and review process as efficient as possible.

Abstract and keywords. All manuscripts must include an abstract with keywords. Abstracts describing the essence of the manuscript should not exceed 150 words. All inquiries should be sent to Ms. Krystle Hecker, P.O. Box 210, Teachers College Columbia University, 525 W. 120th St., New York, NY 10027.

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Journal of Mathematics Education at Teachers College

Call for Papers

The “theme” of the fall issue of the *Journal of Mathematics Education at Teachers College* will be *International Mathematics Education*. This “call for papers” is an invitation to mathematics education professionals, especially Teachers College students, alumni and friends, to submit articles of approximately 2500-3000 words describing research, experiments, projects, innovations, or practices related to international or comparative mathematics education. Articles should be submitted to www.tc.edu/jmetc by September 1, 2010. The fall issue’s guest editor, Dr. Juliana Connelly, will send contributed articles to editorial panels for “blind review.” Reviews will be completed by October 1, 2010, and final drafts of selected papers are to be submitted by November 1, 2010. Publication is expected in late November, 2010.

Call for Volunteers

This *Call for Volunteers* is an invitation to mathematics educators with experience in reading/writing professional papers to join the editorial/review panels for the Fall 2010 and subsequent issues of *JMETC*. Reviewers are expected to complete assigned reviews no later than 3 weeks from receipt of the blind manuscripts in order to expedite the publication process. Reviewers are responsible for editorial suggestions, fact and citation checking, and identification of similar works that may be helpful to contributors whose submissions seem appropriate for publication. Neither authors’ nor reviewers’ names and affiliations will be shared; however, editors’/reviewers’ comments may be sent to contributors of manuscripts to guide further submissions without identifying the editor/reviewer.

If you wish to be considered for review assignments, please request a *Reviewer Information Form* from Ms. Hecker. Return the completed form to Ms. Krystle Hecker at JMETS@tc.columbia.edu or Teachers College, Columbia University, 525 W 120th St., Box 210, New York, NY 10027.

Looking Ahead

Anticipated themes for future issues are:

Spring 2011	Curriculum
Fall 2011	Technology
Spring 2012	Equity
Fall 2012	Leadership
Spring 2013	Psychology

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Current and Needed Research on Alternative Certification Programs

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With alternative certification programs gaining popularity in teacher education, the need to evaluate these programs has become much more necessary. Without strict guidelines to classify alternative certification programs, it is difficult to make generalizations about these programs because of different requirements for completion and certification. Furthermore, differing research analyses result in conflicting views, making alternative certification programs even more difficult to evaluate. This article examines the results of several research studies and focuses upon two key components of teacher education: coursework and fieldwork. Researchers have called for different types of studies to evaluate alternative certification programs more effectively. Several of these research questions have been included in this article.

Introduction

On November 30, 2009, the New York Commissioner of Education, David Steiner, proposed his ideas on the evolution of teacher certification: allowing non-profit and non-academic institutions to grant masters' degrees and teacher certification, thus promoting and evolving the use of alternative certification programs (ACPs) to educate teachers. The current system of teacher education is flawed because of the overemphasis on preparation for the teacher certification exams, especially when research has shown that there is little to no correlation between success on the teacher certification exams and success in the classroom. According to Steiner, teacher certification programs need to increase emphasis on "mastery of skills and classroom effectiveness" (Steiner & Tisch, 2009). Based on Steiner's comments, teacher certification programs need to shift the emphasis of their curriculum while granting alternative certification programs the ability to offer masters' degrees along with teacher certification.

Even before Steiner's speech, ACPs have been gaining in popularity. With the passing of No Child Left Behind, teachers receiving certification through ACPs were deemed "highly qualified." In the year 2003, 47 states (including the District of Columbia) had initiated ACPs and produced over 200,000 teachers (Abell, Arbaugh, Chval, Friedricshen, Lannin, & Volkmann, 2006), and in the year 2009, all 50 states had ACPs and produce 60,000 teachers annually (Garcia & Huseman, 2009). In Texas and California, approximately one-third of the new teachers come from ACPs, and in New Jersey, the percentage is about 40%. The growth of ACPs has coincided with the increased demand for teachers (Darling-Hammond, Chung, & Frelow, 2002). Knowing that ACPs are becoming more relevant in teacher education, researchers have begun to study the effectiveness of ACPs, and teacher education in general.

Teacher education consists of two components: coursework and fieldwork. Coursework provides the

foundation for teaching by offering courses in psychology, pedagogy, and methodology, whereas fieldwork provides students with in-classroom experience by which they can apply what they have learned under supervision. These components are also found in ACPs, but ACPs have different ideas about the amount of time necessary for each, and also the timing of the components. The purpose of this paper is to examine the two components of ACPs, coursework and fieldwork, in comparison to those of traditional teacher certification programs (TCPs) and the relevant research involved.

Information about Alternative Certification Programs

Currently, potential mathematics teachers have two routes for earning their certification: through a traditional certification program or an alternative certification program. These programs have different ideals, yet maintain the same goal: to produce highly qualified teachers. By definition, teachers choosing to receive their teacher certification through traditional means begin preparing for their careers in undergraduate university programs and continue through graduate school programs, with the goal of having a strong liberal arts and science background along with a knowledge of professional education and field experience (Zumwalt & Craig, 2005). According to Adelman (1986), an alternative certification program is "any program (run by either a college, university, a state education department, a school district, or a private organization) which enrolls non-certified, post-baccalaureate individuals and offers short-cuts, special assistance or unique curricula leading to eligibility for standard teaching certification" (Zumwalt & Craig, 1986). There are fundamental differences between the requirements necessary for certification through each of these programs.

ACPs were established for several reasons: (1) to reduce the teacher shortage in high need areas such as

Table 1. Number of Hours Necessary to Receive Teacher Certification in Chosen Alternative Certification Programs

Alternative Certification Program	Coursework
New Jersey's Provisional Teacher Program	Preservice: 40 hours training Inservice: 200 hours training
Milwaukee's Metropolitan Multicultural Teacher Education Program	Preservice: 6 weeks of coursework Inservice: Weekly university classes
NC Teach	Preservice: 5 week summer institute of fulltime coursework Inservice: Continued coursework
Los Angeles Unified School District	Preservice: 3 weeks of coursework Inservice: Weekly courses

mathematics and science, but also in urban school districts; (2) to bring diversity to the teaching population by recruiting minorities and males, (3) to provide opportunities for recent college graduates with a bachelor's degree to enter education without going through the time-consuming traditional certification path; and (4) to recruit professionals wishing to change careers, bringing with them a broad range of knowledge and experiences (Shen, 1999).

Researchers are trying to study the effectiveness of ACPs and measure whether or not they are achieving the goals set forth when ACPs were first established. Some of the questions that have been or are currently being explored are:

1. Are teachers from ACPs successful in teaching and increasing student achievement?
2. How do teachers from ACPs compare to teachers from TCPs? How do teachers from ACPs compare to teachers from TCPs in student achievement gains (Podgursky, 2004)?
3. Has the demand for teachers been alleviated with the establishment of ACPs (Shen, 1999)?
4. Is there a significant difference in the turnover rate between teachers from ACPs and from TCPs (Podgursky, 2004)?
5. Has the teaching population become more diverse? Has there been an increase in males or minorities?
6. What types of people are ACPs recruiting? Recent college graduates? Experienced career changers?

However, a problem exists when researching ACPs in that no uniformity exists between the many programs; the programs are run independently of each other and may have different ideals and methodologies. Previous comparative research has produced conflicting results among different ACPs, suggesting that these programs cannot be grouped together for generalization (Miller, McKenna, & McKenna, 1998).

Coursework

By offering shortcuts to certification, ACPs hoped to help recent university graduates and career changers with a

bachelor's degree enter the field of education. A traditional certification route averages two academic years, so by choosing an alternative certification program, potential teachers (especially career changers) are minimizing the time without work and its accompanying remuneration. The coursework is typically separated into preservice hours, the number of hours of training necessary before entering a classroom, and inservice hours, the number of hours of training taken concurrently with their beginning years in the classroom. Before entering the classroom, potential teachers are given a crash course in education theory and methods. Once they enter their own classroom and begin teaching, teachers will continue taking coursework, helping them unify education theory and methods with their own practice. A look at Table 1 shows some specific alternative certification programs and the amount of coursework necessary to attain certification (table adapted from Humphrey & Wechsler, 2007).

In fact, a larger study of ACPs found that the coursework ranged from 75 to 795 hours in comparison to TCPs, which ranged from 240 to 1,380 hours (Warner, 2009). Knowing that teachers from ACPs have a less rigorous coursework curriculum, the following question has to be asked: are ACPs doing enough to prepare their students to become teachers? Is such a short, albeit intense, period of training sufficient for a potential teacher? In a meta-analysis of studies involving teachers from the New York City public schools, teachers were asked to comment on how prepared they felt for their first year of teaching, and it was found that teachers certified from ACPs felt much less prepared than those teachers from TCPs. Being less prepared led to several consequences: (1) teachers had to work harder to "catch up" to their colleagues in terms of teacher efficacy and quality, and (2) their level of preparedness had a direct correlation with their job satisfaction, which in turn correlates with plans to remain in teaching (Zeichner & Conklin, 2005). Some studies have shown that a lack of preparation was a direct result of a lack of pedagogical skills primarily because of the less intensive coursework provided teachers from ACPs. Another result of the study shows that "alternative certified teachers often blame their students for not understanding the material, instead of taking the responsibility for their

CURRENT AND NEEDED RESEARCH

teaching deficiencies (Shepherd, 1999). According to Darling-Hammond and Cobb,

fully prepared and certified teachers are generally more highly rated and more successful with students than teachers without full preparation. [A] review of several studies indicates that teachers who complete traditional preservice preparation before beginning teaching are superior to alternate route teachers on virtually every dimension of teaching.... Key to the success is the linking of a theoretical foundation, provided through coursework, to the practical benefits of guided clinical experiences. (Turley & Nakai, 2000)

The preparation of beginning teachers correlates with the amount of coursework completed prior to entering the classroom and also contributes to a fundamental difference between teachers from ACPs and from TCPs.

Further research has shed new light on these differences. After their initial two months in the classroom, alternatively certified beginning teachers from the Houston Independent School District reported having greater problems than their traditionally certified counterparts in the following areas: student motivation, managing teacher time, paperwork, lack of personal time, grading students, problems with school administration, and classroom management. However, it was noted that near the end of the school year, all of these differences, with the exception of classroom management, diminished (Zeichner & Conklin, 2005). A combination of learning on the job and taking courses concurrently while teaching has led to overcoming these beginning difficulties. This is in line with the fact that significant differences between ACPs and TCPs tend to disappear after several years on the job. It can also help explain why beginning teachers from alternative certification programs have a much higher attrition rate, as they must spend extra time to “catch up” during their first year in the classroom. According to the National Commission on Teaching and America’s Future, there exists a positive correlation between strong teacher preparation and higher retention of beginning teachers (Abell et al., 2006).

Fieldwork

Another fundamental difference between a traditional certification program and an alternative certification program lies in their respective views of the fieldwork aspect of the curriculum, more commonly known as student teaching. To gain certification, the California State University Northridge, Michael D. Eisner College of Education requires potential teachers to enroll in two semesters of “supervised field experience” for classroom observations and student teaching (Student Teaching Handbook, 2008). At Teachers College, Columbia University, preservice students are required to complete 100 hours of observations, 150 hours of fieldwork at a middle school, and 150 hours of fieldwork at a high school. By contrast, several programs, such as the Alternative Certification Program at Texas A&M (Shepherd, 1999) and the SMART² Alternative Certification Program, University of Missouri-Columbia (Abell et al., 2006), place teachers into their own independent classrooms using mentors to assist them. According to Turley and Nakai (2000), student teachers reported independence in the classroom as a major advantage of coming from an ACP. Essentially, there are two options: teachers can be placed in a supervised classroom with a cooperating teacher, under the guidance of a university supervisor, or teachers can be placed in an independent classroom, under the guidance of a mentor. Both of these routes have their advantages and disadvantages, as can be seen in Table 2 (table adapted from Turley & Nakai, 2000).

As Table 2 indicates, research has shown conflicting views on student teaching: at times, the student teacher feels limited by the methods and ideas of their cooperating teacher and is never fully able to express his or her own methods and ideas in the classroom. At other times, the cooperating teacher serves as a role model for the student teacher, with the student teacher emulating the master teacher and eventually integrating the master teacher’s methods and ideas into his/her own teaching personality (Tanner, 2000). Also, teachers from ACPs enjoy the freedom of running their own classroom but still cite a lack of supervision and mentoring as a problem. However, the

Table 2. Advantages and Disadvantages of Fieldwork

	Advantages	Disadvantages
Traditional Certification	<ul style="list-style-type: none"> • fieldwork will help unprepared student teachers for classroom responsibilities • desire to work with cooperating teacher in a supervised environment 	<ul style="list-style-type: none"> • unpaid work • possibility of weak or incompatible cooperating teachers
Alternative Certification	<ul style="list-style-type: none"> • financial gains (teachers get paid to work) • independence in the classroom • learning to teach through experience 	<ul style="list-style-type: none"> • heavy workload for beginning teachers • lack of supervision and mentoring • stress

goal of fieldwork remains the same: to give teachers experience in the classroom and to prepare effective teachers.

The National Council of Teachers of Mathematics Professional Standards of 1991 outlines standards necessary for successful teaching, and several of these areas are taught in the coursework or seen during student teaching, but studies have shown that the best way to achieve these standards is through classroom experience. Lesson planning, classroom management and discipline, and reflections on teaching are gained through time and experience in the classroom and difficult to attain solely through student teaching. Lesson planning requires knowledge of the students' social and cultural characteristics to give students a connection between mathematics and the real world. Beginning mathematics teachers have been able to duplicate activities they have been exposed to but have had a difficult time devising their own original tasks in the classroom (Wilson, Cooney, & Stinson, 2005).

Research has shown that beginning teachers emphasize classroom management as opposed to subject matter, since classroom management tends to be more problematic than the subject matter (Oliveria & Hannula, 2008). Discipline problems are prevalent in challenging urban school districts, resulting in beginning teachers spending more time working with discipline problems than actual lessons and teaching. Often, in student teaching, the presence of a master teacher helps alleviate concerns about classroom discipline so that it is an element that is never fully addressed or developed in student teaching; the only way to truly address these skills is through experience in the classroom. To become an effective mathematics teacher, a teacher must learn to strike a balance between classroom management and the mathematics activity or lesson by establishing good management practices at the beginning of the school year and by making a positive first impression, establishing authority and rules in the classroom while incorporating fairness as well (Tanner & Jones, 2000).

A part of analyzing one's own teaching requires reflection upon teacher lessons to ensure that student learning outcomes are achieved. By constantly assessing these outcomes, teachers adapt their instruction to ensure that all students are learning. Reflection occurs at two different levels: (1) the local level, where teachers reflect on their current classes and students and how to improve upon their lessons, or (2) the global level, where teachers reflect on the overall purpose and ideas behind their lessons, units, or subject (Schoenfeld & Kilpatrick, 2008). Beginning teachers have difficulties reflecting on their own teaching practices. When they do, they tend to focus at local-level reflections. Not only do beginning teachers have difficulties with reflections, but they have an even more difficult time taking action with their reflective practices by being flexible and making the appropriate

modifications to their teaching practice (Oliveira & Hannula, 2008). Reflection cannot be taught, but is gained through experience and practice within the classroom setting.

Even though in a supervised environment, teachers from TCPs would have some exposure, through observations, experience, or discussions with the cooperating teacher, to these paths to effective teaching. Such exposure would give teachers a better sense of preparedness in the classroom. It was mentioned previously that teachers from TCPs were better prepared to enter the classroom than those from ACPs. However, studies have shown that after one year of teaching, the gap between these teachers closes considerably, and after three years of teaching, there was found to be no difference between the teachers from ACPs and TCPs in terms of teacher performance and competence, and student achievement (Turley & Nakai, 2000).

Conclusion

The overall goals of TCPs and ACPs remain the same: to produce quality teachers for the classroom. Differences between how they achieve this goal exist and are reasons for much controversy. The two components of teacher education, coursework and fieldwork, are essential in preparing effective teachers, yet both TCPs and ACPs have their own ideas and methodologies for implementing these two components. Current research has shown that comparisons between teachers from TCPs and ACPs are both inconclusive and contradictory. Complicating matters, research has shown that comparisons among different ACPs are also inconclusive and contradictory because of the variety that exists among ACPs.

According to Abell (2006), "We have little understanding of what or how ACP interns learn in coursework and field experiences throughout teacher development programs and into their initial years of teaching." There are questions that have yet to be conclusively answered but still need more research. There has been a call for longitudinal studies following teachers and their learning from ACP coursework up to their first several years of unsupervised teaching in hopes of answering several questions:

1. How do teachers from ACPs learn in both coursework and fieldwork and apply what they learned in the classroom?
2. How does the length of a program affect teacher learning?
3. How do students of ACP teachers learn? Is there a difference between the students of ACP teachers and TCP teachers?

Further understanding how ACPs develop teachers and their effectiveness in the classroom can assist teacher education in general.

CURRENT AND NEEDED RESEARCH

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