Recruiting and Mentoring Mathematics Teachers

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Abstract

The attrition of our nation's teachers is an ongoing problem. In particular, widespread mathematics teacher staffing problems continue to exist. This article examines recruitment methods that attempt to improve the supply of teachers and mentoring programs that attempt to retain classroom teachers. A recent nationwide study of 1571 middle school and high school mathematics teachers reports a significant relationship between mathematics teachers who have participated in an induction or mentoring program and the decision to remain in the teaching profession. Recommendations from teachers in the field support the use of on campus mentors to provide continuous and consistent support for new teachers.

Key words: Teacher education, teacher retention, mathematics teacher education

All children have the right to learn, and should have access to a qualified teacher. Disparities exist in our schools, and many children attend schools housed in poor facilities, without textbooks, and without a qualified teacher (Darling-Hammond, 2004). Teacher shortages are not new. In the past 50 years, there have often been fewer teachers available than needed, forcing policy makers to increase recruitment efforts and issue temporary credentials to those without proper qualifications (Cochran-Smith, 2004). Specifically, mathematics and science teachers are in high demand, and many state and federal programs such as the Science Mathematics Initiative have been initiated in an attempt to meet the need. In schools with large numbers of minority students and/or impoverished students, mathematics and science courses are often taught by teachers who do not have adequate background or teaching skills in the subject matter (Darling-Hammond, 2007).

Increasing recruitment efforts is one issue that must be dealt with. Teacher recruitment is an important challenge, but Ingersoll (2007) has made the strong claim that an even greater concern is teacher retention. Thus, it is important to understand why teachers leave the profession. Results of ongoing research find that "critical problems in the teaching and learning environment are literally driving teachers from the classroom" (Futernick, 2007, p. 1). Recruitment, hiring and replacement of teachers are factors that are costing California alone more than $455 million each year (Futernick, 2007).

1. Recruitment

The need to recruit mathematics and science teachers has been apparent since the 1980s. Clewell and Forcier (2000) found that "although there may be doubt concerning the predicted shortage of two million new teachers in the next 10 years, there seems to be no question that there is in fact a shortage of mathematics and science teachers" (p. 3). The National Research Council established a panel in 1986 to study the problem. Even with today's economic downturn, and many teachers being laid off, districts continue to try to recruit qualified mathematics teachers. In an effort to assist school districts with the recruitment problem, the National Comprehensive Center for Teacher Quality (2006) published tips and strategies for districts to use that would attract candidates to apply for open positions. Some of the "tips" given involved providing meaningful incentives for prospective teachers, targeting teachers with the experience and education to meet the needs of the school, building a relationship with higher education institutions, taking advantage of local teacher supplies, recruiting through internet usage, recruiting people from other professions to transfer into teaching, being selective in accepting candidates from alternative preparation programs, and broadening the diversity of prospective teachers.

In recent years, there have been concerns about the decrease in the number of students studying mathematics courses (Anthony & Graven, 2004). This issue, along with mathematics teachers' qualifications, and teacher attrition, impact the quality of teaching within schools, and make recruitment of quality mathematics teachers more difficult. It was also noted in the research that it was difficult to engage teachers in "out of school" curriculum development projects. When teachers are asked to develop curriculum, it becomes increasingly difficult to find substitute teachers. The research showed that the teachers do not want to return to school after project involvement, and therefore schools are reluctant to release quality teachers for these development projects.

In California, the recruitment of much-needed mathematics and science teachers was stepped up with the implementation of the Mathematics and Science Teacher Initiative (MSTI) (The California State University Office of the Chancellor, 2009). The initiative is an effort by the California State University (CSU) system to increase the number of qualified mathematics and science teachers in the K-12 classrooms. Each CSU campus that receives MSTI grant funding is mandated to make an annual report of the number of mathematics and science credentials issued, provide an expenditure plan on the use of the MSTI funds appropriated, and evaluate the effectiveness of the initiative's different components and activities, and report job placement of students who earn a mathematics or science teaching credential.

In California, the number of mathematics teaching credentials issued by campuses in the California State University system in 2002-2003 was 349. That number steadily increased to 791 in 2007-2008 (California Commission on Teacher Credentialing, 2009). The number of science credentials issued has also risen from 419 in 2002-2003, to 618 in 2007-2008. It should be noted that the state of California did not provide funding for the MSTI initiative until after the 2004-2005 years. In the University of California, a project know as CalTeach recruits and prepares high quality secondary mathematics and science teachers and promotes experimentation with alternative approaches to teaching (Newton, Jang, Nunes, & Stone, 2010).

In 2003, the Single-Subject Credential in Foundational-Level Mathematics was initiated in California. This credential allows an individual to teach mathematics courses through geometry and algebra II, and does not require an individual to obtain a degree in mathematics. Those who earn a Foundational Level Mathematics credential are authorized to teach all levels of algebra, geometry, probability and statistics, and consumer mathematics in grades twelve and below. In 2007-2008, nearly one-third of the mathematics credentials issued were foundational-level mathematics credentials (California Commission on Teacher Credentialing, 2009). The introduction of this credential has caused the number of mathematics credentials issued to increase over the last 6 years. Although this credential has limitations, it has helped to ease the challenge of producing highly qualified mathematics teachers in California.

Following the efforts by California to aid in the mathematics teacher recruitment issue, in 2008 other states took up the charge to try to "ensure the country's economic competitiveness and close the gap in student achievement" (Guess, 2008, p. 1). Over 75 public colleges and universities signed on to the Science and Mathematics Initiative (Science Mathematics Initiative at UC Santa Cruz [SMI], 2010). This was an organized effort to commit faculty and staff to supply data and work with state agencies to formulate specific targets for the number and kinds of teachers needed. SMI was designed to entice math and science students to choose teaching careers by building partnerships with state governments and school systems. The debate continues over mathematics and science teacher shortages and the causes of those shortages. Many researchers believe that the supply of new mathematics teachers has more than kept pace with the demand (Ingersoll & Perda, 2010). Even though graduation requirements, student course taking, and teacher retirement have all increased, the new supply of math teachers has kept pace. When pre-retirement attrition is factored in, the cushion of new supply, relative to losses is much less in the mathematics and science areas. With this fact in mind, the question becomes whether recruitment of new mathematics teachers is really the answer to the shortage problem. Many researchers wonder if the shortage crisis would continue, even with the best recruitment strategies.

2. Mentoring

With attrition rates for new teachers measuring at approximately 40% in the first 5 years of teaching, induction and mentoring programs attempt to help the new teacher transition in to the teaching profession, thus lowering attrition. Teacher mentoring programs provide the beginning teacher with a personal guide who helps the new teacher navigate the system. Mentoring programs vary from school to school, and from district to district.

Mentoring programs can vary from a single meeting between mentor and mentee, to other programs that are more structured and involve frequent meetings over a period of 2 to 3 years. Most of the research regarding mentoring programs revolves around the outcomes of teacher attitude and teacher retention. Teacher mentoring programs have been in effect for several years. Ingersoll and Kralik (2004) compiled a synthesis of several mentoring programs that were operational during the 1980s and 1990s. The California Mentor Teacher Induction Project's major objective was to increase retention of new teachers. The 1-year mentorship matched new teachers with master teachers. Surveys given at the end of the year provided inconclusive information regarding the results. For example, the study examined teachers' intentions to continue teaching, but no data were collected on the actual retention or turnover rates.

New York City employed retired teachers as mentors for new teachers. Data collected about this program were inconclusive due to the high level of non-respondents to the exit questionnaire. In Toronto, a pilot-mentoring program was undertaken. This program incorporated a control group and an experimental group. Results from both groups of teachers indicated that the mentored teachers (76%) were more likely to state that they planned to remain in teaching. Both Montana and Texas employed mentoring programs in the 1990s. Both programs reported impressive numbers in teacher retention; however, the small sample sizes and voluntary responses to the surveys limited the ability to generalize the results.

A more recent study of mentoring programs took place in New York City, where a nationally recognized mentoring program was adopted (Rockoff, 2008). Each mentor was assigned 17 teachers to mentor. The mentors worked full time in the mentor position. Approximately 300 mentors and 5000 teachers took part in the program. At the end of the 1st year, 97% of mentored teachers remained in teaching until the end of the school year, 90% returned to teaching the 2nd year, with 80% returning to the same school. Findings revealed "strong relationships between various measures of mentoring quality and teachers' evaluations of the impact of mentors on their success in the classroom" (Rockoff, 2008, p. 33).

A qualitative study contrasting two mentoring programs analyzed whether assistance and assessment can coexist (Yusko & Feiman-Nemser, 2008). One of the programs was the Peer Assistance and Evaluation Program (PAEP) in Cincinnati. The other program was the Santa Cruz New Teacher Project (SCNTP). Interviews were conducted with program leaders, program documentation was analyzed, and staff meetings and mentor training was observed. The underlying issue of the research was the question of how mentors can combine assisting the mentee, while at the same time assessing the mentee's performance. There was a question of how this can occur in such ways that the mentor can still earn the trust of the new teachers. Recommendations from the study suggested providing mentors with a full complement of mentoring tools, such as teaching standards, ways of analyzing student work, and formats for documenting interactions with new teachers.

The effectiveness of mentoring programs is a major concern. However, there is also concern over the price of these mentoring programs. Funding of mentoring programs is an issue for legislators who are concerned about potential returns on educational investments (Villar & Strong, 2007). Cost information for these programs was obtained from the State of California, Department of Education, school districts' budget office, program leaders, and the local county office of education. Data collected regarding teacher retention, student achievement and mentor effectiveness were matched with monetary estimates to determine the benefits and program effects. Findings revealed that from an administrator's point of view, the mentoring program is a clear winner. The model of new teacher induction in a given district pays $1.50 for every $1 spent. When considering the cost of replacing teachers who leave, constantly inducting new teachers in to the profession, not to mention the effect a high turnover rate has upon student achievement, mentoring programs more than pay for themselves.

With attrition rates as high as 50%, some question how the other 50% manage to survive the first 5 years of teaching (Maistre & Pare, 2009).

In studying Canadian students in their final year of field experience and then into their 1st year of professional practice, researchers conducted interviews from four professions – physiotherapy, occupational therapy, social work, and teaching. The interviews were transcribed and allowed the researcher to make comparisons among the four professions. The three non-teaching professions received extensive support from experienced colleagues, while beginning teachers received little or no support after they had been hired. One 1st year teacher in the study said,

> When you're a new teacher, it's a very isolating feeling because you're there in the classroom and you don't know who to turn to if you need help… So you don't necessarily feel like you can go to them if you're having a problem because in some way, you are going to lose credibility with them. It makes it difficult if you need help. (Maistre & Pare, 2009, p. 3)

The recommendation made for teacher educators from this study was to provide less clear-cut "ideal" solutions to problems, and to help student teachers understand that their ability to accept a less than perfect solution will be more useful to them in the long term. The Wicomico County Public Schools in Maryland launched a successful mentoring program, which included monthly professional development sessions for all teachers with 3 or fewer years of experience. Liemann, Murdock, and Waller (2008) said, "Teacher retention is a problem in public schools that can and should be addressed through mentoring programs" (p. 1). Mentors are assigned to new teachers, with trust being a large part of the mentoring. The county offered support with a new teacher induction program that offered monthly professional development sessions to assist teachers with classroom management, assessment, communication with students, parents, and community members. Results of the program showed that more than 80% of the county's new teachers were retained over a 6-year period.

California's Beginning Teachers Support and Assessment (BTSA) induction program provides formative assessment, individual support, and advanced content for newly credentialed and beginning teachers (California Commission on Teacher Credentialing, 2008). The 1997 Mazzoni legislation established BTSA and encouraged collaboration among school districts, county offices of education, colleges, and universities. The program mandates step-by-step guidance in obtaining a Clear Teaching Credential. The program objectives provide transition into the teaching career for 1st and 2nd year teachers in California. Program goals are to enable beginning teachers to be effective teachers who are culturally, linguistically, and academically diverse. Intentions of the program also ensure professional success and retention of new teachers. In the first 2 years of the program, 92% of new teachers were retained. The percentage retained in the 3rd year was 86%, and 87% were still teaching in the 4th year. BTSA is funded through California Assembly Bill (AB) 825 Credentialing Block Grant funds.

According to Quinn and Andrews (2004), beginning teachers require special support in order to ensure that they become veteran teachers. In order to retain new teachers, various programs and components must be in place. The improved retention of the teaching workforce will have positive effects on raising student test scores and improving the quality of schools (Reed, Rueben, & Barbour, 2006). At the current time, almost a quarter of all new teachers leave the profession in the first 5 years.

3. Recent Findings

The effect of mentoring programs upon mathematics teacher retention was a focus of recent research (Curtis, 2011). In a nationwide random sample of 3,000 high school and 2,000 middle school mathematics teachers, participation in a mentoring program was measured against the teachers' intention to remain in the teaching profession beyond the next five years. Surveys with a cover letter were mailed via U.S. mail to mathematics teachers at their school addresses. A code number was placed on each survey for tracking purposes. A stamped, self-addressed envelope was included with each survey for the return convenience of the participant and respondents were offered no incentives for their participation in the study. Out of the 5,000 randomly selected mathematics teachers, approximately 31% (1571) of the teachers participated. Demographics of the sample are shown by gender (Table 1) and by age (Table 2). Survey participants were asked how many years they anticipated remaining in the teaching profession. Those who responded with a number less than or equal to 5 years were classified as "Leavers". Those who anticipated remaining more than 5 years were classified as "Stayers".

Teachers who intended to leave due to retirement were also classified as "Stayers", since they had essentially made teaching their career. Results of the survey sorted by age and leave/stay are shown in Table 3. It should be noted that the highest percentage of "Leavers" is in the 26-35 age group, followed by the 36-45 age group. As part of the survey, teachers were asked to respond to questions regarding their first year experience. Using a 4-point Likert scale, participants were asked about receiving a reduced teaching schedule, common planning time, classroom assistance, administrative support, and classes for new teachers. Participants were also asked if they had participated in an induction or mentoring program as a new teacher. Findings showed no significant differences in retention when compared with responses concerning the first year experience.

Results did show a significant difference in the responses of those participating in an induction/mentoring program in relationship to teacher retention ($F = 4.939$, $df = 1$, $p = .026$). The latter result was initially surprising due to the previous finding of non-significance when the first year experience variables were tested against teacher retention. However, because of the vast difference in age and experience of the respondents, 1st year experiences were vastly different for survey participants. Most of the more experienced teacher participants were not exposed to any special programs when they began their teaching careers. The terminology "Induction/Mentoring Program" is more familiar to newer teachers, and responses to this question were more accurate in assessing the relationship of program participation to retention. With the tremendous success of programs such as BTSA (California Commission of Teacher Credentialing, 2008), it would make sense that with the support of an effective induction/mentoring program, retention rates would increase.

Participants in this study were asked for suggestions to improve teacher retention. One of the most common responses involved the need for a mentor for new teachers. Many of the surveyed teachers expressed feelings of being unprepared to assume the duties of a classroom teacher when they began their careers. Regardless of the amount of pre-service training one receives, true reality sets in when taking the helm as a teacher for the first time. Almost all of the teachers felt knowledgeable and competent in teaching mathematical content, but many felt unprepared in other areas of the job. They recommended that each new teacher be given a mentor who would be another teacher in the same department and on the same campus as the new teacher. The mentor should not be on the new teacher's evaluation team. Although induction/mentoring programs can be effective, the new teacher needs day-to-day help so that problems do not develop. The top reasons for teachers leaving the profession are lack of professional support, poor school leadership, low pay, and personal reasons (Carroll & Fulton, 2004). Mentoring and induction programs, if well done, are a way to help support new teachers. The many factors attributing to teacher attrition make it difficult to assess the worth and success of the many induction or mentoring programs. However, with proper support from knowledgeable individuals, the direction taken by new teachers can be one of positive development into effective and satisfied teachers.

4. Tables

Table 1. Number of Respondents by Gender

Gender	f	%
Male	584	37.2
Female	975	62.1
Total	1571	100.0

Table 2: Number of Respondents by Age

Age	f	%
Less than 25	52	3.3
26-35	408	26.0
36-45	420	26.7
46-55	364	23.2
56-65	272	17.3
66+	23	1.5
No Response	32	2.0
Total	1571	100.0

Table 3: Frequencies and Percentages by Age and Leavers/Stayers

	Leaving		% within leave/stay	Staying		% within leave/stay	Total	
Age	f	%		f	%		f	%
< 26	26	1.7	5.1	26	.7	2.5	52	3.4
26-35	186	12.1	36.2	222	14.4	21.7	408	26.5
36-45	135	8.8	26.3	285	18.5	27.8	420	27.3
46-55	109	7.1	21.2	255	16.6	24.9	364	23.7
56-65	53	3.4	10.3	219	14.2	21.4	272	17.7
> 66	5	.3	1.0	18	1.2	1.8	23	1.5
Total	514	33.4	100.0	1025	66.6	100.0	1539	100.0

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