Journal of Science Teacher Education (2006) 17:165–183
DOI: 10.1007/s10972-005-9001-4

Recruiting Future Science and Mathematics Teachers Into Alternative Certification Programs: Strategies Tried and Lessons Learned

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Published Online: 28 November 2006

SMAR^{2}T: Science and Mathematics Academy for the Recruitment and Retention of Teachers is an NSF-funded project for the alternative certification of science and mathematics teachers. Since 2003, we have recruited 4 cohorts of students for 2 different routes to postbaccalaureate teacher certification for teaching grades 5–12. Because we did not meet our target numbers for the recruitment of the 1st cohort, we examined our recruitment strategies and their effects. In this paper, we discuss strategies used to recruit for the 1st SMAR^{2}T cohort and the outcomes of those strategies. We present ongoing recruitment efforts and data on inquiries and applicants for the 2nd cohort. Finally, we highlight the intentional and unintentional gatekeepers of our program and present implications for others engaged in designing and implementing alternative pathways certification.

Introduction

Nationally and locally we are facing a critical shortage of qualified teachers. This is especially true in the areas of science and mathematics, where national figures for those who lack state certification in their field range from 28–33% for mathematics teachers and 18–20% for science teachers (Ingersoll, 1999; Olson, 2000). In Missouri during the 2000–2001 school year, out of 65,389 teachers statewide, 1,803 were not certified. Moreover, 137 mathematics and 194 science teachers were teaching without certification or with substitute certification or special assignment

certification (Hough, 2000). In 2003–2004, Missouri's Core Data Collection System indicated that, of those teaching science, 785 individuals (20%) were teaching out of subject or with temporary certification; the comparable figures for mathematics were 1,117 individuals, or 25% (M. Ehlert, personal communication, May 4, 2004). In Fall 2000, to address teacher shortages in Missouri, the Department of Elementary and Secondary Education issued a call for teacher preparation institutions across the state to develop alternative postbaccalaureate teacher preparation programs. In Spring 2001, also in response to the growing teacher shortage in Missouri, the State Board of Education approved a 1-year renewable Temporary Authorization Certificate (http://www.dese.state.mo.us/divteachqual/teachcert/bacdegree.html) that does not require completion of a teacher education program at the time the certificate is issued. Under this program, school districts can apply for a teaching certificate for an individual who holds a bachelor's degree from an accredited college or university and makes a commitment to pursue professional certification through a state-approved teacher education program.

Alternative certification is not a newcomer to teacher certification in the U.S. The state of New Jersey, for example, established alternative certification for teachers in 1984; that alternative route currently produces 20–25% of all new teachers hired in that state (Feistritzer, 1999). By 1998, 41 states, plus the District of Columbia, had established some type of alternative teacher certification program (ATCP), with more than 80,000 individuals licensed through them (Feistritzer). While states have been developing alternative certification policies, institutions of higher education and other entities have been busy creating programs to meet the need. For example, Teach for America (http://www.teachforamerica.org/), in operation since 1990, claims to have produced more than 9,000 teachers across all subject areas and grade levels. More specifically in science and mathematics, Arizona State University graduated 66 teachers in a fast-track postbaccalaureate certification program between 1996 and 2000 (Piburn & Baker, 2000).

ATCPs in the U.S. vary widely in terms of content and structure (Darling-Hammond, 1992). Some programs offer crash courses in the summer for quick entry into teaching, while others are extended programs leading to the master's degree. Darling-Hammond, Hudson, and Kirby (1989) proposed two terms to distinguish these ends of the alternative teacher preparation spectrum. The term *alternative certification* represents programs that allow individuals to assumer teacher roles prior to completing the requirements for licensure. *Alternate routes* is a label for programs that provide a flexible option to the tradition education program (TEP) while preserving major certification requirements.

Recently the furor surrounding alternative certification in the U.S. reached a peak. On one side, we had the Bush administration and the former U.S. Secretary of Education, Rod Paige. The 2002 No Child Left Behind Act (http://www.ed.gov/nclb/landing.jhtml) requires that states provide a "highly qualified" teacher in each classroom. In July of 2002, Paige issued a report, "Meeting the Highly Qualified Teachers Challenge" (U.S. Department of Education, 2002), that argued for dismantling the teacher education system as we now know it in order to create more highly qualified teachers. A large part of the secretary's argument

was that ATCPs are *the* solution to teacher quality issues, an argument that the secretary claimed is supported by "scientific research". Missouri decided to meet the challenge of having a highly qualified teacher in every classroom by defining "highly qualified" as any teacher who holds certification, including temporary certification.

On the other side of the argument are teacher educators who claim that alternative certification is not a reasonable answer to improved teacher quality. Like most areas of educational research, the findings on ATCPs are mixed. Unfortunately for former Secretary Paige, his research-based evidence does not hold up under scrutiny (Darling-Hammond & Youngs, 2002). For example, although his report claimed that Teach for America (TFA) has been very successful, Darling-Hammond and Youngs (2002) asserted, after analyzing three TFA studies, that "no sweeping claims can be made for the effectiveness of the program" (p. 23). Yet, contrary to the dissent voiced by some teacher educators (e.g., Penick, 2001, 2002), some findings surrounding alternative certification are positive. As Darling-Hammond and Youngs reported, "When this research [on alternative certification] is analyzed in terms of program design, it appears that more carefully designed programs yield stronger outcomes in terms of teacher effectiveness and retention than those that provide less training and support" (p. 23). We believe that science and mathematics teacher educators have two choices: (a) to fight against state departments of education that plan to meet teacher shortages through alternative routes to traditional teacher education or (b) to carefully design and implement such programs. We opted for the second.

The literature on ATCPs demonstrates that these programs have attracted a more diverse group of individuals than have TEPs. Indeed, the demographic background of individuals entering ATCPs represents one of the strengths of such programs. Teachers completing ATCPs are more ethnically diverse than TEP teachers (Feistritzer, 1992; Shen, 1998) and are more likely to have lived in an urban setting. In addition, ATCPs attract a higher percentage of males into the teaching profession. Approximately half of ATCP teachers enter teacher education programs after beginning their careers in a nonteaching field (Shen, 1997).

Because they see of the value of education in society, ATCP teachers have a strong desire to serve as teachers (Feistritzer, 1990). Perhaps, because of their backgrounds and age, ATCP teachers are more willing to teach in urban settings than TEP teachers (Natriello & Zumwalt, 1992). ATCPs have increased the number of mathematics and science teachers and placed a large proportion of these teachers in urban settings (Shen, 1998). However, ATCPs have had less impact on the teacher shortages that are occurring in rural school systems.

Despite the considerable body of knowledge on ATCP demographics, few strategies have been discussed for identifying and recruiting potential teachers into ATCP programs. Denton and Morris (1991) found that placing a single ad in a Houston paper led to more than 50 inquiries into their ATCP for mathematics and science teachers. Such a strategy may be successful in an urban area during a time of economic difficulty, but carefully designed recruitment efforts are needed to attract teachers to rural areas or in times of economic prosperity. Reys and Reys (2003)

noted the complexities of identifying and contacting potential TEP mathematics certification candidates. Such difficulties are often exacerbated for ATCP students as a result of the variety of professional positions (e.g., engineering, chemistry, animal science, and computer science) from which potential mathematics and science teachers could be drawn. In the following sections we describe how we designed our alternative program, discuss the strategies we used to recruit mathematics and science teachers for rural Missouri, and present the outcomes of those strategies. Finally, we highlight the intentional and unintentional gatekeepers of our program and present implications for others engaged in designing and implementing alternative certification programs.

Overview of SMAR^{2}T Programs

Through its STEM-TP Program (NSF 01-136, http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf01136), the National Science Foundation recognized the need to alleviate teacher shortages by developing a call for *alternative pathways to teaching* for postbaccalaureate students. In response to their call, a team of science and mathematics educators and scientists from the University of Missouri-Columbia (MU), with a group of school-based partners, developed a proposal for SMAR^{2}T: Science and Mathematics Academy for the Recruitment and Retention of Teachers. Since 2003, we have recruited four cohorts of students for two different routes to postbaccalaureate teacher certification for teaching grades 5–12 science or mathematics. Because our recruitment efforts did not meet our target numbers for the first cohort, we decided to examine more carefully our recruitment strategies and their effects. In this paper we discuss the strategies we used to recruit for the first and second SMAR^{2}T cohorts and the outcomes of those strategies, as well as the intentional and unintentional gatekeepers of our program. We begin by describing our programs and discussing our data collection efforts.

For SMAR^{2}T, we designed a science and mathematics certification program composed of two different pathways. Using the Darling-Hammond, Hudson, and Kirby (1989) definitions, the options include the Accelerated Post-Baccalaureate (APB) program and the Alternative Certification (ALT) program, as represented in Figure 1. Both pathways are designed for students holding an undergraduate degree in a science, mathematics, or a related field. Both require 35 semester hours of study; and both lead to a master's degree in education. APB participants are full-time students who complete the program in 15 months, while ALT participants are full-time teachers who complete the program in 24 months.

Secondly, students decide on either a mathematics or a science education path through the program. Science and mathematics education students' programs of study overlap for general pedagogy courses and during internships, but are separate for science or mathematics content courses and for subject specific methods courses. Mathematics and science education students come together to complete a capstone integrated science and mathematics methods course near the end of their programs. Lastly, SMAR^{2}T students decide on the grade range in which

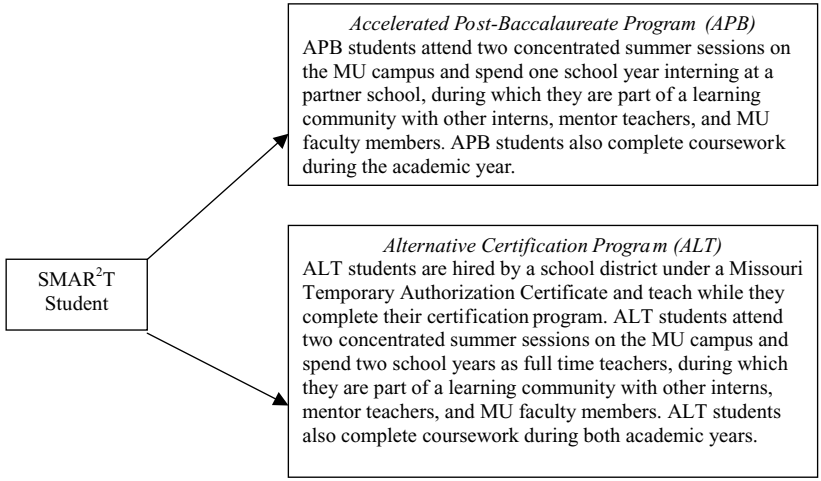

Figure 1. *Two pathways to certification: APB and ALT.*

they want to be certified: middle level, secondary, or dual, as defined by the state.

These decisions create slight program variations for students. In general, the program includes 10 semester hours of general pedagogy coursework, 6 semester hours of science or mathematics content courses taught in reform-minded ways, 11 semester hours of subject-specific methods courses, and 8 semester hours of internship. (SMAR^{2}T Programs of Study can be found at our Web site, www.smar2t.missouri.edu.) Exit requirements include an online portfolio, which is required of all MU teacher education students to demonstrate achievement of the Missouri Standards for Teacher Education Programs (Department of Elementary and Secondary Education, 1999), and an action research project (Hubbard & Power, 2003), which serves as the final exam for the master's degree.

Data Collection Methods

Evaluation of SMAR^{2}T program recruitment efforts began in February 2003 at the beginning of our Cohort 1 recruitment process. An external evaluation team provided formative and summative program evaluation as part of our accountability to NSF. External evaluators designed instruments for a range of data-gathering activities and helped project staff develop application materials that would provide further information. The SMAR^{2}T project coordinator documented data from each person who inquired about the program. This included their name, contact information, and how each person had heard about the SMAR^{2}T program.

Applicants admitted into the program were also a data source for assessing recruitment efforts via written surveys and face-to-face interviews. We developed a survey, the SMAR^{2}T Recruitment Survey (see the appendix), to evaluate participants'

reasons for applying to the SMAR^{2}T program, as well as to gain a better understanding of how participants initially learned about the program. In the 1st week of the first summer session, the evaluators began collecting formative program evaluation data. They met Cohort 1 students and conducted an initial interview. Over 3 days, all 19 students were interviewed by one of the two evaluators. Prior to conducting the interviews, evaluators read each student's personal data sheet from his or her application and each individual's recruitment survey responses. Evaluators began the interviews with a brief introduction, discussed the evaluator role in the program, and assured participant confidentiality. Following this introduction, the participant and evaluator reviewed participant responses to each of the recruitment survey questions. Using the surveys as background information, the evaluators asked participants to elaborate on how they had found out about the program. This component of the interview usually lasted about 20 minutes.

We taperecorded and transcribed all interviews verbatim. We then read and reread the survey answers and interview transcripts and looked for patterns in the data. From these patterns, we generated a new construct, that of gatekeepers, to explain the data. Finally we returned to the data set to test that construct against the data and to find representative excerpts.

Recruiting Issues, Strategies, and Results

As described above, we designed a postbaccalaureate certification program to meet the requirements of the many masters governing the process (e.g., Missouri Department of Elementary and Secondary Education certification requirements, College of Education certification officiers, College of Education faculty governance, MU Graduate School). We reported previously on this phase of the project (Abell et al., 2003). However, in science and mathematics teacher education, it is certainly not true that "if you build it, they will come." Thus we needed to become experts not only in program design, but also in advertising and recruiting, processes with which most education faculty are unfamiliar. To become more successful at recruitment, we enlisted help from our School of Journalism's advertising program from College of Education career and placement specialists, and from the students themselves.

We began by asking some key questions: Who are we attempting to recruit? How do we find them? What will entice them into the program? The nature of our postbaccalaureate certfication program helped to define the recruitment population. First, we knew we were looking for individuals who held undergraduate degrees in science or mathematics who had decided to become teachers. Yet this group is by no means homogeneous. We defined two major groups of recruits: (a) *career changers*, who decide to become teachers after a successful career in a science- or math-related field; and (b) *homecomers,* who decide to become teachers during their undergraduate science or mathematics program, but choose to finish their science or math degree and then enter a postbaccalaureate teacher certification program. In addition, we were looking for individuals interested in teaching in rural Missouri,

Table 1
How Inquirers and Applicants Found Out About SMAR^{2}T: Year 1

Source of program information	Number of inquirers	Number of applicants	Number accepted
MU advisor/faculty	22	11	10
Internet	18	4	3
Administrator at partner school	8	3	2
Friend/family	5	3	3
Newspaper article	3		
Career fair	2		
Placement director—other universities	1	1	1
Unknown	10		
Total	69	22	19

especially in locations surrounding our five partner districts, areas suffering from science and mathematics teacher shortages.

Who we wanted to recruit influenced the recruitment strategies used. We developed recruitment materials that included a brochure, Web site, and poster display. Within these materials, we advertised the financial and academic incentives for the program, which included a one-half tuition waiver and an additional tuition stipend, a small living stipend, and a program that would earn students a master's degree and state teacher certfication. We advertised statewide, but focused on the rural regions of the state where we wanted to supply teachers. Finding homecomers was easy—we needed to have a presence on their campuses, in their departments, and at their career fairs. Finding career changers was a bit more problematic. How do you know who or where these individuals are? For this group, we sent letters to school district personnel, including principals and personnel directors, asking them to spread the word locally about our program. We also capitalized on our partnership with Troops to Teachers, a national program to facilitate the transition of military retirees into teaching careers.

We launched our recruitment plan in February 2003 for the first cohort that would begin in June 2003. During that time, we had 69 inquiries, nearly evenly divided between science and mathematics. Table 1 reports how the individuals who initially inquired about SMAR^{2}T found out about the program. University advisors, our Web site, and school district administrators were important sources of recruitment information. Of these inquiries, 22 individuals applied; and we accepted 19 students, 8 in science and 11 in mathematics. Among those who applied, MU advisors were most frequently cited as sources for learning about the program. Given our target of 30 students, we were somewhat disappointed with the outcome of our recruiting efforts.

Our disappointment led us to reconsider our recruitment strategies. Using feedback from our students, faculty, and advisory board, as well as strategies suggested by a group of MU advertising program student consultants, we implemented changes

to our recruitment processes. First, we started recruitment for the second cohort a full six months earlier than for Cohort 1. We revised our recruitment materials to better reflect the program and the incentives available (including a new $10,000 Noyce stipend from NSF). We added a toll-free phone number on our materials to encourage inquiries. With additional funding for recruitment efforts from the U.S. Department of Education, we developed and implemented a Cohort 2 Recruitment Plan (see Table 2). This plan included strategies for both homecomers and career changers that we used in the 1st year, as well as some less conventional approaches, such as billboards along well-traveled highways in the state. We mailed thousands of brochures across the state to teachers and principals, worked with various campus organizations, and presented at 15 different institutions of higher education career fairs and three military career fairs. As of April 15, 2004, the deadline for Cohort 2 applications, we had 157 inquiries about the program, more than double the number of inquiries in the 1st year. Table 3 indicates how these individuals found out about our program. Our attendance at career fairs led to on-the-spot requests for more information, creating an inflated number of inquiries in that category. MU academic advisors and our Web site continued to be important sources of information about the program for potential students. From these inquiries, we received 46 applications. Table 3 also illustrates how those who applied found out about the program. The most significant recruitment source was MU advisors, faculty, and staff members. Our Internet presence continued to be an important recruitment tool. Specific recruitment efforts, such as attendance at career fairs, a mailing to MU alumni, and a newspaper advertisement did bring in some applicants, but we still need to assess if the numbers are worth the expenses associated with these efforts. We have decided to wait for data on one more cohort of recruits to have a sufficient sample size to provide an accurate cost-benefit analysis.

Program Gatekeepers

Reflecting on recruitment strategies and outcomes is useful in contemplating future recruiting actions. However, recruitment is only part of the story. In order to better understand why students do or do not apply to alternative certification programs, we also needed to find out what facilitates and constrains them in the process. Analysis of data from Cohort 1 suggested that there was a range of program gatekeepers that greatly influenced how far individuals moved in the application process. These gatekeepers fell into two key categories—those that we call *intentional gatekeepers* and those we name *unintentional gatekeepers*. Intentional gatekeepers were planned strategies—requirements, incentives, and resources—that we implemented to aid the application and selection of a cadre of high-quality future teachers. Such gatekeepers helped ensure that potential students were well informed and positioned to successfully complete the program. Unintentional gatekeepers were unanticipated qualities, persons, and resources that emerged during data analysis as constraining or facilitating factors to a candidate's application

Table 2
SMAR^{2}T Recruitment Plan for the Second Cohort

Recruiting event/item	Timeline

Develop recruitment materials:
• Revise and update recruitment brochure
  • Include new toll free phone number
• Revise and update Web site (www.smar2t.missouri.edu)
  • Include student profiles
• Develop new Web site (www.teach-math-or-science.org)
• Revise poster display board for career fairs
• Develop ad for print media
  • Newspapers
  • Alumni magazine
• Develop ad for other media
  • Billboard
  • Radio
	September–October 2003

Present at state conferences: • Missouri Association for Secondary School Principals • Meeting the Mathematics and Science Teacher Shortage: A statewide conference for teacher educators • Missouri Association for Rural Education	September 2003–February 2004

Recruitment specific to *career changers*:
• Package to school district human resources directors
• Package to Dept. of Economic Development (Fast Response Team)
• Target areas with local business closings
• Package to job placement companies
• Ad in mid-Missouri newspapers
• Ad in MU alumni magazine
• Information to Department of Conservation, Forestry, etc.
• Mailings to MU alumni from science and mathematics departments
• Collaboration with Troops to Teachers
  • Career Center-Contact Vet Rep. at each center
  • Military career fairs
  • Military Transition Assistance Workshops
	October 2003–March 2004

Recruitment specific to *homecomers*: • Attend graduate and professional school fairs in Missouri • Mailing to MU science and mathematics department heads • Conversation with MU academic advisors in science and mathematics • Student discussion lists • Provide information to MU Career Support Center • Speak to student groups/meetings	October 2003–March 2004

(*Continued on next page*)

Table 2
(Continued)

Recruiting event/item	Timeline
Recruitment from school districts: • Mailing to Missouri middle and secondary principals • Mailing to curriculum coordinators and human resource directors • Information given to 150 school districts attending the Missouri Job Opportunities in Education at MU • Mailing to partner school districts	October 2003–March 2004
Follow up contacts to all initial inquirers	

Table 3
How Inquirers and Applicants Found Out About SMAR^{2}T: Year 2

Source of program information	Number of inquirers	Number of applicants[a]	Accepted
Internet	43	9	9
Career fair	39	3	3
MU advisor/faculty/staff	31	17	17
Administrator at partner school	10	2	2
Friend/family	7	8	4
Student in Cohort #1	6	2	
Alumni mailing	6	2	2
Placement director—other universities	4	2	2
Newspaper advertisement	3	1	
Veterans' representative	2		
Newspaper article	1		
Unknown	5	1	
Total	157	47[b]	39

[a]Applicants include three individuals who initially inquired in the previous year.
[b]Some applicants provided more than one response.

process. We list these gatekeepers and describe them briefly below with some illustrative examples.

Intentional Gatekeepers

Entrance Criteria. We use undergraduate GPA and GRE scores to screen applicants. Undergraduate or advanced degrees indicate a strong science or mathematics background; GPA and GRE scores indicate potential for academic success. However, none of these criteria signals potential for teaching success. For Cohort 2, we used a phone interview (the *Automated Teacher Screener*, Wallwey, 2000) as a

screening tool for this purpose. For Cohort 3, we developed an application essay that provided research-based indicators of successful teachers based on the Gallup/SRI Teacher Perceiver process (The Gallup Organization, 1994).

Application Deadline. To select a cohort in a timely manner, negotiating a reasonable deadline was important. The tradeoff is between allowing applicants plenty of time to apply and insuring that they receive information in time to be prepared for the summer session. Cohort 1 students appreciated this timeframe, but encouraged us to do even more in preparing Cohort 2 students for their summer work. At the time of the first interview, the Cohort 1 students were enrolled in an intensive 8-credit-hour summer course. They felt a bit overwhelmed by the reading that was required. So, although the students told us that they were notified of acceptance to the program in a timely manner, they felt that they were not well prepared for the intensity of their summer courses. One suggestion that many students made was to provide a reading list for summer courses prior to the start of summer session. Ted explained:

> *There were two reasons the reading list would help. One, because there is so much we have to read—I mean, four chapters in two nights and then five books by the middle of the next week. But the main problem was just the bookstore . . . eight people couldn't get [the books] because they were out, and then . . . one of the books we have to read [for] Monday we just got.*

Time. The program is structured in such a manner that students can earn certification in 15–24 months. Career changers do not want to spend too long becoming certified, yet a quality program cannot be too short. The SMAR^{2}T program was structured so that candidates could complete it in a reasonable time frame. This characteristic of the program turned out to be important to our students. When asked about deciding factors in her decision to apply to this program, Regina replied, "That it was a quick program. I was really, I don't want to say I was hesitant to go in a program that was going to be like 2, 2 1/2 years . . . I kind of wanted to get in, get it done."

Financial Incentives. The program was intentionally designed so that two routes for certification were possible: one unpaid, but shorter in duration route; the other paid (through full-time teaching in a school), but longer. Additional stipends from grants and tuition relief from our university supported students in their plans. For Edie, like several other students, "The tuition [stipend] was a big issue" in her decision to come back to school for certification. Our interpretation of data from a subset of Cohort 2 students who received an additional $10,000 Noyce stipend is that the financial incentives, although only one part of the decision to apply to SMAR^{2}T, may have provided a tipping point in their decision making.

Program Personnel. Program personnel who could quickly and correctly answer inquiries were critical factors for Cohort 1 students. Key program personnel included a one-half time SMAR^{2}T program coordinator and two science and mathematics education faculty advisors. One Cohort 1 student reported that, if not for the program coordinator's persistence, she would not have known this program was viable for her. Candace, who lives 95 miles from the university, reported that she was looking for a certification program. After an initial inquiry about the SMAR^{2}T program, she misinterpreted the internship requirement, thinking that she would have to complete her internship in the university town. This would have been impossible, given her family commitments. Because the program coordinator had not heard from Candace after Candace's initial inquiry, she contacted her. Upon hearing Candace's dilemma, the program coordinator assured Candace that she could fulfill her internship close to home. This one small piece of information was crucial in Candace's decision to apply to, and ultimately be accepted into, the program. Thee toll-free phone number established for Cohort 2 has facilitated the communication process.

College of Education Advisors and Certification Officers. To ensure an accurate assessment of past coursework in relation to state certification requirements, College of Education personnel who assure compliance with state certification rules (certification officers) must be involved. This is critical so that potential students will know the processes for state certification and so that certification officers are aware of and understand program design and philosophy. For many students, the advising office and certification officers are entry points into the program.

Nonhuman Information Sources. We designed the SMAR^{2}T Web site (www.smar2t.missouri.edu) to provide detailed information about the program to enhance what might be learned via phone calls or e-mails. Several students indicated that they utilized this Web site extensively to obtain detailed information about the program. We improved the Web site for Year 2 by including an online Request for Information form. Thirty individuals used this form to request further information about the program.

Geography. We wanted to build a program to attract rural Missourians to teach in rural Missouri (urban campuses in our university system support urban teacher education programs), although we accept students who plan to teach elsewhere. Thus, we worked with our five partner school districts to advertise in their regions, and we designed a program that could be delivered both locally and at a distance. In Cohort 1, five students taught or interned in rural schools located one hour or more from campus. We delivered classes online and on campus in evening and Saturday sessions to decrease their commute time. Despite our efforts at recruiting students from rural areas, most Cohort 1 students were from the university town.

Unintentional Gatekeepers

College of Education Certification Officers. We unexpectedly found that certification officers often did not portray the same values regarding teacher education and certification as our faculty. For example, one student who applied for our program held a PhD in chemistry. He was told by the certification officer that, with the PhD, he could be certified in Missouri without further coursework. As science and mathematics educators, certification is not our only goal. We believe that the pedagogical content knowledge (PCK) students gain from a teacher preparation program is important to their success in teaching mathematics and science. In this particular case, the student decided he needed the knowledge and skills he would gain from participating in the SMAR^{2}T program; he applied and was admitted to the program. Similarly, students who want dual certification in middle and secondary school teaching are often advised to take and pass another Praxis test, rather than enrolling in additional coursework. Again, we believe students will gain PCK by participating in the coursework needed for dual certification. These suggestions from certification officers, although legal paths to certification in the state, are at odds with the faculty view that teacher education is essential for producing highly qualified teachers.

Life Stage. Applicants to SMAR^{2}T exhibited a range of life stages (e.g., recent graduates of undergraduate programs, recent science or mathematics graduate students, burned-out career changers, laid-off career changers, retired military, mothers with grown children returning to the workforce, and teachers teaching without certification). When designing and recruiting for a program, it is important to note the range of possible backgrounds of participants, because no one set of design assumptions will hold for all. In one case, we found a student attracted to our program instead of a TEP because: "I [was] going to be in class with 19- or 20-year-olds, whereas, in this route, I'm going to be with people who are my own age and probably people who have been in the . . . battlefield."

Tenacity. How good are applicants at digging up information? How good are the students at asking the right questions to determine program requirements, time, and cost? We found that some of our applicants made multiple inquiries before applying. This factor implies that we need multiple forms of guidance (paper, Web-based, and human) to support potential applicants.

Internet Savvy and Accessibility. At most institutions, program information is provided through Web sites. However, institutions are unlikely to provide a special link at a university home page for certification programs. In fact, it is often very hard, even within a college or school of education homepage, to be granted a clear link to the alternative certification program page. How creative are future students in terms of typing in key words and searching the Internet or navigating a university or college or school of education Web site? Since the majority of our inquiries began on the Internet, we need to ensure that navigation to and within our program

information is clear. Thus, Web site maintenance is a process of continual quality improvement.

Institutional Reputation. There is a pecking order, at least in the minds of applicants, with regard to the reputation of state institutions of higher education. Although Missouri has more than 30 colleges and universities that certify teachers and 18 that offer ATCPs, the reputation of the University of Missouri-Columbia (MU) as the flagship campus in the state attracted many Cohort 1 students to the SMAR^{2}T program. The students assumed that an MU program would be of high quality and that an MU degree would be highly valued. Alan commented, "I've had friends [who have] come here and have always had a good experience." Furthermore, some applicants had an MU connection that influenced their application, including a previous MU degree, a family member with an MU degree, or friends at MU. Such connections create a comfortable familiarity with the campus and increase the likelihood of application. Katrina, for example, lived outside of the U.S. when she began looking for an alternative certification program. She previously considered moving to Texas or Oregon, but felt that the certification processes in those states were too complicated. She then looked for certification programs in Missouri: "My parents, they both graduated from MU, so . . . I grew up in Columbia . . . that's how I knew about MU." She was pleased to find a program that would bring her back to a place with which she was familiar.

Word of Mouth. Potential students found out about the program from a variety of persons: academic advisors, family members, friends, personnel directors, school counselors, and teachers in local schools. The paths that word of mouth takes cannot be anticipated. For example, one student, who was substitute teaching, received a SMAR^{2}T brochure from the head of the mathematics department—who had received the brochure from the principal—who had received the brochure through our mailing. In another fortuitous situation, Keith, who had already heard about the program but was not planning on applying at the time, took an educational psychology course with an MU science education doctoral student who was a research assistant for SMAR^{2}T. In conversation, Keith learned more about the program: "I actually met [him] through that, and I had heard about the program before; but [with him] being involved with it, he was able to give me more information about it." This conversation was just what Keith needed to pursue application. Therefore, spreading the word widely is important.

Luck. Those students who may not have initiated a full Internet search often found out about the program by chance. For example, some simply wandered into the College of Education and queried a secretary in some office. Edie is an example of this kind of luck. She reported:

> *I walked into here and I came to the college [MU] and I asked them what master's programs they had. My degree is in computer science and math, and so I was looking for something either with a master's in computer*

science or a master's in math education. . .. When I came to the admissions building, they didn't think they had a master's in computer science, so they sent me over here [to the education building]. . .. [Once here] I just stopped in the first office as I walked in the doors.

Edie was lucky that the first office she came to in the College of Education was the Career and Placement Services office. The person with whom she spoke referred her to a mathematics education faculty member who could answer her questions about certification. Did we have possible candidates who spoke with secretaries or others who did not know about our program and were, therefore, "unlucky"?

Some applicants found our brochure on science or math department bulletin boards. We wonder if other possible applicants missed this type of opportunity to learn about the program. Getting the word out to various players is key to increasing the odds that a lucky connection is made.

Geography. Unanticipated geographical issues also played a major role in the decision of applicants. Issues of location that affected Cohort 1 students included the need to be near child-care facilities, the desire to be near a support network, a wish to limit travel time and a concern about bad-weather commuting, the familiarity with the area, having investments (e.g., a house) that he or she did not wish to sell, and the potential to intern in a school where he or she would eventually seek employment. Ted told us that he had looked at programs in a major Missouri city, but, once his wife was admitted to a doctoral program at MU, he felt that the SMAR^{2}T program best fit his needs geographically.

Testing. Students are required to take the GRE for admission into the program. Some universities in the state offer master's degrees in education without requiring the GRE, which makes those programs more attractive for some applicants. Also, during their first summer, Cohort 1 students took the Praxis II to diagnose their need for further science or mathematics coursework (successful completion of the Praxis II is also a condition for certification). We assumed for SMAR^{2}T students, who had strong science and mathematics backgrounds, that this would not be a hurdle. In fact, the Praxis II created some anxiety for Cohort 1 students, and several students did not pass in their first attempt. For some students, time away from school science and mathematics content is an issue that could be a factor that constrains them from applying.

Thus, there were many intentional and unintentional gatekeepers for our program. Continuing to negotiate the intentional gatekeepers, and recognizing that unintentional gatekeepers exist, will help recruit a qualified pool of candidates.

Next Steps

Our data from the recruitment of SMAR^{2}T Cohorts 1 and 2, as well as our findings about program gatekeepers, have implications for the next phases of our

work. In particular, we learned that we need to do a better job within the College of Education in raising awareness of all personnel—faculty, administrators, advisors, certification officers, secretaries, and Webmasters—about the SMAR^{2}T program. Second, we learned the importance of getting the word out to academic advisors and career support persons in science and mathematics deparments across our university and to mathematics and science education departments in institutions across the state. Because many of our students are homecomers—recent science and mathematics graduates looking for a career in education—contact through academic advisors and career fairs is valuable. Third, we found out that a strong Internet presence is critical to informing potential students about the program. Yet, we cannot rely on merely launching a Web site; we must also ensure that the Web site is easy to find from the College of Education and departmental home pages, which continually change. In order to recruit more individuals into science and mathematics teaching, we have launched a new Web site (http://www.teach-math-or-science.org) geared toward informing many different audiences—high school students, homecomers, career changers, and current teachers—about science and mathematics teacher education opportunities across the state, not just at our institution.

Recruitment into alternative certification programs at a state university located a considerable distance from an urban area suffers from geographical constraints. At issue is creating a large enough pool of applicants to fill our program with academically capable students, while addressing the teacher shortage in rural Missouri. We wanted to make our program convenient, yet, at the same time, attract potential teachers from regions near our partner districts, which are located up to two hours away from the university. In terms of program delivery, we offer academic-year courses in a combined on-campus and online format to ease commutes, established video conferencing capabilities in each partner district, and place students in internships near their home towns. Our goal remains to attract more students from rural Missouri who are interested in teaching in those areas. However, recruiting these students continues to be difficult. We recognize that we need to do a better job of getting the word out to these regions. To help us meet this challenge, in our 2nd year, we placed advertisements in regional newspapers, presented at state conferences, and maintained consistent communications with our school district contacts. We also traveled to career fairs at higher education institutions across the state in an attempt to get the word out. These efforts led to a larger pool of applicants from across mid-Missouri, but the majority still came from the university town.

Designing what science and mathematics educators consider to be a quality program that also meets state certification requirements was our first challenge. Recruiting students into the program proved to be as great a challenge. The first task we knew how to do well—we were experts in teacher education. However, the task of recruitment required new knowledge, skills, and connections be built. Consistent documentation of individual inquiries and in-depth program evaluation data from participants allowed us to understand what works, what does not work, and what considerations we must take into account as we revise both our program and our recruitment strategies.

Now that our first and second cohorts have graduated and the third group is in the midst of their programs of study, we find ourselves asking new questions. Who is successful in our program and why? What are the barriers to success? What support systems are needed as students move into their beginning years of teaching? These questions will provide fuel for continued examination of our program's effectiveness.

We hope that what we have learned, as well as what we propose, will inform others who embark on this journey. In the realm of recruitment, we know that individual contexts for alternative certification will lead to variations in terms of intentional and unintentional program gatekeepers. We challenge those who are engaged in alternative certification for science and mathematics teachers to document these gatekeepers so that we can develop a knowledge base for the science and mathematics education communities.

Acknowledgments

This material is based upon work supported by the National Science Foundation under Grant No. DUE 0202847. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. We presented previous versions of this paper in January 2004 at the Association for the Education of Teachers of Science annual meeting in Nashville, Tennessee, and in March 2004 at the NSF Teacher Preparation PI Conference in Arlington, Virginia. The authors acknowledge the contributions of the other SMAR^{2}T team members, Meera Chandrasekhar, Abdulkadir Demir, Mary Laffey, and Jan Weaver to the creation and implementation of the program.

Appendix

SMAR^{2}T Recruitment Survey: 2003

Name _____ Date (day/month/year) _____
Math or Science? (circle) M or S
Please answer each question as completely as possible.

1. Why did you choose this program?
2. Did you investigate other potential programs for your certification? Yes or No. If yes, which programs and where?
3. Do you plan to be a full-time teacher while participating in this program? (just circle) Yes or No.
4. How did you initially hear about this program?
5. After initially hearing about the program, what were some questions that you had?
6. After you heard about the program, what specific steps did you take to learn more about the program?

7. After your follow up contact to answer additional questions, were all of your questions answered? If some of your questions were not answered, please let us know the nature of your unanswered questions.
8. Please briefly tell us the issues that affected whether you did/did not choose an alternative certification program such as this one. Please consider issues, but not limited to, geographical location, reputation of MU, incentives offered, and so forth.
9. What methods might we use to better publicize the program so that other future teachers might apply?
10. We want to make this a successful program for all participants. Can you tell us some reasons that might affect why you would or wouldn't complete the program in a timely manner? We realize that there are many possible issues that would be out of your control, but we are attempting to develop mechanisms that will help all participants complete the program.

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