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EXAMINING THE VALUE FACULTY SEARCH COMMITTEE CHAIRPERSONS PLACE ON FORMAL TEACHER TRAINING IN THE SCIENCES, TECHNOLOGY ENGINEERING AND MATHEMATICS FIELDS: RESULTS OF A NATIONAL STUDY

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EXAMINING THE VALUE FACULTY SEARCH COMMITTEE CHAIRPERSONS PLACE ON FORMAL TEACHER TRAINING IN THE SCIENCES, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELDS: RESULTS OF A NATIONAL STUDY

By

Jeremy Joe Hernandez

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ABSTRACT

EXAMINING THE VALUE FACULTY SEARCH COMMITTEE CHAIRPERSONS PLACE ON FORMAL TEACHER TRAINING IN THE SCIENCES, TECHNOLOGY, ENGINEERING, AND MATHEMATICS FIELDS: RESULTS OF A NATIONAL STUDY

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The use of formal teacher preparation programs are seen by many as a means to better develop the teaching skills of science, technology, engineering, and mathematics (STEM) doctoral students as well as to promote the ideals of the scholarship of teaching and learning. No one has addressed whether participation in these programs are advantageous during the STEM faculty hiring process, however. This study sought to address this gap. I examined the value placed on participation in these programs by STEM faculty search committee chairpersons during the pre-interview stages of the hiring process within the context of the last search they chaired. This was accomplished in two ways. First, I conducted an archival search of *The Chronicle of Higher Education* and collected data on 1387 tenure-track, assistant professor level STEM job postings from across academia. I used analysis of variance (ANOVA) and Tukey HSD post hoc tests to look for differences between teaching duties mentioned and for requirements of statements/evidence of teaching. Second, I invited 705 of the STEM faculty search committee chairpersons identified in the *Chronicle* search to take a quantitative 20-question survey online of which 206 participated. Participants were first asked about themselves and their institutions as well as the context of the last search they chaired. Participants were then asked to evaluate the teaching credentials of different pairings of fictional candidates' vita and to rank order five fictional candidates with varying

credentials within the context of the last search they chaired. I performed chi-square tests to evaluate the two fictional candidate comparison responses and a combination of Kruskal-Wallis ANOVA tests and Mann-Whitney U-tests to evaluate responses to the five candidate rank order question. The findings indicate that STEM search committee chairpersons place value on formal teacher training experiences, although the value given is dependent on many different factors. My findings also revealed that the value chairpersons placed on FTPP participation was dependent on a range of different factors including STEM discipline, institution type, whether postdoctoral experience was required, the experience level of the chairperson, and expectation of time commitments to research and teaching.

In loving the memory of my grandmother

Guadalupe Rainey

(December 11, 1934 – February 18, 2007)

ACKNOWLEDGEMENTS

To say that the last five years of my life have been an interesting adventure would be an understatement. I feel truly privileged to have been able to work with so many fine individuals during my time at MSU.

I would like to express my deep thanks to my advisor Jim Fairweather for his guidance and what seemed like ever-lasting patience. I also would like to thank my dissertation committee - Roger Baldwin, Marylee Davis, and Rique Campa - for their unwavering encouragement and support throughout my entire doctoral experience.

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I thank my family back home in San Antonio for their encouragement and support over the years. My mother especially deserves thanks, as she has always been there for me in good times and in bad.

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TABLE OF CONTENTS

CHA
DISC

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

This study examined the value science, technology, engineering, and mathematics (STEM) faculty search committee chairpersons currently placed, if any, on applicant participation in formal teacher-preparation programs during their doctoral studies. I sought to examine whether or not obtaining such a credential made a significant difference in the employment prospects of a faculty applicant during the pre-interview stages of the faculty hiring process. In other words, which applicant characteristics and experiences did STEM search committee chairpersons rate most important when recommending a group of applicants for advancement beyond the initial rounds of the hiring process to the interview stage?

Teaching, Research, and the Changing Nature of STEM Students

Currently STEM faculty demographics in American higher education are undergoing substantial change. Over the next decade, faculty retirements in STEM fields will provide for many new faculty employment opportunities (Austin, 2003; Finkelstein, Seal, & Schuster, 1998; National Science Board, 2004; Rice, Sorcinelli, & Austin, 2000). At the same time, an increasing number of these positions are not being refilled with tenure-track assistant professors (Austin, 2002; Baldwin & Chronister, 2001; Finkelstein et al., 1998). These findings are consistent with Schuster and Finkelstein's (2006) finding that the number of non-tenure track hires made as a percentage of all faculty hires increased by 8.6% between 1993 and 2003.

It is interesting to note that Dubowsky, Hartman, Simons & Przybylski (2000), in their survey of biology and chemistry department chairs, found that 92% of respondents planned on replacing their tenured faculty upon retirement with new tenure-track hires.

In explaining this seemingly contradictory finding, Dubowsky et al. (2000) pointed out that very few of the participants' departments had hired any candidates in recent years and may have been unaware of current hiring challenges. Openings for the dwindling number of tenure-track positions are becoming increasingly competitive and applicants with the desired combination of training and skills are greatly advantaged in such an environment (Austin, 2003).

Nationally there is growing concern about the low level of STEM literacy in the United States (Dubowsky et al., 2000). Multiple reports (e.g., NSF, *Science and Engineering Indicators,* 2002; AAAS, *Science for All Americans: Education for a Changing Future,* 1989; NSF, *Shaping the Future: New Expectations for Undergraduate Education,* 1996) warn that many Americans are ill-equipped to contribute to a science and technology-based economy. This concern has resulted in demands by policymakers and the public for STEM faculty to better educate their students so as to meet future needs of a STEM-based society.

At the same time, the diversity of students entering the higher education system as a whole is increasing in terms of race, gender, age, and academic preparedness (Baldwin & Chronister, 2001). Traditional instructional approaches, in particular lecturing while students passively listen, increasingly seem ineffective in educating both current STEM students and the increasingly diverse future student body (Felder, 1994; Finkelstein et al., 1998; Speck, 2003). In this context aspiring faculty members trained in effective teaching methods while in graduate school would appear to have an advantage over their less well prepared peers.

Despite the potential advantages of graduate training in teaching and learning, doctoral students in STEM fields face a strong cultural emphasis on research training over that of teaching. Faculty buy-outs of teaching time to concentrate on research can give STEM doctoral students the impression that teaching is of secondary importance (Kennedy, 1997). At the same time, aspiring faculty need only to look at job postings to see that most hiring STEM departments expect their candidates to teach. This uncertainty about the value of teaching in disciplines where research rules the day makes it difficult for an aspiring faculty member to know whether or not advanced preparation in teaching will be an advantage during the hiring process.

STEM Doctoral Student Exposure to Teaching and Learning

The importance placed on teaching preparation by academic employers may have a direct influence on the skills and experiences STEM doctoral students choose to develop in order to enhance their immediate faculty job prospects. Tuckman, Gapinski, and Hagemann (1977) asserted that the potential returns for possessing certain skills over others could influence how graduate students choose to focus their time and energy. Unfortunately many academic programs offer little formal guidance on the full range of skills students should develop, especially non-research skills. This lack of guidance affects how a student spends his/her time in an academic program, which can have beneficial or detrimental effects on early faculty career prospects (Coppola & Jacobs, 2001).

Limited exposure to teacher training often leaves the doctoral student to approach teaching in much the same or opposite manner of their faculty advisor depending on their personal experiences (Nyquist & Wulff, 1996) and to learn how to teach almost entirely

on their own in a haphazard manner (Austin, 2003; Fleet, Rosser, Zufall, Pratt, Feldman & Lemons, 2006; Shannon, Twale & Moore, 1998). In addition, the amount and quality of training many graduate teaching assistants receive is minimal at best. It is not uncommon for the entirety of a graduate assistant's teacher training to consist of a couple of one-day workshops taken at the beginning of a term (Shannon et al., 1998).

How STEM Faculty Search Committees View Teaching

When a faculty search committee considers an applicant's preparation and/or training inadequate in light of departmental and/or institutional needs, the applicant will most likely will rejected (Perlman & McCann, 1996). Unless an aspiring student is already aware of, or made aware of, the gate keeping realities of their chosen profession, especially in the context of different academic environments, they will most likely model their development behaviors and actions solely on the faculty actions to which they are exposed (Austin, 2002; Austin, 2003; Paglis, Green, & Bauer, 2006; Rice et al., 2000). Although modeling one's self after one's faculty adviser and/or other mentors can be beneficial, it can also be problematic if the norms and expectations of the hiring department values different faculty skill sets (Anderson & Swazey, 1998; Austin, 2003; DeNeef, 2002; Duderstadt, 2003; Gaff & Lambert, 1996). For example, the importance of teaching skills may differ between STEM search committees at research universities versus those at liberal arts colleges (Fleet et al., 2006; Meacham, 2002). Austin (2003) pondered the fit between the graduate program and the faculty work life at distinct types of institutions: "Does the graduate student have any idea that the academic life that he or she might choose is actually likely to be very different from the work and lives of current professors" (p. 120)? There is a tendency in STEM doctoral programs, most of which are

located in research universities, to emphasize research training more than teacher preparation. Doctoral students may obtain some teacher training, but it is often outweighed by the amount of research training received.

The lack of teacher training is also problematic to doctoral students wishing to become faculty in non-research universities. With only 10% of all Ph.D. graduates obtaining employment at the same type of research university they typically attend (Gaff & Lambert, 1996; Golde & Dore, 2001), there is an apparent gap between future faculty skill preparation opportunities for graduate students and the institutions where they will most likely end up (Atwell, 1996; Austin, 2002; Austin, 2003; DeNeef, 2002; Golde & Dore, 2001; Fleet et al., 2006; Meacham, 2002; Rice et al., 2000; Speck, 2003; Tichenor, 2003). This gap is further exacerbated by a concern Fairweather (1996) expressed about tight labor markets resulting in teaching-oriented institutions hiring more research-oriented candidates at the expense of the institution's long-term teaching and service missions. The stress that this "preparation gap" creates may lead otherwise talented individuals to bypass a faculty career (Rice et al., 2000). Nyquist, Manning, Wulff, Austin, Sprague, Fraser, Calcagno & Woodford (1999) found that many graduate students across disciplines gave serious thought to pursuing non-academic careers in response to that type of stress.

Instilling the Value of Teaching Skills

Ernest Boyer (1990) in his highly acclaimed *Scholarship Reconsidered* asserted that "the full range of faculty talent must be more creatively addressed." He challenged colleges and universities to redefine their traditional definition of scholarship to include teaching (p. 34). This challenge spurred many academics to respond to the growing

internal and external concerns about deteriorating teaching quality by taking action to improve the situation. One such action was the establishment of formal teacher-preparation program to support the development of graduate students' teaching abilities. College-level formal teacher-training programs have been initiated at both national and local levels to orient and supplement graduate students to teaching (Gaff & Lambert, 1996). The goal of many formal teacher-preparation programs is to expose participants to different teaching situations, often in a variety of institutional settings, to enhance their teaching skills (Rice et al., 2000). National programs such as the Preparing Future Faculty program and more local programs such as College Faculty Preparation Program alliance between the College of the Redwoods and Humboldt State University are just two examples of this type of initiative.

Many of these graduate student development programs also presume that the early establishment of certain values during graduate school, such as teaching skill development, will spur future involvement and expansion of those same values to others later (Fairweather, 1996). Although a noble goal, there is little evidence that these programs are effective over the long-term in shaping values if the faculty reward system is any indication (Fairweather & Rhoads, 1995; Fairweather & Rhoads, 1996). Current evidence suggests that effective research skills and scholarly productivity still trump teaching when it comes to rewards, especially within the STEM fields and regardless of institution type (Fairweather & Rhoads, 1995; National Research Council, 2003; Nyquist et al., 1999). Despite the push to provide better teacher training, faculty pay systems still reward research much more than teaching in nearly every institution type and this imbalance appears to be worsening (Fairweather, 2004; Fairweather, 2005; Felder, 1994).

Leslie (2002), in his analysis of data from the 1998 National Survey of Postsecondary Faculty, found that faculty across disciplines and institution types personally valued their teaching skills equal to or greater than research ability, yet the formal academic reward structures of their departments rewarded research over all else. Gaff and Lambert (1996) concurred and added that many faculty members consider the topic of reward systems to be taboo.

Signs that the academic reward system favors research over teaching are apparent to graduate students as well. Anderson and Swazey's (1998) survey of 2,000 graduate students found that 72% of respondents felt that research assistants were carefully supervised by their faculty, but only 40% made the same assessment in regard to teaching assistants. Langenberg (1998) observed that graduate research assistants get paid to do what must be done to earn their degree anyway and typically work with a faculty supervisor on their current research. In contrast a teaching assistant's job relieves some of the faculty member's teaching obligation so that the faculty member can devote more time to research. Shannon et al. (1998) concurred:

> Generally, research assistantships offer better funding and more opportunities to work closely with faculty mentors. Therefore the prestige of teaching assistantships becomes jeopardized as the best graduate students seek research assistantships so that they gain the research skills and experience necessary to become successful college faculty members (p. 440).

Finally, Rice et al.'s (2000) interviews of graduate students across academia revealed that, despite collective optimism about the faculty role, prospective faculty members

expected that pressures to conduct research would ultimately end up trumping teaching efforts in their early career.

This tension between the current values rewarded by those in STEM departments and those seeking to meet the teacher preparation needs of the future faculty by changing their values and skill sets must be examined further. The results of this study provide evidence about the effectiveness of efforts to prepare doctoral students for the job market and/or possible challenges that they may need to overcome.

Problem Statement

In a well-run formal teacher-preparation program, a doctoral student should be able to obtain a specific set of teaching skills and learn multiple approaches to improve student learning. Participants might also get the opportunity to teach at nearby institutions. For the purposes of this study, a formal teacher-preparation program is defined as a program that is "designed to help graduate students organize and develop their teaching experience in a systematic and thoughtful way, with assistance from faculty, campus offices, and programs in a manner similar to that already in place for research experience" (Michigan State University Certification in College Teaching program (http://www.grad.msu.edu/teaching.htm).

I believe that the challenge to formal teacher-preparation program participants' employment prospects in the STEM fields, however, lies first in the credibility of these experiences during the early stages of the hiring process and second in the chance to showcase these newly learned skills during the later stages of the hiring process. Unless faculty members doing the hiring deem formal teacher-preparation program participation a valuable component of an applicant's dossier, a formal teacher-preparation program

participant may never get the opportunity to showcase his/her learned teaching skills. In this study I examined whether or not having participated in a formal teacher-preparation program is helpful in the job hunt or if it is another piece of paper for search committee members to put in the job applicant's file as Frost and Teodorescu (2000) suspect. Assuming the given research skills requirement prescribed by the hiring committee is met, would a graduate student applying for a faculty position in the STEM fields, with evidence of participation in a formal teacher-preparation program, have any advantage (or disadvantage) when applying for an academic position? Does having obtained such preparation help applicants if potential employers do not recognize the added value of those learned skills?

Research Questions

In this study, I examined the ways STEM faculty search committee chairpersons[1] from across the United States evaluate potential early career entrants into tenure-track academic positions. In particular, I examined the value placed by STEM faculty search committee chairpersons seeking to hire an assistant professor based on participation in formal teacher-preparation programs as compared to other types of teacher training. The initial round(s) of the hiring process, before the interview stage, is an ideal time period to examine formal teacher-preparation program participation effects such as the decision on whether or not the applicant advances into future rounds (e.g. the interview stage) or is rejected outright. Research questions for this study include:

- Do job postings reflect the value committee members have for formal teacher-preparation program participation?

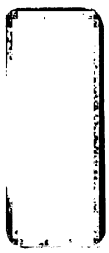
[1] I chose to conduct this study using only search committee chairpersons as opposed to all members on a search committee. Chapter Three provides a detailed explanation why this choice was made and the possible ramifications of said choice.

- Do search committee chairpersons in different STEM fields and institutional types place different values on formal teacher-preparation program participation during the pre-interview stages of the hiring process?
- Do time delays between graduation and faculty application, such as post-doctoral experiences, affect the value that search chairpersons place on formal teacher-preparation programs?
- Does the STEM search committee chairperson's experience serving on search committees influence his/her formal teacher-preparation program valuation?
- Do position's defined expectations of teaching and research duties affect formal teacher-preparation program valuation?

Intended Audiences

The research presented in this study is of potential interest to many different individuals, academic support organizations, and institutions. First, STEM doctoral students considering a faculty career have a vested interest in knowing what types of career preparation will maximize their chances of obtaining a tenure-track position. As has been previously mentioned, how a doctoral student spends his/her time can have a significant impact on their early career prospects. By having a better understanding of the current impact of formal teacher-preparation program participation has on their academic employment prospects, STEM doctoral students can potentially gain an advantage in better understanding what hiring institutions value in their new hires, especially in terms of their teaching preparation choices.

Similarly, faculty members who advise STEM doctoral students can gain from this study's findings. As has been mentioned, faculty advisors often play a vital role in



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steering their student'(s) career preparation choices. By having both a better understanding of the influence formal teacher-preparation program participation has in the STEM faculty hiring process and an idea of what academic employers expect in terms of qualifications, faculty advisors will have a better idea of what types of experiences they should, or should not, encourage their advisees to pursue.

Academic organizations, university teaching centers, and other units that focus their efforts on supporting college-level teacher preparation may also find this study of interest. As the next chapter demonstrates, very little is known about how academic employers evaluate STEM student teaching experiences. By having a better idea of how STEM faculty search committees currently value different types of teaching skill preparation, organization/unit leaders can gauge their overall impact on academia and/or develop new strategies to address possible challenges they were previously unaware of in relation to their goals.

Those who provide external funding to support formal teacher-preparation program efforts in the STEM disciplines may also gain from this study. By being able to better identify and understand what academic STEM employers value in the early stages of a search, funders can develop additional evaluation criteria to determine whether a proposed formal teacher-preparation program should be funded or in evaluating the success of an existing formal teacher-preparation program that is being sponsored.

Finally, institutional leaders may find this study useful in reassessing their doctoral programs. Although this study does not focus on any single institution, institutional leaders may be able to draw inferences about findings concerning institutions

that are similar to their own. Leaders may also gain a better understanding of how hiring practices may be similar to or different from those in their non-STEM academic units.

Dissertation Organization

The second chapter of this dissertation reviews the existing literature on the faculty hiring process and formal teacher-preparation programs within the STEM disciplines. The third chapter describes the methodology used to conduct this study. The fourth chapter describes and explains the significant statistical findings from the data that were collected. In the fifth chapter, I discuss this study's findings in relation to my research questions and make recommendations for future research.

CHAPTER TWO: LITERATURE REVIEW

To better understand the current value being placed on formal teacher-preparation program participation by those hiring new STEM faculty, a deeper examination of the goals and values of formal teacher-preparation program facilitators, STEM faculty members, and STEM doctoral students needs to be examined within the context of faculty hiring. This literature review is divided into two main sections. The first section examines the faculty search process. An understanding of the history and current motivations behind the search committee decision-making process, up through the interview stage, is critical to examining the value placed on formal teacher-preparation program participation by search committee chairpersons. The second section of this literature review focuses on formal teacher-preparation programs and their relationship to the STEM disciplines. First, I define formal teacher-preparation programs and compare them with other forms of graduate student teacher training. Next, I assess the strengths and weaknesses of formal teacher-preparation programs as identified in the literature. Finally, I discuss the major forces influencing the attitudes of many STEM faculty and students towards teacher development programs in general.

The Faculty Search Process

Introduction

Although there is scant empirical research about the faculty hiring process, other than a multitude of opinion-based editorials and commentaries giving job seeking advice to applicants (Exum, Menges, Watkins, & Berglund, 1984; Landrum & Clump, 2004), I summarize the existing literature on this topic. First I examine the historical roots of the faculty hiring process and how it has evolved over time. Then I discuss the operations of

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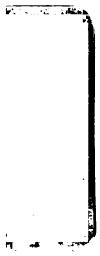
the modern day search committee and the key role played by the committee chairperson through the interview stage of the hiring process.

A Brief History of Faculty Hiring

Although it may be surprising to some, the use of search committees in the faculty hiring process is a relatively new phenomenon (VanderWaerdt, 1982). As I explain below, the evolution of the American faculty hiring process has affected many of the practices and customs faculty search committees use today. In this subsection, I first describe the common faculty hiring practices used prior to the late 1960's as well as explain the motives and drawbacks of these actions. I then discuss how a combination of changing demographics, dropping enrollments and funding, and an oversupply in doctoral graduates led to the creation of the modern day faculty search committee.

The "Old Traditional" Way of Faculty Hiring

Prior to the late 1960's, entry-level college faculty hiring was done primarily through personal communications between networks of senior faculty, department heads, and even deans of various institutions (Burke, 1988; VanderWaerdt, 1982). Very few, if any, institutions utilized committees in hiring. Burke (1988) used a fictional example of a department head with a faculty opening calling a respected colleague at another university to inquire about whether they had any quality doctoral students that needed a job. If a student meeting the description was available the decision to hire that person might be made on the spot, sight unseen. In this type of hiring system, advertisements were used only when no known candidates were available (VanderWaerdt, 1982). Often referred to today as a "good old boy network" hiring approach (i.e., traditional



networking approach), this process of hiring served many functions but also had many negative consequences.

Benefits of the "good old boy network" Hiring Approach

The traditional networking approach was a cost effective means to identify and hire new faculty at minimal risk to the hiring department (Exum et al., 1984). This approach saved valuable faculty time, keeping the effort expended on evaluating candidates to a minimum (Perlman & McCann, 1996). This hiring process allowed a department to screen out applicants deemed undesirable before any potential applicants even knew about an opening. In many cases the evaluation process was carried out for the price of a telephone call or postage stamp.

Some claim that traditional networking approach to hiring made for high quality new faculty hires. Exum et al. (1984) argued that the practice of relying on external peers to identify quality applicants was necessary because the academic market of that time was characterized by "reliance on precedence and custom, absence of clear and universally agreed-upon formal standards, use of ambiguous criteria, and closed, confidential decision making" (p. 305). In other words, those doing the hiring were unlikely to recruit new faculty from institutions they thought were below their institution's standards (Burke, 1988). Recruiting exclusively from certain "acceptable" institutions meant the hiring institution would maintain or improve its own merit status in the eyes of others (Exum et al., 1984).

Some aspects of the current faculty search process is based on perceived successful parts of the traditional networking method of faculty hiring. Although search committees today follow a more formal (and legal) process, remnants of the old approach

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to assess applicant quality include requiring writing samples, letters of reference, vitas, in person interviews, etc. Another residue of this traditional networking approach may be the value placed on a candidate's academic pedigree (Perlman & McCann, 1996).

Drawbacks of the "good old boy network" Hiring Approach

The traditional networking search and hiring process excludes anyone not connected to the "old boy" network. Given the demographics of faculty members before the civil rights movement, the traditional networking approach to hiring all but assured that most faculty members in academia would be white and male (Burke, 1988; Exum et al., 1984; Finkelstein et al., 1998; VanderWaerdt, 1982). Under-represented groups such as minorities or women had very little if any chance of joining the faculty ranks at any college or university, especially the most prestigious ones.

In addition, in the traditional networking approach to hiring the faculty held almost complete power over their graduate students. In general, students who wanted to join the faculty ranks had to enroll at a limited number of institutions and work with faculty members willing to recommend their students to colleagues at peer institutions. Even today Anderson and Swazey (1998) found that nearly 70% of the doctoral students they surveyed believed that who you know is a major determinant in having a successful academic career.

The Switch to Faculty Search Committees

The use of a traditional networking approach, although apparently effective and efficient, began to wane in the 1960's for a variety of reasons (Burke, 1988; VanderWaerdt, 1982). Ethical and legal considerations were paramount although pragmatic considerations also entered the picture. Eventually the traditional networking

hiring approach was replaced by a more standardized use of faculty search committees to fill an open faculty position.

Open Access to All

The passing of the Civil Rights Act in 1964 and the installation of mandatory Affirmative Action policies in hiring meant that the days of the traditional networking approach to hiring were numbered (Burke, 1988; VanderWaerdt, 1982). A process requiring applicants to submit formal applications and materials gradually replaced the traditional networking approach. Departments were now forced to identify and evaluate candidates in a more open and systematic manner. Although some question the effectiveness of these measures in ensuring high quality hires (Exum et al., 1984; Perlman & McCann, 1996; VanderWaerdt, 1982), this major paradigm shift resulted in a considerably more diverse group of faculty hires than their predecessors in terms of race, ethnicity, gender, socioeconomic origin, and national origin (Baldwin & Chronister, 2001; Finkelstein et al., 1998).

At the same time as the changes in the legal requirements for searches was occurring, American higher education was growing so quickly that a shortage of doctoral candidates for tenure-track positions existed. In the 1960's, college student enrollments increased dramatically. The GI Bill, the Higher Education Act of 1965, the Education Act of 1972, and the introduction of Affirmative Action policies into admissions all had a dramatic impact on the make up of the student population (Schuster & Finkelstein, 2006; Speck, 2003; VanderWaerdt, 1982). This increase in student enrollments and the increased federal funding for graduate education meant a substantial increase in faculty positions (Kennedy, 1997; Ross, 1981). This increase in tenure-track positions resulted

in a buyer's market. Graduates could be choosier about where they wanted to work (Baldwin & Chronister, 2001).

Another major demographic shift started to occur in the 1970's. Unlike the previous decade, undergraduate student enrollments began to decrease along with federal higher education funding (Kennedy, 1997). In addition, the end of mandatory faculty retirement policies, combined with a continuous flow of doctoral students matriculating resulted in a seller's market where there were more applicants than faculty positions available (Austin, 2003; Baldwin & Chronister, 2001; Exum et al., 1984; Kennedy, 1997). The back and forth between buyer's and seller's markets, the overall increased demand for faculty hires, and changes in the law resulted in the need to develop a more formal, open, and adaptive process for hiring new faculty members, the faculty search committee.

One effect of a more open hiring process during a tight labor market is an increase in the number of applications received for positions. Instead of relying solely on private referrals from a small group of senior faculty members, departments now looked at the qualifications of wide array of individuals. The time needed to conduct a single search expanded significantly as a result of larger applicant pools. The search committee became the mechanism of choice to coordinate job searches (Burke, 1988; Perlman & McCann, 1996; Sommerfield & Nagely, 1974). Having a group of faculty approve of a candidate based on qualifications became the most efficient way to filter applications. In addition to coordination, Youn and Gamson (1994) asserted that the use of search committees gave job searches more credibility with internal and external stakeholders.

Faculty Search Committee Challenge in the STEM Disciplines

The majority of the senior science faculty members in place today were hired during the 1960's. Many are beginning to retire (Dubowsky, Hartman, Simons & Przybylski, 2000). In addition, Dubowsky et al. (2000) speculated that the increased policymaker interest in undergraduate education and increased scientific literacy means an increased demand for STEM faculty members. These data suggest that STEM faculty search committees will be very busy for the foreseeable future. I will now explore the role modern search committees play in the hiring process.

The Modern Faculty Search Committee

Several circumstances can trigger a faculty search. Often searches are conducted to replace a faculty member who has left because of retirement, resignation, termination, or some other unexpected means (Ross, 1981). In some cases, the availability of additional funding allows for a new tenure-track position to be created (Ross, 1981), although the overall number of tenure-track positions available has been decreasing for several years (Baldwin & Chronister, 2001; Burke, 1998; Exum et al., 1984).

Search committees are typically charged with developing the formal qualifications desired for a position, setting a search timetable, advertising the opening, reviewing job application materials, informing candidates of their application status, identifying finalists, and determining who is interviewed (Ross, 1981; Sommerfield & Nagely, 1974; van der Vorm, 2001). In other words, a search committee is typically charged with ensuring the faculty hiring process is structured, legal, and completed in a timely manner.

First I discuss the key members found on most committees. Then I will describe typical committee actions leading to the solicitation of applications. Finally I review the screening process leading up to the interview stage of the hiring process.

Key Players on a Committee

The length of time a search committee exists and its membership varies between institutions and departments. Many larger departments have permanent standing search committee(s) given the high amount of hiring that occurs whereas smaller departments typically organize search committees on an ad hoc basis when needed (Burke, 1988). In addition, searches often take several months to conduct (Perlman & McCann, 1996). These factors highlight the necessity of ensuring certain individuals on a committee perform key tasks during a search. By better understanding these key needs, departments can better determine who can best fulfill the key committee roles and what tasks will need to be accomplished.

Although there is no consensus about the ideal membership on a search committee (Burke, 1988; Ross, 1981; Youn & Gamson, 1994), three needs must be fulfilled if any search committee is to be successful. The first need is the selection of a chairperson. Although very little literature exists defining the exact functions of the chairperson, Perlman and McCann (1996) asserted that search committee chairpersons are responsible for knowing and enforcing the boundaries of a given search. These boundaries are kept by keeping the search on track in terms of time and money, scheduling meetings and events, establishing deadlines, resolving committee member conflicts, ensuring all members have the most up-to-date documentation, attending to Affirmative Action requirements, making sure all messages/correspondence that the

committee sends out is approved through appropriate institutional channels, and ensuring decisions the committee makes are legal and of high quality.

The second need is the selection of someone to be an Affirmative Action representative. The primary duty of this representative is to ensure that decisions made throughout the process are not discriminatory (VanderWaerdt, 1982). Many departments assign the chairperson or another member of the committee to fulfill this role. A few institutions empower an exterior department (e.g. Human Resources) to place a representative on the committee (Perlman & McCann, 1996).

The third necessity is the assignment of an official record keeper. A record keeper is necessary for legal and practical purposes (Burke, 1988; Sommerfield & Nagely, 1974). The record keeper is charged with maintaining a written record of how all decisions were made and maintaining up-to-date documentation on all applicants. Federal mandates require institutions to document their hiring decisions so as to prevent discrimination against underrepresented groups. Committees also rely on the record keeper to survive the "paper blizzard" that occurs throughout a search (Perlman & McCann, 1996, p. 140). A paper blizzard refers to the hundreds of documents that a committee may receive simultaneously from multiple applicants during a search. The chairperson appoints a committee member to serve as record keeper and, in some cases, a staff member to assist in this function (Perlman & McCann, 1996).

Pre-screening Tasks of the Committee

Faculty search committees begin meeting after a department receives approval to recruit a new faculty member (Perlman & McCann, 1996; Ross, 1981; Sommerfield & Nagely, 1974). Strategies for conducting the search are established during the initial

meetings. Committee members select a chairperson if one has not already been appointed at this stage (Sommerfield & Nagely, 1974).

Creating a Job Description and Advertisement

Although developing a job description and advertising strategy are charges of the committee (Ross, 1981), some criteria for the search may be set by others. As previously mentioned, departments must receive approval to initiate a faculty search. In many instances the department head, or a higher-ranking peer, received permission to conduct a search provided the person hired meets explicitly agreed upon criteria (Burke, 1988). For example, a chemistry department may receive permission to conduct a search provided the candidate they hire specializes in inorganic chemistry. If this type of negotiated promise is not kept, funding for the position may be eliminated and months of search work would be wasted. Perlman and McCann (1996) assert that the committee chairperson is responsible for finding out about any negotiated promises relating to the position and for informing the committee before a job description is developed.

The job description differs from a job advertisement (Perlman & McCann, 1996). A job description is defined as the official document a search committee creates that defines specific expectations of the position being filled. A job advertisement is defined as a brief highlighting of qualities desired for candidates for an open position. Although job advertisements and job descriptions can sometimes be one in the same, the practice is rare given the financial costs of publishing advertisements in various media outlets (Perlman & McCann, 1996). Job descriptions are available to interested candidates seeking a better idea of what a position will entail whereas an advertisement only seeks to initiate interest in an opening,

When designed appropriately, written job descriptions serve as a valuable tool for search committee members when screening applicants for advancement into later rounds of the search (Perlman & McCann, 1996). Although creating a job description and advertisement may appear to be mundane tasks, confusion by both candidates and committee members can result if exact requirements are not specified in writing from the very beginning. Countless stories exist about searches that failed and/or became embarrassing debacles primarily because of a poorly written job description (Youn & Gamson, 1994).

Early career applicants typically have no control over qualifications a committee decides are desirable for a position. An applicant's initial knowledge of required qualifications and/or awareness of an opening's existence come from the official job announcement and/or description (Burke, 1988; Ross, 1981; Mahaffy & Cafferey, 2003). It is in the job description and advertisement that candidates find vital information such as desired experience(s), contact information, and deadline dates (Sommerfield & Nagely, 1974).

Information stated on job postings relate to the quality and can affect the number of applications that might be received (Sommerfield & Nagely, 1974). Ross (1981) suggested that a "description should be an accurate reflection of what the job is likely to entail yet not so diluted and diversified as to inhibit desirable applicants" (p. 50). Burke (1988) found that, "as a general rule, larger departments tended to advertise less well defined openings; smaller departments with precise teaching or research needs..." (p. 48). This difference between large and small departments may be a function of

resources. Smaller departments must be more precise in determining their faculty needs given the lack of resources and time available to conduct a search.

Advertising the Position

Deciding how to advertise a position is another role of the committee. The decision whether to advertise an opening nationally, regionally, and/or only among a small group of peer institutions affects the quality and size of the potential applicant pool (Brems, Lampman, & Johnson, 1995; Mahaffy & Cafferey, 2003; Youn & Gamson, 1994; Twombly, 2005). Burke (1988) argued that increases or decreases in the number of applications received is directly related to the scope of advertising. Although superior candidates can be found regardless of the advertising scope chosen, a more localized outreach often limits the number of superior candidates that would apply otherwise. Some departments only advertise regionally out of fear of not being competitive with better resourced institutions in terms of salary, working conditions, and teaching support (Youn & Gamson, 1994). Departments may also advertise on a smaller scale given the amount of time and monetary expense it takes to process and screen applications. Receiving too many applications can be problematic for a department with limited resources and a tight timeframe (Anagnoson, 1994; Perlman & McCann, 1996).

Conducting a nationally advertised search carries risks. Although conducting a higher profile search attracts more applicants, the costs of faculty time and resources needed to process and screen the applications also increase (Brems, Lampman, & Johnson, 1995; Perlman & McCann, 1996; Twombly, 2005). National searches also tend to significantly increase the number of "shotgun approach" applications received (Landrum & Clump, 2004). The shotgun approach to applying is when a candidate sends

out multiple applications simultaneously with little to no regard to the actual qualifications being sought in hopes that they will advance in someone's search (Brems, Lampman, & Johnson, 1995; Landrum & Clump, 2004). Having to sift through shotgun approach applications is often a waste of time to both reviewers and applicants.

The Screening Process

In a truly open search, with no pre-determined favorite candidates, the first element of influence is the way an applicant initially presents himself or herself. Cover letters, vitas, recommendation letters, writing samples, and other requested materials are often the first contact applicants make with the search committee (Brems, Lampman, & Johnson, 1995; Perlman & McCann, 1996; Seldin, 2004). The committee uses these materials to determine who will advance in the hiring process and who will be screened out (Burke, 1998). The initial application packet is crucial in defining an applicant's specific background and skills to committee members (Seldin, 2004). This screening process goes to the heart of the issue I explored in this study: What do STEM faculty search committee members, in particular the chairpersons, value when determining who gets to advance to the interview stage of the hiring process when the choice is not clear cut?

Once the committee's application deadline has passed, most search committees go about determining which applicants should receive additional consideration and which applicants should be eliminated. Depending on the number and quality of applications received, there may be several rounds of elimination before a handful of candidates advance to the interview stage.

The first cut.

Typically an initial screening is performed to remove "unwanted applications" from consideration (Anagnoson, 1994; Burke, 1998; Perlman & McCann, 1996). The goal of the first screening is to eliminate applications, not to identify the strongest ones. Unwanted applications are defined to those that may be incomplete and/or clearly do not meet required qualifications the committee seeks in some way (Ross, 1981; Sommerfield & Nagely, 1974). For example, a Physiology department looking to hire a cellular physiologist may eliminate an applicant specializing in exercise physiology regardless of the quality of their credentials. Sometimes this initial screening is handled exclusively by the search committee chairperson or by a chosen sub-group of the committee (Sommerfield & Nagely, 1974).

Burke (1988) asserted that cuts made at this stage also could include applicants deemed unlikely to meet certain requirements in a timely manner regardless of their other experiences. For example, a candidate who appears otherwise qualified might be eliminated if it appears they will not complete the Ph.D. by the time the position is set to start.

Deeper cuts leading to the interview.

After the initial screening, the committee examines the remaining applications and decides which candidates to examine further (Perlman & McCann, 1996). I assert that each round of evaluation produces one of three outcomes for those still in the application pool. The first outcome is placement in the *yes pile* (YP) of applications. The YP contains candidates that appear most strongly to meet the desired qualifications and are considered to have the best chance of advancing further in the hiring process.

The second possible outcome is placement into the *no pile* (NP). Typically those going into the NP are considered to be the weakest candidates and/or those that turn out to have improper qualifications not identified in the first screening. Typically NP candidates are officially eliminated from further consideration (Sommerfield & Nagely, 1974).

The third possibility is placement into the *maybe pile* (MP). The MP is comprised either of candidates considered qualified but less talented or experienced than candidates in the YP or whose talents may be considerable with an uncertain fit with the position being filled. Applicants in the MP may possess intangible qualities and/or special skills that the committee may want to consider further. Depending on the circumstance, applicants falling into the MP may or may not advance to the next elimination round.

Once each application has been placed in a pile and those rejected have been removed, this process will repeat itself until the committee identifies a desired number of candidates for interviews. Although this elimination process may seem straightforward, it may not be. Typically as the applicant pool shrinks, it becomes increasingly difficult a committee to make cuts because the candidates remaining are all seen as strong. With the cost of having a single candidate interview on campus typically being in the hundreds or even thousands of dollars (Anagnoson, 1994), it is not possible to interview everyone who may be a good fit for the position. Perlman and McCann (1996) asserted that the longest meetings of a search committee often occur during the final cuts before the interview stage.

It is at this decision point in the screening process that participation in a formal teacher-preparation program could make the most difference for applicants. In particular,

participating in a formal teacher-preparation program may make the difference for a search committee making a final cut between highly qualified applicants. For example, if there are one or two more candidates than there are available interview slots, the members of the search committee must make a value decision based on the wide variety of seemingly qualified candidates they are presented. What is most valued for advancement is what I sought to analyze in this study.

Summary

The faculty search process has evolved from one dependent on the good old boy network to a more formal search process with committees of faculty members empowered to identify a short list of candidates for a position. The increasing emphasis on credentials, along with a tightening academic labor market, has increased the importance of STEM doctoral students obtaining what are considered proper credentials. Yet what constitutes proper credentials across disciplines, types of institution, and individual search committee members is uncertain.

One of the most sought after, yet ambiguous, credentials evaluated by search committees are related to a candidate's teaching experience. There is great debate about the best way for STEM doctoral students to develop teaching skills. One solution has been the formation formal teacher-preparation programs to enhance teaching skill development, but the question remains whether those that do the hiring value such experiences. I will now move on to a discussion of formal teacher-preparation programs.

Formal Teacher-Preparation Programs

I begin the second half of this literature review by distinguishing formal teacher-preparation programs from other types of informal teacher preparation activities that can

be found in every doctoral degree granting institution across the nation. I then differentiate formal teacher-preparation programs from future faculty development programs. I conclude by discussing the identified strengths and weaknesses of formal teacher-preparation programs, with special emphasis on how the STEM community views these programs.

Formal vs. Informal Teacher Preparation

A formal teacher preparation program differs significantly from informal experiences in four ways: (1) entry requirements, (2) student awareness of program participation, (3) a required formal sequence of events and evaluation, and (4) formal recognition of participation after program completion (see Table 1). I assert that all four of these characteristics must exist for program to be considered formal.

Entry Requirements

Students participating in a formal teacher-preparation program are required officially to enroll and/or gain admission into a program before participating. Participants must take some form of action if they wish to participate (DeNeef, 2002; Gaff, 2002). This process differs significantly from an informal training program where students voluntarily participate in an activity without giving advance notice (e.g. listen to an invited speaker, attend brown bag lunch on teaching). Students are free to decide whether to attend informal events at the spur of the moment.

Formal preparation events require an advanced and deliberate commitment from the student. An example of a formal entry requirement can be found in the Michigan State University Certification in College Teaching program (MSUCCT). To participate in MSUCCT interested students must first discuss participation with their advisor (or

department) and then complete official paperwork before entry into the program. Although all STEM graduate students who teach a course are eligible to participate, they must take these steps if they want to enter the program (see http://grad.msu.edu/teaching.htm for more details).

Student Awareness

Participant awareness of being part of a specific program and/or a special community of students is another characteristic found in formal teacher-preparation programs. The literature suggests that STEM doctoral students with a sense of belonging to a supportive community feel greatly benefited in their professional development (Anderson & Swazey, 1998; Austin, 2002, Austin, 2003; Rice et al., 2000). An example of such a community would be participants in the Preparing Future Faculty (PFF) program. Many participants of this program consider themselves to be "PFF alumni" upon completion of the program (Gaff & Pruitt-Logan, 1998).

A student participating in informal programs does not consider himself or herself affiliated with the program. These participants are merely attending an event of interest. The doctoral student may be aware that a particular program sponsors an event, but s/he would not consider himself or herself affiliated with that program simply because of their participation. Michigan State University Graduate School's Career and Professional Development Series is such an example. Although participating students must register to attend functions and are officially considered participants, few students would consider themselves program fellows by attending a few events on an infrequent basis (Tinto, 1993; Tinto, 1997).

Formal Sequence of Events and Evaluation

There is a purposeful, concerted effort to monitor, record, and build upon a student's teaching skill base in an formal teacher-preparation program (Seldin, 2004). This process provides vital feedback to participants that cannot be guaranteed otherwise (Anderson & Swazey, 1998; Austin, 2003). Sometimes teaching courses and/or internships are also required to facilitate even more development. An example if this can be found in the Future Faculty Training Certificate Program in Bio-engineering at the University of Washington (http://www.uweb.engr.washington.edu/education/fft.html). Participants in this program must complete a specific series of courses on pedagogy, complete mentored teaching experience, and complete a capstone project to get recognition for successfully completing the program.

This approach differs greatly from informal programs where teaching development is haphazard at best (Austin, 2003). In many doctoral programs students are left to decide the manner and types of teaching skills they will develop. Although form(s) of evaluation may sometimes occur after an informal teaching experience, such evaluations typically provide only generic feedback. The feedback obtained is often used to pass judgment on a speaker and/or track attendance rather than to help a doctoral student improve teaching skills (Frost & Teodorescu, 2000; Roesset & Yao, 2002).

formal teacher-preparation programs organize planned activities to expose participants to greater and greater teaching responsibilities as doctoral students advance in the program. In an informal program, a doctoral student may serve as a teaching assistant for the same class section repeatedly for years, performing the same tasks, without much variation. The student's institution may offer informal workshops, lectures,

seminars, etc. to address teaching issues, but typically no mechanism exists to measure the student's overall teaching development (Shannon et al., 1998). Although informal program participation can result in increased teaching development and expanded responsibilities, the student is often left alone to identify activities that may increase their teaching skill development (Austin, 2003; Fleet et al., 2006; Shannon et al., 1998). In an formal teacher-preparation program, the same graduate student would be guided toward taking a sequence of specific training opportunities over time, teaching a variety of classes, assuming more teaching responsibilities over time, and may even have the opportunity to teach at a different type of institution (DeNeef, 2002).

Recognition of Participation

Finally, formal teacher-preparation programs usually award participants some form of recognition upon completion of the program. In theory, this recognition provides evidence of one's teaching skills and/or development (Tuckman, Gapinski, & Hagemann, 1977; Bok 2003). This recognition is often in the form of a teaching certificate and/or a special notation being made on college transcripts. Many formal teacher-preparation programs also require their participants to develop a teaching dossier. Dossiers can be used to show teaching philosophy, skills, and experience in an organized fashion (Seldin, 2004).

In contrast, participation in an informal preparation program often does not result in any type of official recognition. Participants who successfully develop strong teaching skills via informal programs may have no tangible means to demonstrate their accomplishments. Although the development of a teaching dossier may be encouraged in

an informal preparation program there is no requirement that it be done and therefore no real acknowledgement by the sponsor that it was done within an acceptable framework.

Table 1: Characteristics of a Formal Teacher Preparation Program

1) Entry requirements exist
2) Students are aware they are in a program
3) Formal sequence of events and evaluation
4) Recognition of participation

Formal Teacher-Preparation Programs vs. Future Faculty Development Programs

It is important to distinguish formal teacher-preparation programs from future faculty development programs. Although both types of programs often share philosophies when it comes to teaching skill development, the main difference is that future faculty development programs often go well beyond a student's development of teaching skills. Often the primary goal of a future faculty development program is to integrate, not just expose, certain ideals into a graduate student's development (DeNeef, 2002; Kezar & Echol, 2002). These programs seek to prepare the student for the many different aspects of the faculty role, not just the teaching function.

It is possible for a future faculty preparation program to contain an formal teacher-preparation program but not visa versa. As Gaff and Lambert (1996) indicated, occasionally an formal teacher-preparation program develops into a future faculty development program such as in the transformation of the Future Professoriate Project at Syracuse University.

Strengths and Weaknesses of Formal Teacher-Preparation Programs

In this section I discuss the strengths and weaknesses of formal teacher-preparation programs, while emphasizing how these programs are perceived by STEM departments, faculty, and students when possible. Very little research discussing the

strengths of formal teacher-preparation programs were geared specifically at STEM programs, but much has been written on weaknesses of STEM formal teacher-preparation programs.

Strengths of Formal Programs

The literature suggests several advantages of formal teacher-preparation program participation for doctoral students as well as for their institution. Participants of formal programs become more confident in their teaching abilities, institutions are better able to address internal and external concerns about graduate student teaching, and these programs can potentially be useful in the graduate student recruitment effort. Studies conducted by the Preparing Future Faculty program on former participants in their programs indicated a marked increase in student self-confidence and perceived personal competence when it came to professional faculty activities, such as their level of teaching ability (DeNeef, 2002; Gaff & Lambert, 1996; Gaff & Pruitt-Logan, 1998).

Institutions are addressing quality teaching issues.

Giving an formal teacher-preparation program participant formal recognition for program completion can benefit the issuing college or university. As the general public has become increasingly critical of the escalating cost of higher education and perceived decline in quality of undergraduate education, demands for more accountability in teaching and learning have increased (Atwell, 1996; Duderstadt, 2003; Huber & Morreal, 2002; Mahaffy & Cafferey, 2003; Tierney, 2004). Continuing to allow the practice of assigning graduate teaching assistants to teach with little to no formal training has not helped to quell this concern. This sentiment is also partly the result of an increasing number of undergraduate classes being taught, not by traditional faculty, but by graduate

teaching assistants, adjuncts, and other non-tenure track faculty hires (Baldwin and Chronister, 2001; Bradley, 2004; Shannon et al., 1998).

By allowing their graduate teaching assistants to participate in formal teacher-preparation programs, colleges and universities may be able to better justify, or at least better communicate, their continued commitment to quality teaching to both internal and external stakeholders. In addition they are developing their doctoral students' teaching skills which should pay benefits for years to come (Austin, 2003).

A possible recruitment tool.

An institution with an formal teacher-preparation program can also use the program to recruit new doctoral students who may have an interest in college teaching. If participation in a formal teacher-preparation program is perceived to lead to a stronger faculty candidate (Bok, 2003; Gaff & Lambert, 1996; Gaff & Pruitt-Logan, 1998; Seldin, 2004), the possibility of being able to attain such a credential could attract students interested in teaching and aspiring to become faculty members (National Science Board, 2004).

Weaknesses of Formal Programs

Formal teacher-preparation programs have several weaknesses in relation to the STEM disciplines that bear mentioning. These weaknesses are the substantial resources needed to effectively run the programs, the economic reality of running STEM departments, the reluctance of many faculty in the STEM disciplines to embrace formal teacher-preparation programs, the possible increase of time it would take students to complete a program, the lack of a program accreditation mechanism, post-doctoral

requirements of many disciplines, and resistance from STEM undergraduates to embrace innovative teaching methods.

Amount of resources needed to run.

A substantial amount of labor and time are required to run a formal teacher-preparation program effectively (Fairweather, 1993; Shannon et al., 1998). Any deep academic change requires a sustained effort by seasoned professionals to succeed (Daves, 2002). This time and effort is especially problematic in the STEM fields as funding sources tend to be focused on disciplinary research rather than teaching (Shannon et al., 1998; Wankat, Felder, Smith, and Oreovicz, 2002).

In addition to money, some form of faculty and/or administrative oversight is also required to run any formal teacher-preparation program successfully. STEM faculty running formal teacher-preparation programs must commit their professional time and energy to perform necessary functions. Time is arguably the most valuable resource available to any faculty member (Fairweather, 1993; Massy & Wilger, 1995; Tobias, 1992). Despite a claimed willingness to devote more time to teaching, faculty often choose not to do so as they believe their institution only "rewards research"(Rice et al., 2000, p.17). Frost and Teodeorescu (2000) found that faculty at research universities felt incentives did not adequately reward teaching activities. This finding supports both Boyer's (1990) and Fairweather's (1993) assertion that teaching and research activities tend to be treated separately in faculty reward structures.

Unless some form of financial support becomes available to entice faculty to contribute their time, which can be otherwise used for doing research, any formal program may be doomed for failure before it starts. As a result of the twin restrains of

faculty time and project funding, formal teacher-preparation programs housed in STEM departments often prove difficult to maintain over a sustained period. Fisher, Fairweather, and Amey (2003) found that the positive effects from engineering reform programs did not tend to extend much beyond the principle investigator or the funded project as the programs often neglected the complex faculty roles and institutional structures needed to institutionalize the innovations. Once an innovator finds a new interest and/or leaves, their innovations often fade away (Tobias, 1992).

Economics of the STEM department.

The dual pressures of accountability and economics placed on faculty in STEM departments may also discourage formal teacher-preparation program participation and acceptance. A formal teacher-preparation program requires institutional and/or departmental resources to be successful. Unfortunately the current fiscal condition for many STEM departments seems to be stifling to many reform efforts.

Currently, many STEM departments rely heavily on "soft money" to meet their fundamental budgetary needs. Soft money often comes from the research projects that faculty are encouraged to seek out without regard to the effect on teaching (Massy & Wilger, 1995; Nyquist et al., 1999). In essence, members of the regular faculty are increasingly accountable to maintain the fiscal condition of their own departments that in turn allows for little time to pursue other ventures. This finding supports Fairweather's (1993) observation that, "the more time a faculty member spends on teaching, the less she or he spends on research and vice versa" (p. 46).

The increasing departmental reliance on soft money has impacted teaching in the STEM fields. Institutions increasingly use adjuncts, teaching assistants, and other non-

tenure track faculty to teach courses (Baldwin & Chronister, 2001; Dubowsky, 2000). Fairweather (1993) found that the average full-time faculty member taught less than 25% of all undergraduate classes. Currently the academic culture seems to reward new tenure-track hires and established faculty for good research by reducing their teaching loads (Baldwin & Chronister, 2001; Bok, 2003; Leslie, 2002).

This situation casts a negative shadow for the outlook of formal teacher-preparation programs in the STEM disciplines. As was mentioned in *Chapter 1: Introduction*, doctoral students often model themselves after their mentors. If students' mentors refuse to participate in formal teacher-preparation programs the students may develop the same attitude. Doctoral students may interpret their mentor's activities as additional evidence of the importance of research over that of teaching.

Before proceeding, I must mention that I am not advocating for more time for teacher preparation at the expense of research. I am merely describing the situation based on the existing literature. With this in mind I continue with the literature review.

Lack of STEM faculty support.

One way to garner STEM faculty support for formal teacher-preparation programs may lie in the increased emphasis on teaching by funding sources external to the department and/or institution. Fortunately many national philanthropic organizations and governmental agencies can and do fund formal teacher-preparation programs (e.g. the Ford Foundation, National Institutes of Health). In addition, the National Science Foundation's Criterion 2 requires all funded research projects to demonstrate how they benefit teaching and learning (Colwell, 2002). Despite the availability and encouragement of such funding, the literature indicates that STEM faculty members are

still reluctant to embrace formal teacher-preparation programs. In addition, many STEM departments refuse to participate in institution-wide teaching initiatives. Reasons for resistance include the "paradigmatic and methodological rigidity" in many STEM fields and major structural differences in the how undergraduates are introduced to their disciplines compared with those in non-STEM fields (Brent & Felder, 2001, p. 73; Huber & Morreal, 2002; Lee, 2000; Singer, 2002, p. 62).

Many a reform effort has failed without faculty support (Kezar & Echol, 2002) and there are many reasons why STEM faculty may not support formal teacher-preparation programs (Coppola & Jacobs, 2001). First, despite the mounting empirical evidence to the contrary, faculty skepticism about the effectiveness of new teaching approaches to the traditional STEM curriculum remains (Duderstadt, 2003; Elton, 2003; Huber & Morreal, 2002; Speck, 2003). Lee (2000) stated, "...the interdependence between the dominant paradigm, the organization of inquiry, and teaching practices can create formidable barriers to implementation of effective principles of teaching and learning [in STEM fields]" (p. 284).

Much of what is currently rewarded in the STEM disciplines is already well defined. Little room is left to reward innovative teaching efforts under the current faculty reward structure. This cultural characteristic makes establishing of new ways of thinking about teaching more difficult to instill (Colbeck, 1998). The incentive for faculty, and more importantly doctoral students, to participate in something outside the immediate needs of their department is often lacking, especially when no funding is committed to buy their time (Schneider & Shoenberg, 1999; Tierney, 2004, p. 150). These factors can affect how change is perceived, implemented, and ultimately accepted or rejected by an

academic culture (Singer, 2002). What is the incentive for a student to use their valuable time to learn something that will not be rewarded?

DeNeef (2002) found that many STEM faculty members had limited experience with institutions different from their own. This led many of them to believe that they should only train their students to fill faculty roles in institutions like their own. These faculty members may view their students obtaining employment in other venues as a failure. This finding, if correct, is troubling because many of the new STEM faculty positions will be available in institutions unlike the research universities where doctoral students receive their education (Baldwin & Chronister, 2001; Rice et al., 2000; Schuster & Finkelstein, 2006). Golde and Dore (2001), in their extensive study on the early careers of 4,114 doctoral students and recent graduates, found that only 42% of graduates ended up working in research institutions in any capacity. It is difficult to believe that STEM faculty mentors would consider over half of all their doctoral students to be failures.

Effects on time-to-degree and research.

Other reasons for STEM faculty resistance to formal teacher-preparation programs are the concern that participation will increase a doctoral student's time to degree and the hindrance of a student's research development (Austin, 2003; Speck, 2003). There are scattered reports of students being openly discouraged from formal teacher-preparation program participation by their advisors for these very reasons (Connolly, 2002; DeNeef, 1996; Ferren, Gaff, & Clayton-Pedersen, 2002; Gaff & Pruitt-Logan, 1998; Meacham, 2002). The mere thought of delays to a student graduating is simply unacceptable to many in the STEM community.

This fear originates from the fact that STEM doctoral students are taking longer to matriculate and begin a faculty career than in the past (Schuster & Finkelstein, 2006). Currently, it takes STEM doctoral students two years longer to obtain their degree than it did in 1965 with the average age of a graduate being 32 years old (National Academy of Sciences, 2000, p. 18; National Research Council, 1998). Given the additional career preparation requirements after graduation in some STEM fields, such as postdoctoral work, the result is that the average age of a newly tenured faculty member is now eight years older than their 1970s counterpart (National Research Council, 1998). As a result, some fear that embracing formal teacher-preparation program participation could invite further delays to an already lengthy qualification building process.

Postdoctoral experience requirements.

As was just mentioned, an increasing number of STEM departments now require applicants have postdoctoral experience to even be considered for a faculty position (National Academy of Sciences, 2000; Schuster & Finkelstein, 2006). Regets (1998) reported that the percentage of all STEM PhDs who ever had a postdoctoral position increased from 25% in 1966 to 41.3% in 1994. The duration of the typical postdoctoral experience had also increased from less than 20 months before 1965 to about 29 months for those graduating in 1995 (National Academy of Sciences, 2000, Regets, 1998). Depending on the starting and ending date of the postdoc, this extra nine months can equate to waiting an additional year to begin a faculty post.

This trend towards requiring postdoctoral work in the STEM disciplines could be especially problematic for applicants with formal teacher-preparation program training. If Fairweather and Rhoads (1996) are correct in their argument that the true value of any

credential fades over time, the current trend towards more post-doctoral work in the STEM disciplines should be cause for great concern for formal teacher-preparation program proponents. Participants may be at risk of forgetting their teaching skills/lessons because of the large span of time between their formal teacher-preparation program experiences and returning to the classroom to teach college students. In addition, the expectation of postdoctoral work, which is usually research-oriented, may further lead students to see teaching skill development as less important than developing research skills when aspiring to a faculty position.

Lack of accreditation.

Formal teacher preparation programs also lack a centralized accrediting body to ensure quality at least some consistency between programs. The quality and format of formal teacher-preparation programs can vary greatly from institution-to-institution and from department-to-department depending on the program. Questions have been raised about whether some teaching opportunities are set up more to meet the immediate needs of the institution than the development of doctoral students (Austin, 2002; Austin 2003). If Tuckman, Gapinski, and Hagemann (1977) are correct in their assertion that quality teaching skills are difficult to certify the lack of accreditation raises questions about the value of an formal teacher-preparation program credential in faculty job searches. Roesset and Yao (2002) also warn of credentials such as teaching dossiers being misused and becoming mere "packaging" rather than being a reflection of quality.

Undergraduate student pressure.

Finally, undergraduates also tend to resist newer STEM teaching initiatives even when these methods are proven more effective (Felder & Brent, 1996; Johnson, Johnson,

& Smith, 1998). Rice et al. (2000) asserted that a tension exists between the goals of instructors and students when it comes to teaching and learning. In the case of STEM undergraduates, the desire for tangible degree prerequisites may play a key role in their resistance to innovative teaching methods. Tobias (2000) gave the example of Harvard STEM undergraduates refusing to take an innovative physics course for fear that the topics not covered might appear on the physics section of the MCAT exam. This fear of not being given traditional content information constrained students' willingness to be exposed to innovative teaching styles and ultimately the instructors, one of whom was a Nobel Prize winner, were forced to offer a more traditional course.

Conclusion

Despite the claimed pros and cons of formal teacher-preparation programs for aspiring STEM faculty members, the literature suggests that the value of formal teacher-preparation programs in the faculty hiring decision is unknown. Is the purportedly low regard by STEM faculty members for formal teacher-preparation programs reflected in the value they place in such participation when making an employment decision? How does formal teacher-preparation program participation stack up versus more traditional forms of teaching skill development? In *Chapter Three: Methodology*, I develop a conceptual framework to enable me to explore the issue of how formal teacher-preparation program participation is being viewed by those conducting STEM faculty searches.

CHAPTER THREE: METHODOLOGY

This chapter explains the research plan used for this study. First an overview of the conceptual framework identifying the critical factors addressed in this study is provided. Second, I explain how the population and sample were selected. Third, the data sources are described. Fourth an overview of the survey instrument is provided. Finally, a description of planned statistical testing is presented. Throughout this chapter, I also provide the rationale behind key decisions made during the development and implementation of this methodology.

Conceptual Framework

This national study sought to examine what STEM search committee chairpersons value when evaluating faculty applicants for open, tenure-track, assistant professor level positions with special emphasis placed on teaching credentials. It is not uncommon for dozens, or even hundreds, of applications to be submitted for a single STEM faculty position. As was described in *Chapter 2: Literature Review*, many applicants are easily eliminated from consideration for many reasons (e.g. candidate had incomplete file, had wrong specialty, was weak compared to peers) and the strongest applicants are considered for advancement to the interview stage. What makes an applicant stand out sufficiently for a search committee member to recommend the candidate advance to the interview stage of the hiring process?

In this research I sought to test the value placed on a doctoral student's participation in a formal teacher-preparation program in the pre-interview round(s) of the faculty hiring process. It is at this screening stage that most faculty search committees are asked to pass judgment on an applicant based solely on the paper credentials

presented. Although formal teacher-preparation program participants may get the opportunity to showcase their teaching skills during the interview stage (Mahaffy & Cafferey, 2003), I argue that committee decisions made during the critical pre-interview stages determine whether or not a formal teacher-preparation program participant will get that opportunity.

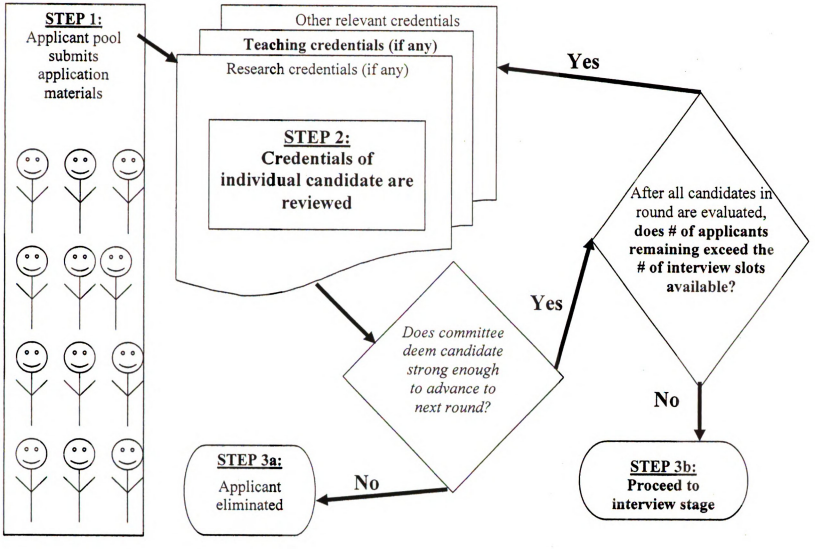
The pre-interview hiring process is illustrated in Figure 1. Applicants will first submit their application materials for an open faculty position (Step 1). Typically documents submitted attest to the applicant's existing research and teaching abilities/experience as well as other credentials whether or not they are required. For each applicant, Step 2 consists of the committee deciding whether submitted credentials are strong enough for advancement. If they are not deemed strong enough to advance, the applicant is eliminated from consideration (Step 3a). The committee will then decide whether to invite the remaining applicants for an interview (Step 3b) or go back to Step 2 and repeat the process until a appropriate number of applicants remain for an interview.

If it can be shown that formal teacher-preparation program participation results in a significantly greater likelihood of a STEM faculty applicant reaching the interview stage, it could affect how graduate students, professors, and academic staff view these programs. University leaders could also use the findings of this study as evidence that STEM departments are placing a greater value on teaching than they have in the past.

On the other hand, should formal teacher-preparation program participation make no significant difference or negatively affect the odds an applicant will make it to the interview stage it could make it difficult to encourage prospective STEM faculty members and their graduate students to participate in such programs. It could also be

interpreted as a signal that STEM search committees do not value teaching qualifications highly in the pre-interview rounds of a search. In such a scenario, one might ask if committee members are aware of, or even understand, what participation in a formal teacher-preparation program entails. Wankat, Felder, Smith, and Oreovicz (2001), in their essay on engineering faculty, were concerned that those making tenure decisions were not well versed in pedagogical knowledge, which could affect the outcome of a tenure review. The same may hold true for those making hiring decisions (Gaff & Lambert, 1996).

Figure 1: Overview of the pre-interview stages of the STEM faculty hiring process



Sample and Design

The initial population selected for the study consisted of faculty search committee chairpersons from recently completed STEM faculty searches from colleges and universities across the United States. Completed faculty searches are defined as those that the hiring entity considers to be officially concluded for the academic year regardless of the ultimate success or failure of the search. As described in more detail later, I restricted the sample to searches focused on the most junior academic rank, assistant professors, and to three institutional types, one focused on research (research universities) and the other two on teaching (comprehensive colleges and universities and liberal arts colleges). Utilizing an archive search of the classified section of *Chronicle of Higher Education (Chronicle)*, 1,387 unique assistant-professor STEM faculty searches were identified with 705 search committee chairpersons being selected for the survey sample. Participants were invited to complete a 20-question quantitative survey addressing the value they placed on formal teacher-preparation program participation within the context of the last faculty search they chaired. Information collected for both the population and sample included institution type, STEM discipline of the opening, participants' search committee experience level, prior teaching expectations for the position, the amount of time a hire would be expected to spend on teaching and research, and post-doctoral expectations for the position. I discuss these sampling criteria below.

Having a population exclusively made up of faculty search committee chairpersons served many purposes. The first purpose was practical. To identify and get committee members other than the chairperson to participate I would have needed to ask search chairpersons to forward my survey to all of their fellow committee members as

appropriate. There would have been no way for me to know how many chairpersons would actually perform such a task or even the number of members on any particular search committee. The approach I chose also allowed me to focus on the individuals most deeply involved throughout the faculty search process, the chairpersons. Before proceeding, it is worth noting that the answers provided by the search committee chairpersons in this study do not necessarily reflect the views of an entire search committee. While chairpersons were asked to answer survey questions within the context of the last search they were involved with, it is possible that the value these individuals placed on varying types of teacher training differed from the other members of their committee.

In the remainder of this sub-section, decisions affecting the design of the survey instrument are highlighted. Key decisions made leading up to the creation of the population and sample for this study are also explained.

Why a Quantitative Survey?

It has been speculated that research on the faculty hiring process can be very difficult to conduct given institutional privacy rules and sensitive legal issues (Toma & Palm, 1998, p. 38). Institutional liability can also be a concern if a participant should reveal illegal actions (e.g. eliminating a job candidate solely because of gender) made during a specific search whether or not it was intentional (Sommerfield & Nagely, 1974). To alleviate such concerns, a quantitative survey was developed to conduct this study. Survey questions were constructed in such a manner as to protect identities while also allowing for specific answers.

The use of a quantitative instrument served many purposes. First, it addressed the privacy concerns and potential liabilities for individuals and institutions as the options for survey respondents were multiple-choice and/or in a rank order format. In addition, steps were taken to prevent readers from being able to identify any participant's institution and/or department based on the answers provided. Only I have access to all the raw data entries provided in individual surveys.[2]

A quantitative approach also reduced the number of personal identifiers that could be mentioned by individual participants and likely increased their willingness to participate in this study. Participants may have been more likely to give honest answers using this quantitative format as they may have had greater confidence that their identity was protected from scrutiny. Using a qualitative method, in contrast, would have made it possible that a sensitive, perhaps inappropriate, topic might have emerged during the data collection. For example, my own minority status, and ethnic last name, could have been problematic should any racial hiring issues arise using a qualitative approach.

Use of a quantitative format also allowed for a study of national scope with a significant number of participants completing the survey in a short period of time. A quantitative instrument also increased applicability and legitimacy of my findings and revealed trends that may not have been apparent in a smaller scale study. In addition, a quantitative survey allowed me to control for multiple variables that may influence the hiring process (e.g. doctoral program reputation).

Finally, a quantitative design allowed me to compare and contrast findings from different categories of interest. For instance I compared and contrasted STEM faculty

[2] As per Michigan State University's IRB policy, the raw data are being stored in a secure location where only I have access and will be destroyed after a predetermined period of time.

hiring values toward formal teacher-preparation program participation between participants located at research institutions versus teaching institutions. Analyses were also made between specific discipline groupings (e.g. biological sciences versus chemical sciences) as well as the hiring experience level of search chairpersons just to name a few.

Identifying the Universe and Population

Placing the survey instrument online allowed for a national study to be conducted in a short amount of time at a reasonable cost. Prospective STEM search committee chairpersons were identified, and contact information recorded, via an archive search of the employment advertisements found in the *Chronicle's* classifieds section. In total I identified a universe of 1387 unique STEM searches using the guidelines below.

I included only the faculty searches that originated from research, comprehensive, and liberal arts institutions. Openings found in medical schools and medical-oriented fields (e.g. Nursing, Radiology) were excluded from the study. Medical fields tend to be run differently at the organizational level given their focus on patient care and the role expectations placed on faculty as compared to other STEM disciplines. I also excluded community college advertisements because the top-down nature of decision-making at community colleges often results in the faculty-hiring process being heavily influenced or even managed through a central administrative office instead of by departmental faculty (Thaxler & Graham, 1999; Twombly, 2005). In addition, many community colleges intentionally seek candidates with only masters-level degrees to fill their faculty positions (Gahn & Twombly, 2001).

I also only included searches where hiring at the assistant professor level was possible. The assistant professor rank is the traditional entering rank for early career

tenure-track faculty (Baldwin & Chronister, 1997). I assert that search committees willing to fill a faculty opening at the assistant professor rank are the most likely to assign value to doctoral student formal teacher-preparation program participation. Searches seeking only higher ranked faculty (e.g. associate professor) are more likely to place value on a candidate's established faculty record rather than training done while in graduate school. Advertisements that purposely mentioned that hiring at the rank of "instructor" and/or "lecturer" as an option were excluded because of the uncertainty about the tenure-track status of the position.

Only advertisements for positions at institutions located inside of the United States were included in the study. Additional hiring considerations exist for foreign-based faculty openings that often do not exist in domestic hiring situations. For example, an applicant's willingness to travel overseas as well as the ability to speak Arabic could be a major factor in a hiring decision at a university located in Saudi Arabia.

Some *Chronicle* advertisements did not explicitly state that an opening was on the tenure-track. Although Baldwin and Chronister (1997) suggested that openings advertised nationally are more likely to be tenure-track than non tenure-track, I chose to eliminate advertisements not making a clear distinction because of the potential contamination of findings that would result from the inclusion of some non-tenure track searches.

Only searches conducted within the last two academic years were included to maximize the chances that a search had closed and/or was completed. If a search was still ongoing, the survey of that participant terminated. A two-year limit also made it more likely that participants still recalled key decisions in the search process.

I excluded faculty advertisements where only the names of hiring departments were listed with no other details provided (see Figure 2). I refer to these as "shopping list" advertisements. This type of advertisement did not provide sufficient information about expectations of desired applicants nor did it provide contact information for the search committee chairperson.

Figure 2: Fictional example of a shopping list advertisement

XYZ University is hiring faculty in the following fields
Anthropology
Biochemistry
Linguistics
Mathematics
Women's Studies
Go to our website to find out more!

Many of the advertisements in the universe contained specific contact information to reach search committee chairpersons that I used to make first contact.[3] All contact names recorded were verified via a search of STEM department websites. If a listed contact person's name could not be found in the hiring department's website and/or the person worked outside of the department as an administrator (e.g. Vice President of Academic Affairs, Dean) they were excluded from being in the population. Cases where the same chairperson was conducting multiple searches simultaneously were also excluded to avoid unnecessary confusion in the answers provided. These steps resulted in a population of 755 STEM search committee chairpersons that were survey eligible.

[3] Twombly, Wolf-Wendel, Williams and Green (2006) recently published a study on search committees in the Teacher Education field that used a nearly identical technique to identify search committee chairpersons. I had no knowledge of this study until after my data collection was completed and believe others' use of this technique adds legitimacy to my process.

Data Sources

I found no previous successful attempts to survey faculty search committee members, STEM or non-STEM, about the perceived value they attributed to formal teacher-preparation program participation in the pre-interview stages of a search. The data collected for this study originated from two sources: (1) an archive search of job postings in the *Chronicle* conducted using issues dated April 30, 2004 through April 28, 2006 and (2) a quantitative survey that was distributed to STEM search committee chairpersons. Chairpersons invited to take the quantitative survey were identified in the *Chronicle* search. These data sources are described in this sub-section.

Classification codes for institution types and STEM fields

The numerous types of institutions and STEM disciplines identified in the job postings and the survey instrument required the establishment of classification schemes to better interpret the data.

Institutional Classifications

Two issues were considered when determining how to best classify participants' institutions. The first issue was the importance of ensuring participants' anonymity. Given the recent changes to categories in the Carnegie classification system (McCormick & Zhao, 2005) and concerns of faculty members' knowledge of such changes, I asked participants to identify their institutions in more universally familiar terms. These terms were (1) research college/universities, (2) comprehensive colleges/universities, and (3) liberal arts institutions. Participants were also provided a fourth option, an open-ended category labeled "other" should the main three terms be confusing and/or not applicable to their institution (e.g. military academy). This approach gave participants flexibility in

describing their institution type without revealing their identities; pre-testing indicated no confusion over what these terms meant.

The second issue was how to match these terms to those identified in the *Chronicle* advertisements. Unlike the survey data, the institution names were available and could be classified using the Carnegie classification system (McCormick & Zhao, 2005). I combined all identified Carnegie "doctoral" and "research" institutions into the research college/universities category. I labeled identified Master's level institutions as comprehensive colleges/universities label and placed Bachelor's institutions into the liberal arts college category. All other Carnegie classification types of institutions were considered to be in the "other" category.[4] For analyses involving differences in institution type, the "other" category was not utilized.

STEM Field Classifications

Glanzel and Schubert (2003) asserted that efforts to classify scientific fields into perfectly fitting categories have been debated for centuries and have never yielded perfect results. They argued that most pre-created systems have shortcomings when applied to issues outside of their original intent and advise developing classification schemes for a particular purpose. Accordingly, I classified STEM disciplines for this study into five categories: Bio-life sciences, chemical sciences, physical sciences, math sciences, and Engineering/Technology. Please see *Appendix B* for the full coding list.

The bio-life sciences group consisted of disciplines primarily focused on living organisms. This group was the largest of the five categories. The chemical sciences

[4] This classification system seemed to work well for the surveys used in this study. Although I was not allowed to do so in the actual survey, I was able identify participants' institutions during pre-testing. Their responses questions about their institution type were consistent with the classification scheme I used in the *Chronicle* advertisements.

included the all chemistry related fields, including biochemistry. The physical science group consisted of fields such as physics, geology, astronomy, and other fields considered to be in the "earth sciences". The mathematic science fields included pure and applied mathematics as well as statistics. The final group, engineering/technology, consisted of disciplines in engineering and computer-related fields. I excluded from this study technology disciplines that were housed outside of STEM departments (e.g. an Information Systems opening in a business school). .

The Archive Search

As mentioned in the previous sub-section, I used an archive search of the *Chronicle* to identify my population. The heavy cross posting of academic employment opportunities from a variety of institutional types that can be found in each week's *Chronicle* provided for a rich source of potential participants (Burke, 1988; Mahaffy & Cafferey, 2003; Sommerfield & Nagely, 1974). In addition to potential search chairperson contact information, I also recorded data on the advertisement's posting date, institution name, the name of the hiring department (e.g. Department of Biology), the desired sub-specialty if listed (e.g. Cell Biologist), the rank(s) sought for the position, and any mentioned desired teaching credentials. This additional information was vital in determining whether a specific advertisement qualified to be included in this study (see Table 2).

Table 2: Key *Chronicle* advertisement information recorded

Variable name	Description (& coding where applicable)
Advertisement date	Calendar date of the advertisement posting. Used only for organizational purposes.
Advertisement hiring field/department	Advertisement's stated discipline sought (open ended to be coded)
Advertisement hiring field subspecialty (if any)	Advertisement's stated specialty within a hiring field
Advertisement rank sought	0= Assistant professor; 1= Assistant or Associate professor; 2= open rank
Advertisement institution type	0= research institution; 1= comprehensive institution; 2= liberal arts institution; 3= other
Contact information	Name and e-mail address (if listed) of contact person listed in advertisement.
Teaching mentioned in advertisement	0= no; 1= will teach; 2= experience needed; 3= teaching statement/proof of effectiveness

The girth of advertisements that mentioned teaching expectations allowed for additional analysis. For each job posting, advertised requirements for teaching skills were divided into one of four categories. The first category included advertisements that described an open faculty position but did not list expected teaching duties and/or desired teaching credentials. The second category included advertisements that did not mention specific teaching experience requirements but did indicate that the person hired would perform teaching duties. The third category of advertisements included statements explicitly asking for applicants with teaching experience. In many instances advertisements falling into this category did not mention the exact teaching duties expected of a hire, but one could logically assume that teaching would be part of that job. The fourth category reflected advertisements that requested applicants to provide evidence of their teaching skill level in addition to having experience. Most often this

came in the form of a required statement from an applicant about their overall teaching philosophy and/or teaching evaluations. A handful of the job postings also welcomed teaching dossiers and/or teaching certificates if an applicant possessed one.

The Survey

The quantitative survey was designed to gather data to measure the value search committee chairpersons placed on different types of teacher preparation during the pre-interview stages of the search process. I also sought to ground participants' responses in a real context. This was accomplished by instructing participants to provide answers based on the needs and wants of the last search they chaired. This context enabled participants to reflect better the current faculty needs of their department and/or institution. The real search context also seemed preferable to a hypothetical one where the respondent might give politically-correct answers rather than describing the results of a real search. Specific features of the survey instrument are described in the next section.

Instrumentation

Pre-testing and Safeguards

Prior to distributing the survey, two rounds of pre-testing were performed. Fifty subjects were randomly chosen from the population and invited to take the pre-test questionnaire. Pre-test participants were given the opportunity to provide written feedback after each question. The first round of pre-testing led to substantial instrument revisions. The second pre-testing evaluated the revised survey instrument.

During data collection, safeguards were put into place to ensure the data received were secure. The first safeguard was to make a backup copy of all data collected on a daily basis until the end of the survey collection period. Information collected was stored

in a computer database as it was received. I extracted and copied data onto my personal computer's hard drive daily. I am the only person who has access to my personal computer.

The second set of safeguards put into place was designed to protect the validity of incoming survey data. In question #6 of the survey (see *Appendix A*) participants were asked about the number of searches they had previously chaired, which included the search being inquired about. If they indicated that they had not chaired any searches before, the survey was programmed to terminate. The same was true in question #9 where participants were asked about the rank sought during their last search. If a participant indicated an academic rank for the search other than assistant professor, the survey was programmed to terminate.

Survey Distribution Strategy

Survey invitations were distributed to 705 potential participants via e-mail in the later half of October 2006. Reminder e-mails were distributed two weeks later. The e-mail invitations contained a web link that led participants to a survey description/consent webpage (see *Appendix A*). This page described the nature of the study and the type of questions that would be asked. As per Michigan State University's Institutional Review Board policy, participants were informed of their research subject rights and the potential risks of taking the survey. Participants were also informed that they would receive no monetary compensation for taking the survey. After reading this page, participants could choose to acknowledge and consent to take the study or to decline participation by closing their web browser.

In total, 206 search committee chairpersons of the 705 invited chose to participate, which equated to a 29.2% response rate[5]. As shown in Tables 3, the sample's distribution by STEM field was proportional to the overall distribution of the population and universe.

Table 3: Universe of ads, eligible population, and sample by STEM field

STEM Field	Universe (%)	Eligible Population (%)	Sample (%)
Chemical Sciences	222 (16.0)	109 (14.4)	30 (14.6)
Engineering/Tech	201 (14.5)	99 (13.1)	30 (14.6)
Math Fields	313 (22.6)	165 (21.9)	43 (20.9)
Physical Sciences	227 (16.4)	142 (18.8)	34 (16.5)
Bio/Life Sciences	424 (30.6)	224 (29.7)	69 (33.5)
TOTAL	1387 (100)	755 (100)[6]	206 (100)

The Survey Instrument

The survey instrument was divided into four sections (see Appendix A for full survey). The first section asked participants to provide information about themselves, their department, and institution. The second section asked participants about their last search experience. The third section asked search chairpersons to evaluate two fictional faculty candidates and declare whether either candidate seemed better qualified than the other based on criteria provided. The fourth section consisted of a single question asking participants to rank order five candidates in terms of desirability as a potential hire. Each section is described below.

Section 1: Background Information

The first section of the survey was designed to collect general census information about the search committee chairperson, their institution, and the hiring department (see

[5] Nineteen invitees notified me via e-mail that they did not wish to participate. The overall response rate increases to 30.0% if these 19 invitees are removed from the overall population.
[6] Fifty of the 755 were used for pre-testing my instrument.

Table 4). The first three questions asked participants about their institution. They were asked to identify their institution type (research, comprehensive, liberal art, or other), whether their institution's affiliation was public or private, and their departmental affiliation. The public/private status of institutions was not used for analysis; such status is not clearly related to the emphasis on teaching found in the literature.

Questions 4-6 asked participants questions about themselves and their experience with faculty searches. Participants indicated their current faculty rank, the number of faculty searches they had been involved with in their career, and the overall number of searches they had chaired. Pre-testing revealed that many chairpersons did not remember the exact number of searches they had been involved with so questions 5 and 6 were altered from an open-ended answer format to a multiple choice format.

Table 4: Information collect in section one of survey

Survey Variables	
Survey Institution type	0= research institution; 1= comprehensive institution; 2= liberal arts institution; 3= other (open-ended)
Institution affiliation	0= public; 1= private
Chair field of study	Participants' answer (open ended to be coded)
Chair rank	0= instructor; 1= assistant professor; 2= associate professor; 3 = full professor; 4= Professor Emeritus; 5= other (open ended)
Overall committee experience	0= 0-5 searches; 1= 6-10 searches; 2= 11 or more searches
Overall chair experience	0= none; 1= 1-5 searches; 2= 6-10 searches; 3= 11 or more searches

Section 2: Questions about the Last Search Chaired

The second section of the survey asked participants about the last faculty search they had chaired (see table 5). Question 7 asked participants to identify the academic discipline of the hiring department. Although participants' answers to question 7 were often the same provided in question 3, this question was used to prevent searches from being misclassified in the event that a search committee chair belonged to another department.[7] Question 8 asked participants to indicate how long it had been since they last conducted a completed faculty search and question 9 about the rank(s) sought for the position.[8] Question 10 asked about whether the search ultimately led to a candidate receiving a job offer. This question was relevant as 96.5% of all respondents indicated that their last search ended with a job offer being made to a candidate. This strengthens the significance of this study's findings as the answers submitted represent considerations being made about candidates that led to actual job offers.

The next three questions (11-13) focused on the expectations of applicants in filling the open position. These questions focused on the teaching expectations of applicants in terms of percentage of time spent on teaching as distinct from research and service (question 11) as well as teaching expectations on a semesterly basis (question 12). Question 13 asked participants whether postdoctoral experience was seen as a necessity, an asset, or was unlikely to make a difference for an applicant's chances.

[7] While verifying STEM committee chairperson identities on the web I noticed some searches, mostly in very small departments, occasionally selected a faculty member in another department to chair the search.
[8] Of the 68 participants who indicated that their search sought to hire either an assistant or associate professor, 55 (80.9%) indicated a clear preference for hiring at the assistant professor rank.

Table 5: Questions #7-13 variables

Search discipline	**Participants' answer (open ended to be coded)**
Academic rank sought	0= Assistant only; 1= Assistant or associate, prefer assistant; 2= Assistant or associate, prefer associate; 3= Assistant or associate, no preference; 4= open rank; 5= not applicable
Successful search	0= yes; 1= no
Hire's ideal work time	% research/scholarship, % teaching; % service (total will add up to 100%)
Teaching expectation	0= every term; 1= will teach but not every term; 2= no minimum teaching expectation
Postdoctoral experience	0= required; 1= preferred; 2= not sought but helps; 3= not sought and unlikely to help

Question 14 asked participants to identify the advertising forum(s) utilized to publicize their last faculty opening (see Table 6). Participants were asked if they posted job advertisements to academic journals, disciplinary professional societies, academic employment websites such as higheredjobs.com, their departmental and institutional websites, or any other forums not on the list. Participants could also mark the "I do not remember" category if appropriate.

Table 6: Outlets job advertisements

Advertisement Forums	
Academic journals	0= yes; 1= no
Professional societies	0= yes; 1= no
Department website	0= yes; 1= no
Institution website	0= yes; 1= no
Targeted mail out (postal or e-mail)	0= yes; 1= no
Academic employment website (e.g. higheredjobs.com)	0= yes; 1= no
Other	0= yes; 1= no (open-ended option)
None	0= yes; 1= no
Do not remember	0= yes; 1= no

Section 3: Two-candidate Comparison Exercises

Prior to the survey's two-candidate comparison questions and rank-order exercise, participants were provided with the definition of formal teacher-preparation programs being used in this study (see definition in Chapter 1: Introduction). Survey participants were required to acknowledge that they had read the definition provided before proceeding. This was done as pre-testing revealed that some faculty were either unfamiliar with formal teacher-preparation programs and/or had a different interpretation of what formal teacher-preparation programs entail.

The third section of the survey sought to compare/contrast the types of teaching credentials that a search committee chairperson may consider when evaluating applicants. In particular, this section of the survey asked respondents about the value of formal teacher-preparation program participation relative to other teaching credentials such as teaching assistantship experience, independent teaching experiences, exposure to teaching at different institution types, etc. For each question, respondents were presented with two fictional faculty candidates that were equal in every way except for the teaching experience listed. Subjects were asked to indicate the superior candidate based on the different experiences. They also had the option of stating that both candidates were equal in qualification. Below is a description of each of the five exercises in this section. Table 7 provides a summary of each question.

Question 15 asked participants to compare the strength of an formal teacher-preparation program participant with one year of experience as a teaching assistant to a informally trained candidate with three years of experience as a teaching assistant for a single course (no variety of experiences). If participants decided the formally trained

candidate was stronger it would mean that the formal teaching skill development was seen as more valuable than classroom teaching experience of unmeasured quality. Should participants decide the informally trained candidate were stronger it meant that the substantial in-class teaching experience exceeded the value of formal teacher-preparation program participation even though the quality of the latter experience could be measured. If both were seen as equal it could be interpreted as one year's worth of teaching experience combined with formal teacher preparation was seen as equivalent to three years worth of teaching experience.

Question 16 asked participants to determine whether a candidate with one year's experience as a teaching assistant coupled with a single term teaching independently at another institution was stronger/weaker than a candidate with two years teaching assistant experience and formal teacher-preparation program participation. If the latter were deemed stronger it would mean that the overall development provided by an formal teacher-preparation program was seen as more valuable than having independently taught a course with informal preparation. If the former was preferred it could mean that the amount of formal teacher-preparation program preparation did not matter if a candidate had an independent teaching experience, even if the overall amount of teacher training were less. A finding of no preference could mean that the amount and type of teacher training did not make a difference to a reviewer. This in turn would lend support to the notion of formal teacher-preparation programs not making a difference to search committee chairpersons. Using a community college setting for the independent teaching experience guaranteed that all participants would answer this question in a

similar manner. If any other institution type (e.g. liberal arts) were listed, participants may have varied their answers based on their own institution type.

Question 17 asked participants to determine whether they saw a candidate with a varied, yet informal, teaching experience as stronger/weaker than a candidate with an equal amount of experience where one year's worth of experience at another institution was in an formal teacher-preparation program. This question sought to determine how participants viewed different varieties of teaching experience. If participants viewed the candidate with informal teacher training as stronger or equal to the formally tained candidate it would mean that any variety of teaching experience was equal or more valuable to a search committee chairperson than a more elaborate, formalized set of experiences. If the formal teacher-preparation program candidate were viewed as stronger it would mean that STEM search committee chairpersons thought teaching experiences at different institution types added value to a candidate's teaching credentials. This question also sought to see whether search committee chairpersons from teaching-oriented institutions (liberal arts and comprehensive institutions) would place a greater value on experience at a teaching oriented institution.

Question 18 asked participants to determine whether they viewed a candidate who had a rich, yet informal, teaching experience at the beginning of their graduate program as superior/inferior to an formal teacher-preparation program candidate with an equal amount of experience that was more recent. This question sought to address whether the timing and formality of a teaching experience made a difference to search committee chairpersons. If the informally trained candidate was selected as superior or equal to the formal teacher-preparation program participant it meant that timing and formality of a

teaching experience was not a decision making factor so long as the experience was considered to be rich. If the formal teacher-preparation program participant was viewed as stronger it would mean that the timing of the teaching experience and formality of training were major factors in the search committee chairperson's view.

Question 19 asked participants to compare a formal teacher-preparation program candidate with many years of teaching experience and little research experience to one with many years of research experience and no teaching experience at all. The motive behind this question was not to compare strong teaching credentials versus strong research credentials, but to see if chairpersons' earlier recorded expectations for an open position matched the value they placed on teaching skill within the context of their last search.

Table 7: Comparing two individuals questions and answer choices

Question	**Answer choices**
Question #15	0= Prefer candidate with one year experience with formal teacher-preparation program participation; 1= Prefer candidate with three years experience in same course; 2= Candidates are equal
Question #16	0= Prefer candidate with one year experience as teaching assistant and taught summer course at a community college; 1= Prefer candidate with two years experience with formal teacher-preparation program participation; 2= Candidates are equal
Question #17	0= Prefer candidate with two years experience in multiple courses in department; 1= Prefer candidate with two years experience with one at neighboring liberal arts college as part of a formal teacher-preparation program; 2= Candidates are equal
Question #18	0= Prefer candidate with two years experience (implied informal program) but no teaching in last three years; 1= Prefer formal teacher-preparation program candidate with two years experience in variety of courses; 2= Candidates are equal
Question #19	0= strong teacher; 1= strong researcher; 2 = balance sought

Section 4: Rank-order Question

This final section of the survey instrument focused on placing formal teacher-preparation program and other teaching experiences in the context of the candidate's overall application, including his/her research training. The goal was to obtain search chairpersons' views of the relative value of different levels and types of teaching skills while taking into account a fuller range of candidate credentials considered in the hiring process.

Question 20 asked search committee chairpersons to rank order their preference for five candidates with varying levels of research and teaching experience in the context of their last search. Pre-testing revealed that participants were uncomfortable in assessing specific research experiences that were not applicable to their fields. Participants from different STEM disciplines and institutional types expected different research experiences from a candidate with a realistic expectation of being hired. For example, one STEM field may consider one publication in any journal as an average research record whereas another field may expect an average applicant to have at least five publications, all in major journals. To resolve this dilemma I adjusted candidate descriptions to state that research records were simply "very strong", "average", or "below-average" as compared to other applicants. This allowed participants to determine the proper strength of a candidate's research record.

Although the actual order of answer choices was presented randomly to survey participants, which better insures reliability, I refer to each candidate here by letter to simplify the descriptions provided below (see Table 8). Each of the candidates was meant to represent a range of combinations of teaching and research experience and ability likely to occur in a search for an assistant professor. Candidate A had three years of experience as a teaching assistant, was a formal teacher-preparation program participant and had an average research record when compared to the rest of the applicant pool. Candidate B had the same qualifications as Candidate A except that the teaching assistant period was for one year instead of three. Candidate C had no teaching experience but had a very strong research record compared to the rest of the applicant pool. Candidate D had two years experience as a teaching assistant, did not participate in

a formal teacher-preparation program, and would be considered an average researcher. Candidate E had three years of experience as a teaching assistant, participated in an formal teacher-preparation program that included working at the same type of institution as the survey participant, but had a below-average research record when compared to others in the candidate pool.

Table 8: Characteristics of candidates in rank-order question

Question #20 candidates	**Research skills**	**Teaching skills**	**Formal Teacher-Training Program**
Candidate A	Average	3 years TA	Yes
Candidate B	Average	1 year TA	Yes
Candidate C	Very Strong	None	No
Candidate D	Average	2 years TA	No
Candidate E	Below-Average	3 years TA	Yes

Although I leave discussion of the results to the next chapter, it is worth noting a few candidate pairings here. For example, I wanted to observe how Candidates C and E were ranked given their extreme focus on either research or teaching skill development. I also wanted to examine how Candidate A was ranked compared to Candidates C and E given the level of balance between research ability and teaching credentials.

Statistical Testing

Each of the five research questions below were analyzed using the statistical techniques described below.

***Research Question 1**: Do job postings reflect the value committee members have for formal teacher-preparation program participation?*

To answer this question, I used ANOVA tests to identify significant mean differences between teaching duties mentioned in the advertisements with chairpersons' stated teaching requirements, by institution types and by STEM field. For overall significant mean differences, I carried out a Tukey post-hoc test to examine the

significance of paired means. A series of chi-square tests were also used to identify the relationship between job posting advertisement strategies and various demographic characteristics of the sample.

***Research Question 2**: Do search committee chairpersons in different STEM fields and institutional types place different values on formal teacher-preparation program participation during the pre-interview stages of the hiring process?*

In order to answer this question I first performed two separate chi-square analyses on the first three two-candidate questions (questions #15-17) using STEM discipline and institutional type as an independent variable for each test. I then performed two Kruskal-Wallis analyses of variance (ANOVA) on the rank order question (question #20) using STEM discipline and institutional type as independent variables for each test. In cases where significant variation(s) were discovered using the Kruskal-Wallis ANOVA, I performed the appropriate number of Mann-Whitney U-tests to determine the cause(s) of the overall significant difference in the ANOVA.

***Research Question 3**: Do time delays between graduation and application for a faculty position, such as a post-doctoral experience, affect the value that search chairpersons place on formal teacher-preparation programs?*

To answer this question, a chi-square analysis of the responses of the first three two-candidate questions (questions #15-17) was performed using postdoctoral requirements as the independent variable. I then performed a Kruskal-Wallis ANOVA on the rank order question (question #20) using postdoctoral experience as the independent variable. Mann-Whitney U-tests were the performed to examine statistically significant relationships in more detail.

I had hoped to also utilize a series of chi-square tests on Question #18 to analyze whether time delays between teacher training and application for faculty positions, combined with other factors, affected the value search chairpersons placed on formal teacher-preparation programs. This analysis was not possible as most participants chose a single answer resulting in insufficient variation to perform a valid chi-square analysis.

***Research Question 4**: Does the STEM search committee chairperson's prior search committee experience influence his/her formal teacher-preparation program valuation?*

For this question I used the chairperson's rank and search committee experience level as independent variables in chi-square analyses of the two-candidate questions (questions #15-17). Mann-Whitney U-tests were then performed to determine whether variations existed between the ranks of specific candidates, the chairperson's rank, and the chairperson's search committee experience level.

***Research Question 5**: Do expectations of teaching and research duties affect formal teacher-preparation program valuation?*

For this question I performed a series of chi-square analyses on the two-candidate questions (questions #15-17) using participants' answers to questions about time commitment expectations as independent variables. A series of Kruskal-Wallis ANOVAs and Mann-Whitney U-tests were then performed to determine the significance of relationships between the ranking of specific candidates and the expected research and teaching time commitments.

The results from all of the statistical tests described above are provided in the next chapter. I will be used $p<=0.05$ as the standard level of significance for my findings, but

given the exploratory nature of this study I will also discuss borderline significant findings ($p = 0.05$ to 0.10) when deemed relevant.

CHAPTER FOUR: RESULTS

This chapter provides the results of the statistical tests described at the end of the previous chapter. I start with a general description and key breakdowns of the population and sample[9], and then the results for each of the five research questions are presented. All data analyzed utilized SPSS software.

General description of the universe, population, and sample

The Advertisement Universe

The universe of advertisements used included 1387 unique faculty searches that had been advertised in the *Chronicle*. Each of these searches was in the STEM disciplines and invited individuals to apply for tenure-track, assistant professor level positions. Of these 1387 searches 319 (23%) were conducted by research colleges/universities, 674 (48.6%) at comprehensive institutions, 350 (25.2%) at liberal art institutions, and 44 (3.2%) at other types of institutions. The chemical sciences field consisted of 222 (16%) of the searches within the population. The engineering and technology field consisted of 201 (14.5%) searches. The mathematical sciences consisted of 313 (22.6%) searches. The physical sciences consisted of 227 (16.4%) searches and the biological/life sciences consisted of 424 searches (30.6%).

Slightly more than two-thirds (67.2%) of the advertisements in the stated that teaching experience was preferred and/or required for the position, 32.8% had no statement regarding teaching experience. Providing a teaching statement and/or other tangible evidence of teaching development (e.g. portfolio) were requested in 46.1% of the

[9] Although the population was described in the previous chapter, I include it here as it was used for testing in this study.

advertisements while 53.9% did not ask for such materials. Table 9 provides a breakdown of a teaching statement requirement by STEM field.

Table 9: Was teaching statement required? (by STEM field)

STEM Field	Yes (%)	No (%)	Total
Chemical Sciences	105 (47.3)	117 (52.7)	222
Engineering/Tech	85 (42.3)	116 (57.7)	201
Math Sciences	110 (35.1)	203 (64.9)	313
Physical Sciences	93 (41.0)	134 (59.0)	227
Biological Sciences	247 (58.3)	177 (41.7)	424
TOTAL	640 (46.1)	747 (53.9)	1387

The Eligible Population

The eligible population that received invitations to participate consisted of 755 of the 1387 faculty searches. Of these 755 searches 230 (30.5%) were conducted by research colleges/universities, 336 (44.5%) at comprehensive institutions, 165 (21.9%) at liberal art institutions, and 24 (3.2%) at other types of institutions. The chemical sciences field consisted of 109 (14.4%) of the searches within the population. The engineering and technology field consisted of 99 (13.1%) searches. The mathematical sciences consisted of 165 (21.9%) searches. The physical sciences consisted of 142 (18.8%) searches and the biological/life sciences consisted of 224 searches (29.7%).

Profile of Chairpersons

The survey sample consisted of 206 STEM search committee chairpersons who participated in the study. Information regarding the overall response rate can be found in the previous chapter. The number of chairpersons at research colleges/universities was 45 (21.8%), chairpersons at comprehensive institutions totaled 85 (41.3%), chairpersons at liberal arts institutions totaled 71 (34.5%), and chairpersons at other institution types totaled 5 (2.4%).

Chairpersons in the chemical sciences consisted of 30 (14.6%) members of the sample. Engineering and technology chairpersons also consisted of 30 (14.6%) members of the sample. Mathematical science chairpersons numbered 43 (20.9%). Physical science chairpersons numbered 34 (16.5%) and biological/life science chairpersons numbered 69 (33.5%).

Chairpersons whose overall search committee experience consisted of five or less searches totaled 38.8% of the sample. Those with experience with at least six searches totaled 60.8% of the sample. The number of chairpersons at the rank of associate professor was 93 (45.1%), with full professors totaling 94 (46.6%), and the remaining 17 (8.3%) being at other ranks. Associate professors were significantly more likely to have less overall search committee experience than full professors ($F=28.558$, $t=-3.783$, $p<0.001$).

Profile of Open Faculty Positions

Chairpersons indicating their last search sought to hire someone exclusively at the assistant professor level totaled 62.7% of the sample. A little more than one third (33.8%) indicated their last search considered candidates for the assistant or associate professor ranks. The remaining 3.5% indicated their last search was an open-rank search where candidates at all possible ranks would be considered.

Using submitted answers from Question #11 as a guide (see Appendix A), the expected time commitment to teaching and research by a new hire was categorized by the respective time means reported by participants (see Table 10). The total number of cases that fell below the expected mean teaching time (55.1% of work time) totaled 55.4% of the respondents. I placed these respondents into one group. Those reporting above the

time mean totaling 44.6% of the sample made up the second group. The same procedure was conducted in regard to the expected time commitment of new hires to research work. The total number of cases that fell below the expected mean research time (31.4% of work time) totaled 56.5% of the respondents, with those above the mean totaling 43.5%.

Table 10: Percentage of participants by mean time commitments to teaching and research

	% Time Mean	% Ss below mean	% Ss above mean
Teaching	55.1	55.4	44.6
Research	31.4	56.5	43.5

Submitted answers to question #19 were used to determine a preference, if any, towards a research-oriented or teaching-oriented candidate (see Table 11). Teaching-oriented candidates were sought in 40.5% of the cases, research-oriented candidates were sought in 40% of the cases, and 19.5% of participants indicated a preference for candidates with balanced training in teaching and research preparation.

Table 11: Responses to question #19 by percentage

Question #19 Preference	N	%
Research oriented candidate	77	40.5
Teaching oriented candidate	76	40.0
Balanced training	37	19.5
TOTAL	190	100.0

Postdoctoral experience was listed as "required" by 14.3% of the chairpersons with 30.3% indicating such experience as "preferred". Chairpersons indicating postdoctoral experience as "advantageous" but not expected comprised 38.1% of the sample. Chairpersons listing postdoctoral experience as unexpected and unlikely to improve a candidate's chances represented 17.3% of the sample. The finding that 44.6% of respondents indicated that postdoctoral experience was required or preferred is consistent with Reget's (1998) finding that 41.3% of all STEM Ph.D.s had a postdoctoral experience.

Table 12: Responses to postdoctoral requirement question by percentage

Postdoctoral experience expectations	N (Standard Dev)	%
Required for advancement	21 (1.300)	14.3
Preferred	59 (1.600)	30.3
Advantageous	77 (1.374)	38.1
Unlikely to benefit	41 (1.225)	17.3
TOTAL	198 (1.438)	100.0

When asked about teaching loads, 91.9% of participants indicated that a prospective hire would be expected to teach every regular academic term. Teaching duties were flexible but required in 7.1% of the cases. The remaining 1% indicated that regular teaching duties were not expected. Because this item contained little variation in responses, I did not use it in the statistical analysis.

Research Question #1: Are job advertisements reflective of teaching needs?

Table 13 lists descriptive statistics for the advertisement data that were collected from the *Chronicle*. I used analysis of variance (ANOVA) tests to identify significant means differences between teaching duties that were mentioned in the advertisements and requirements of statements of teaching by institution types and by STEM field. For overall significant mean differences found, I carried out a Tukey HSD post-hoc test to determine the nature of the variation.

Table 13: Advertisement descriptive statistics

	N	Mean	Standard Dev.
Institutions	1387	1.0231	0.7051
STEM field	1387	2.31	1.4412
Rank Sought	1387	0.1759	0.4118
Teaching Duties	1387	0.6720	0.4697
Teaching Stmt Required	1387	0.5386	0.4987

Teaching Duties mentioned in Advertisements

I performed ANOVA tests to measure for means differences in teaching duties mentioned in the job advertisements (see Table 14). The first ANOVA test found

significant differences between STEM fields and whether teaching duties were mentioned ($F=2.871$, $p<0.022$, d.f.=4). A Tukey HSD post-hoc test revealed no significant differences between any pairs of individual STEM fields existed although the pairing of the biological/life sciences with the engineering and technology fields ($p<0.051$) and the physical sciences ($p<0.066$) approached significance.

Table 14: ANOVA of Teaching Duty Types by ___

	df	MS	F	*P*
STEM field	4	0.630	2.871	0.022*
Institution Type	2	1.157	5.272	0.005*

*is significant

The second ANOVA test focused on mean differences in the teaching duties by institution type. Institution type was a significant factor in the teaching duties that were mentioned in the advertisements ($F=5.272$, $p<0.005$, d.f.=2). A Tukey HSD post-hoc test revealed that liberal art institutions were significantly more likely to list teaching expectations and requirements (73.1%) than were research colleges/universities (61.4%). This is consistent with the distinct missions of these types of institutions (Fairweather & Rhoads, 1996). This finding also supports Burke's (1988) assertion that smaller departments, as is the case with most liberal arts institutions, provide more detailed information about an opening in their advertisements.

Calls for Teaching Statements in Advertisements

I performed two ANOVA tests to examine mean differences by whether or not the advertisement requested candidates to submit statements about their teaching (see Table 15). The first ANOVA identified significant differences between teaching statement requirements and STEM fields ($F=11.328$, $p<0.000$, d.f.= 4). A Tukey HSD post-hoc test found that the biological science fields were significantly more likely to request a

statement of teaching (58.3%) than any other STEM field (the difference with the chemical sciences was borderline significant at $p<0.055$).

Table 15: ANOVA of Teaching Statement Requirement by

	df	MS	F	*P*
STEM field	4	2.736	11.328	0.000*
Institution Type	2	0.003715	0.149	0.861

*is significant

Table 16: Biological science field Tukey HSD post-hoc test results

	Mean Diff	Sig.
Chemical sciences	-.1096	.055
Engineering/Tech	-.1597	.001*
Math Sciences	-.2311	.000*
Physical Sciences	-.1729	.000*

*is significant

Excluding the five participants in the "other" institutional type category, the second ANOVA test found no significant differences in teaching statement requirements and institution types ($F= 0.149$, $p<0.861$, d.f.=2).

Analysis of Job Advertisements Distribution Strategies

The final set of data analyzed was participants' responses about the location of advertising for the search. Chi-square tests were conducted to identify relationships between job posting advertisement strategies and chairpersons' rank and search experience level.

Table 17 shows the results of the chi-square test that sought to determine the relationship between a search committee chairperson's overall search experience level and the advertising forums utilized during their last search. Chairpersons who had participated in six or more searches, in any capacity, were more likely than their less experience counterparts to advertise open positions via direct mail out to specific

departments ($\chi 2$=6.295, d.f. =1, p<0.012). The direct mail out category included both e-mail and postal letters. No other pairings were significant.

Table 17: Advertising forums, chairperson's search experience level

Advertising	$\chi 2$	d.f.	*p*-value
Academic Journals	2.139	1	0.144
Professional Orgs.	0.070	1	0.791
Listservs	1.875	1	0.171
Department website	3.190	1	0.074
Institutional website	2.307	1	0.129
Direct mail out	6.295	1	0.012*
Employment website	0.449	1	0.503

* denotes significance

A chi-square test was performed to see if there were a relationship between search committee chairperson rank and advertising forums utilized in the search. Once again, the use of a direct mail out was the only significant finding of any of the advertising strategies utilized when chairperson rank was considered ($\chi 2$=7.460, d.f. =1, p<0.006). Chairpersons at the full professor rank were more likely than those at the associate professor rank to advertise an open faculty position via a direct mail out.

Table 18: Advertising forums, chairperson's academic rank

Advertising	$\chi 2$	d.f.	*p*-value
Academic Journals	0.041	1	0.840
Professional Orgs.	1.104	1	0.293
Listservs	0.114	1	0.736
Department website	1.026	1	0.311
Institutional website	0.023	1	0.880
Direct mail out	7.460	1	0.006*
Employment website	0.091	1	0.763

* denotes significance

When combined these two findings suggest that more experienced and higher ranked STEM faculty chairpersons may be more willing to utilize a direct mail out strategy. It may be that more senior faculty members have a larger network of contacts. It could also be a remnant of the days of the "good old boy" network (Perlman and

McCann, 1996) although legal requirements restrict the intentional limitation of the search to such a network.

Research Question #1 Summary

Job advertisements and the strategies used to distribute them seem to be related to STEM field, institution type, and a chairperson's experience. Biological science advertisements were more likely to list requirements for teaching experience than were other STEM fields, as were liberal art institution advertisements when compared to other institution types. Findings also indicated that higher ranking and more experienced search committee chairpersons were more likely to use direct mail outs for advertising positions than their less experienced and junior counterparts. The ramifications of these findings will be discussed in the next chapter.

Research Question 2a: What effect does STEM field have on formal teacher-preparation program valuation?

To examine the differences between STEM fields and search committee chairperson valuation placed on formal teacher-preparation program participation, answers to the two-person comparison questions and the rank-order question were analyzed using appropriate statistical tests.

Two-person comparisons by STEM field

To determine whether or not STEM field was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions of the survey (questions #15-17) using STEM field as an independent variable for each test. Table 19 shows the results from these tests. The table also gives a brief

description of the two candidates being compared in each question. The STEM fields only made a significant difference in Question #16 ($\chi 2$=15.697, d.f.=8, p<0.047).

Table 19: Difference between candidate's ranking and STEM field

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	9.077	8	0.336
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	15.697	8	0.047*
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of formal teacher-preparation program	10.22	8	0.250

*- Denotes statistical significance at p<=0.05

A post hoc examination of the chi-square adjusted residuals (see Table 20) for question #16 revealed that participants in the biological science fields were significantly more likely to select Candidate #1 (Z=2.9) as superior and significantly less likely to select Candidate #2 (Z=-2.2). This means that chairpersons in the biological science fields are significantly more likely to believe that a candidate with an independent teaching experience at another institution has a stronger credential than an formal teacher-preparation program participant with more time spent on teaching skill development. This finding is consistent with Fleet et al.'s (2006) finding that biology departments tend to value candidates with independent teaching experiences more than those with only teaching assistantship experience. The opposite was found for participants from the engineering and technology fields where Candidate #2 (Z=2.3) was significantly more likely to be selected and Candidate #1 (Z=-2.1) less likely. This result indicated that participants in the engineering and technology fields found the formal

teacher-preparation program participant with more experience to have the stronger credential.

Table 20: Adjusted $\chi 2$ residuals of answers to question #16 by STEM field

	Question #16: Candidate preference		
STEM field	Candidate #1	Candidate #2	Candidates Equal
Chemical Sciences	0.2	-1.3	1.3
Engineering/Tech	-2.1*	2.3*	-0.2
Math Sciences	-1.6	1.8	-0.1
Physical Sciences	-0.1	-0.1	0.3
Biological Sciences	2.9*	-2.2*	-1.0

* Denotes significance (SPSS, 1999, p. 70)

Rank-ordered question by STEM field

Although Table 21 was described in detail in the last chapter, it is presented here again for easier interpretation of results in this chapter.

Table 21: Characteristics of candidates in rank-order question

Question #20 candidates	**Research skill**	**Teaching skill**	**Formal Teacher-Preparation Program**
Candidate A	Average	3 years TA	Yes
Candidate B	Average	1 year TA	Yes
Candidate C	Very Strong	None	No
Candidate D	Average	2 years TA	No
Candidate E	Below-Average	3 years TA	Yes

I performed a Kruskal-Wallis ANOVA to test for ranking differences between candidate preference and STEM fields. No significant differences were found at $p<=0.05$ level. However, comparisons of Candidates B, C, and E were marginally significant at the $p<0.10$ level when analyzed by STEM field (see table 22) so I pursued more detailed comparisons in these cases. Of the three marginally significant differences, the most interesting cases involved Candidates C and E. Based on Mann-Whitney U-tests, participants from the mathematics fields were more likely to rank Candidate C lower than all the other STEM fields (Engineering $U=351.5$, $Z=-2.159$, $p<0.031$; Physical sciences $U=411.50$, $Z=-2.114$, $p< .035$; Biological sciences $U= 909.5$, $Z=-2.023$, $p< .043$) with the

exception of the chemical sciences (U=472.5, Z=-0.659, p<.510). At the same time mathematic participants were more likely to rank Candidate E higher than the physical sciences (U= 359.5, Z=-2.781, p<=0.005) and the chemical sciences to a lesser degree (U=387.0, Z=-1.809, p<=0.07). These findings would imply that those in the mathematics fields would more likely prefer a candidate with teaching experience than chairpersons in other fields, although the exact type of training would appear uncertain given this finding alone.

Table 22: Candidate preference by STEM field.

Candidate	$\chi 2$	d.f.	*p*-value
A	3.676	4	0.452
B	9.414	4	0.052
C	8.119	4	0.087
D	3.537	4	0.472
E	7.869	4	0.096

* Denotes significance

Research Question 2b: Institution Type

To examine the differences between institution types and STEM search committee chairperson valuation of formal teacher-preparation program participation, answers to the two-person comparison questions and the rank-order question were analyzed using appropriate statistical tests.

Two-person comparisons by Institution type

To address the issue of whether institution type was related to formal teacher-preparation program valuation I performed a chi-square analysis on the two-candidate questions of the survey (questions #15-17) using institution type as an independent variable for each test. Table 23 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences at p<=0.05 were found in any of the two-person comparison tests when

analyzed by institution type, but question #17 did approach significance ($\chi 2$= 8.215, d.f.= 4, p<0.084).

Table 23: Difference between candidate's ranking and institution type

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	0.722	4	.949
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	3.262	4	.515
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	8.215	4	.084

*- Denotes statistical significance at p<=0.05

A post hoc examination of the chi-square adjusted residuals (see Table 24) for question #17 revealed that participants in comprehensive institutions were more likely to select the candidate with informal teacher training who had taught several courses (Z=2.0) rather than the formal teacher-preparation program candidate with experience teaching at a liberal arts college. Perhaps not surprisingly, chairperson's at liberal art institutions preferred the candidate with experience teaching at a liberal arts institution when the experience level was equal (Z=2.5). The finding that chairpersons from comprehensive institutions placed more value on the teaching of a variety of courses while liberal art chairpersons valued the teaching experience at a liberal arts institution more appears to support DeNeef's (2002) assertion that STEM faculty value training with institutions like their own. It appears that the specific type of teacher training received,

formal or informal, plays a major role in how teaching qualifications are valued by search chairpersons.

Table 24: Adjusted $\chi 2$ residuals of answers to question #16 by institution type

	Question #17: Candidate preference		
Institution type	Candidate #1	Candidate #2	Candidates Equal
Research institution	-0.4	0.1	0.3
Comprehensive institution	2.0*	-2.5*	1.1
Liberal arts institution	-1.8	2.5*	-1.3

* Denotes significance (SPSS, 1999, p. 70)

Rank-ordered question by Institution Type

Excluding the data from the "other" category of institutions[10], I used a Kruskal-Wallis ANOVA test for rank differences between candidates and institution types. Significant ranking differences based on institution type were found for Candidate A ($\chi 2$=11.139, d.f.=2, p<0.004), Candidate C ($\chi 2$=36.176, d.f.=2, p<0.000), Candidate D ($\chi 2$=6.293, d.f.=2, p<0.043), and Candidate E ($\chi 2$=14.529, d.f.=2, p<0.001). I used Mann-Whitney U-tests to determine the nature of these differences. Table 25 shows the relationships between institutional types for these candidates. Participants at research universities were significantly more likely to rank Candidate C (no teaching experience with a very strong research record) higher than participants in either liberal arts or comprehensive institutions. Research university participants were significantly more likely to rank Candidates D (two years teaching experience and average research record) and E (three years teaching experience, formal teacher-preparation program participation, and below-average research record) lower than their counterparts. Liberal art institution participants were more likely to rank Candidate A (3 years teaching experience, formal teacher-preparation program participation, average research record) higher than

[10] With only 5 participants placed in the institution type of "other", I decided to exclude this group from analysis.

participants at research institutions and comprehensive institutions, although to a lesser extent ($p<0.10$). This last finding would lend support to Fairweather's (1996) concern about teaching-oriented institutions hiring more research-oriented candidates.

Table 25: Comparison of candidate ranking between institution types

Pairing	Cand.	U	Z	Mean Rank Compare**	Sig.
Research vs. Comprehensive	A	1256.5	-1.807	66.78 v 55.91	.071
	C	795.0	-4.408	40.38 v 68.94	.000*
	D	1205.0	-2.018	68.10 v 55.25	.044*
	E	1053.5	-3.08	71.99 v 53.34	.002*
Research vs Liberal Arts	A	828.0	-3.40	63.77 v 45.74	.001*
	C	443.0	-5.798	31.36 v 65.18	.000*
	D	921.5	-2.46	61.37 v 45.74	.014*
	E	736.5	-3.82	66.12 v 44.33	.000*
Comprehensive vs Liberal Arts	A	2189	-1.808	77.29 v 66.68	.071
	C	2003.5	-2.408	65.38 v 81.18	.016*
	D	2426.0	-.595	74.29 v 70.32	.552
	E	2363.5	-.855	75.08 v 69.36	.392

-* Denotes statistical significance at $p<=0.05$ at $p<0.05$

-** Lower mean rank equals higher overall rating of candidate[11]

Research question #2 summary

The evidence suggests that a relationship between institutional type and teacher preparation exists. For instance, the two candidate questions revealed that liberal art institutions valued candidates with experience in liberal art institutions. This result will be discussed further in the next chapter. The value placed on formal teacher-preparation program preparation also appears to be related to several of the STEM fields. It was revealed that chairpersons in the biological sciences preferred a candidate with an independent teaching experience at another institution to one with more overall

[11] In this study, higher means equated to a lower overall rankings of a candidate. A ranking of "1" indicated a participant's most desired candidate and a "5" ranking indicated the least desired. The lower of the two reported means being compared indicates the one that was ranked higher.

experience that had not taught independently. The data also revealed that the mathematic fields sought candidates with teacher preparation more than any other field.

Research Question #3: Postdoctoral training

To examine the differences between STEM search committee chairperson valuation placed on formal teacher-preparation program participation and postdoctoral experiences, answers to the two-person comparison questions and the rank-order question were analyzed using appropriate statistical tests.

Two-person comparisons by time since training

To address the issue of whether requirements for post-doctoral training was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions in the survey (questions #15-17) using the participants' answer to question #13 (post-doctoral experience question) as the independent variable for each test. Table 26 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in any of the two-person comparison tests when analyzed by postdoctoral requirements.

Table 26: Difference between candidate's ranking and post-doctoral requirements

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	1.496	6	.960
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	4.648	6	.590
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	5.849	6	.440

*- Denotes statistical significance at p<=0.05

In addition to tests described above, I had hoped to utilize a series of chi-square tests on Question #18 to analyze whether time delays between teacher training and application to faculty position, combined with other factors, affected the value search chairpersons placed on formal teacher-preparation programs. This analysis was not possible as nearly four-fifths (79.6%) of participants thought Candidate #2 was stronger, which did not provide sufficient variation to perform a valid chi-square analysis on this question.

Rank-ordered question by time since training

I used a Kruskal-Wallis ANOVA test for rank differences between candidates and institutional types. Significant ranking differences based on postdoctoral requirements were found for Candidates C ($\chi 2$=11.676, d.f.=3, p<0.009) and E ($\chi 2$=8.571, d.f.=3, p<0.036).

Mann-Whitney U-tests were performed to determine the nature of the variations when ranking Candidate C (no teaching experience with a very strong research record)

and Candidate E (three years teaching experience, formal teacher-preparation program participation, and below-average research record). As Table 27 shows, participants who indicated that postdoctoral experience was "required" for a position were significantly more likely to rank Candidate C higher than those who believed post-doctoral experience was "advantageous" (U=469.5, Z=-2.113, p<. 035) or "made no difference" (U=202.5, Z=--3.033, p< .002). These finding are consistent with the strong research emphasis of Candidate C and the research focus of most postdoctoral experiences. Participants who indicated that postdoctoral experience was required for a position were significantly more likely to rank Candidate E lower than those who did not expect or require postdoctoral training (U=476.0, Z=-2.129, p<. 033; U=221.0, Z=-2.747, p<. 006). This finding is consistent with teaching skill emphasis of Candidate E over that of research training. Respondents who "preferred" postdoctoral experience were also more likely to rate Candidate C higher than those who did not want postdoctoral experience (U=809.0, Z=-2.535, p<. 011). Candidate E's ranking approached significance in this same regard (U=906.0, Z=-1.814, p<0.07). No relationships were found between the preferred and advantageous postdoctoral requirement categories. This result did not apply to those indicating that postdoctoral experience was advantageous. Since the only significant difference found between the postdoctoral requirement groups occurred in the comparison between the candidates with no teaching experience and the strongest research record (Candidate C) with the candidate with the strongest teaching with the weakest research record (Candidate E), I conclude that search committee chairpersons value postdoctoral training more highly than formal teacher-preparation program

participation in the search consideration process. This supports Fairweather and Rhoads (1996) concern that the true value of such a teaching credential fades over time.

Table 27: Comparison of candidate ranking between institution types

Pairing	Candidate	Mann-Whitney U	Z	Mean Rank Compare**	Sig.
Required vs. Advantageous	C	469.5	-2.113	34.71 vs. 48.39	.035*
	E	476.0	-2.129	55.95 vs. 42.70	.033*
Required vs. No difference	C	202.5	-3.033	20.66 vs. 34.44	.002*
	E	221.0	-2.747	38.37 vs. 26.02	.006*
Preferred vs. Advantageous	C	1871.0	-.758	61.82 vs. 66.65	.448
	E	1854.5	-.867	67.64 vs. 62.12	.386
Preferred vs. No difference	C	809.0	-2.535	43.19 vs. 57.28	.011*
	E	906.0	-1.814	53.11 vs. 43.15	.070

* Denotes statistical significance at p<=0.05

** Lower mean rank equals higher overall ranking of candidate

Research question #3 summary

Although a complete analysis exploring how time delays (e.g. postdoctoral experience requirements) influence the value of formal teacher-preparation program preparation was not possible, the findings suggest that time delays impact the value placed on formal teacher-preparation program preparation. When postdoctoral experience was required or expected, chairpersons indicated that formal teacher-preparation programs were not valuable whereas the opposite was true in situations where postdoctoral experience was not expected of candidates.

Research Question 4: Chair's Experience

To examine the differences between the valuation placed on formal teacher-preparation program participation and the search committee chairperson's experience, answers to the two-person comparison questions and the rank-order question were analyzed using appropriate statistical tests. The chairperson's overall experience with searches and their academic rank were used for analysis.

Two-person Comparisons by Search Experience

To address the issue of whether a search committee chairperson's overall search experience was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions of the survey (questions #15-17) using the search committee chairperson's overall search experience as an independent variable for each test. Table 28 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in the two-person comparison tests when analyzed by chairperson overall search experience.

Table 28: Difference between candidate's ranking and chairperson's overall experience

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	0.064	2	.969
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	3.630	2	.163
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	2.899	2	.235

*- Denotes statistical significance at p<=0.05

Rank-ordered Question by Overall Search Experience

Although question #5 (see Appendix A) offered three answer choices to list search experience, I decided to collapse answer choices B (6-10 searches) and C (more than 10 searches) into one category to simplify analysis. As there were only two categories to be compared, a Mann-Whitney U-test was performed to see whether

significant mean rank differences existed based on the chairperson's search experience level. Only the findings for Candidate E ($U=3395.5$, $Z=-2.118$, $p<.034$) were significant. A less experienced chairperson was more likely to rank Candidate E higher than a more experienced chairperson (mean rank comparison: 83.66 vs. 99.71). As was previously mentioned, Candidate E had the strongest teaching record possible but also the weakest research record. This finding is consistent with the concept of increased teaching values taking hold with less experienced search committee chairpersons.

Two-person Comparisons by Chairperson's Rank

To address the issue of whether a search chairperson's rank was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions (questions #15-17) using the search committee chairperson's rank as the independent variable for each test. Chairpersons with ranks other than associate professor and full professor were excluded from this test. Table 29 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in any of the two-person comparison tests when analyzed by chairperson rank.

Table 29: Difference between candidate's ranking and chairperson's rank

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	0.192	2	.908
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	0.450	2	.798
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	0.717	2	.699

*- Denotes statistical significance at p<=0.05

Rank-ordered Question by Chairperson's Rank

A Mann-Whitney U-test was conducted to determine whether significant mean rank differences existed based on the search chairperson's academic rank. The 14 cases where a participant's rank was not at the associate or full professor level were excluded. Although no significant differences were found, Candidate C's (no teaching experience with a very strong research record) test result came very close to being significant (U=3086.5, Z=-1.932, p<.053) with full professors being more likely to rank this candidate higher than associate professors who participated (mean rank comparison: 79.68 vs. 93.81). This result could mean that the chairpersons who are full professors value research ability more than teaching ability.

Research Question #4 Summary

The role of the search committee chairperson experience appears to play a key role in the value placed on teaching credentials. As was mentioned earlier in this chapter,

a correlation between chairperson rank and level of overall search committee experience exists with lower ranked chairpersons having less overall search experience and visa versa. Based on this relationship and the findings presented, it appears that the more experienced faculty prefer candidates with the strongest research records whereas those chairpersons with less experience and lower rank are more likely to place a higher value on teaching oriented candidates. This finding will be discussed in more detail in the next chapter.

Research Question 5: Expectations of Research and Teaching Time

To examine the differences between STEM search committee chairperson valuation of formal teacher-preparation program participation and chairperson expectations of hire's time commitments to teaching and research, answers to the two-person comparison questions and the rank-order question were analyzed using appropriate statistical tests. This issue was analyzed utilizing the mean time expectations participants provided in questions #11 and #19.

Two-person Comparisons by Expected Teaching Time Mean

To address the issue of whether a hire's expected time commitment to teaching was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions (questions #15-17). The "expected teaching time mean" grouping discussed earlier was used as the independent variable for each test (see Table 29). Table 30 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in any of the two-person comparison tests when analyzed by teaching time means.

Table 30: Difference between candidate's ranking and chairperson's overall experience

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	3.642	2	.162
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	1.855	2	.396
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	0.558	2	.756

*- Denotes statistical significance at p<=0.05

Rank-ordered Question by Teaching Time Mean

A Mann-Whitney U-test was performed to determine if any significant variations existed between candidate rank means based on the participant's expected teaching time means from Question #11 (see Appendix A). Once again, the only significant differences found where when Candidate C (U=2483.5, Z=-4.853, p<.000) and Candidate E (U=2505.0, Z=-4.894, p<.000) were being ranked. As has been previously mentioned, Candidate C had no teaching experience and a very strong research record whereas Candidate E had three years teaching experience, was an formal teacher-preparation program participant, and had a below-average research record. Participants expecting a hire's teaching time commitment to be greater than the mean were more likely to rank Candidate C lower (mean rank comparison= 75.59 vs. 112.21) than participants whose teaching expectations fell below the teaching mean. The opposite was true for Candidate E (mean rank comparison= 72.05 for teaching above the mean vs. 108.2 for teaching below the mean). Both these findings are consistent with the claimed focus on teaching

expectations of the candidates. Chairpersons who expected a hire to perform a high amount of teaching were more likely to rank candidates with the most teaching experience higher and the candidates with the least amount of teaching experience lower than chairpersons with lower expectations of teaching time.

Table 31: Comparison of candidate ranking between expected research

Pairing	Candidate	Mann-Whitney U	Z	Mean Rank Compare**	Sig.
Below vs. Above teaching expectation	A	3744.5	-1.283	9688.5 vs. 7147.5	.200
	B	4116.50	-.072	9267.5 vs. 7568.5	.942
	C	2483.5	-4.852	7634.5 vs. 9201.5	.000*
	D	3793.5	-1.023	9639.5 vs. 7196.5	.306
	E	2505.0	-4.894	10928.0 vs. 5908	.000*

-* Denotes statistical significance at p<=0.05
-** Lower mean rank equals higher overall rating of candidate

Two-person Comparisons by Research Expectations

To address the issue of whether expected time devoted to research work was related to formal teacher-preparation program valuation I performed chi-square analysis on the two-candidate questions in the survey (questions #15-17) using the "expected research time mean" as an independent variable for each test. Table 32 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in any of the two-person comparison tests when analyzed by research time mean.

Table 32: Difference between candidate rankings by mean research expectation

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	4.276	2	.118
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	1.855	2	.396
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	.364	2	.834

*- Denotes statistical significance at p<=0.05

Rank-ordered Question by Research Time Mean

A Mann-Whitney U-test was performed to determine if any significant variations existed between candidate rank means based on the participant's expected research time means from Question #11. Once again, significant differences were found where when Candidate C (U=1981.0, Z=-6.251, p<.000) and Candidate E (U=2315.0, Z=-5.385, p<.000) were being ranked. Participants expecting research time greater than the mean of the sample were more likely to rank Candidate C (strong researcher with no teaching experience) higher than those participants whose teaching expectations fell below the expected research time mean. The opposite was true for Candidate E (below average research experience and three years teaching experience with formal teacher-preparation program participation).

Unlike the expected teaching time variable previously discussed, a significant mean rank difference was also found for Candidate A (3 years teaching experience, formal

teacher-preparation program participant, and average research record) when the expected research time mean was considered (U=3326.0, Z=-2.54, p<.011). Candidate D (2 years teaching experience and an average research record) approached significance as well (U=3539.5, Z=-1.68, p<.093). Study participants expecting research times above the mean of the sample were more likely to rank Candidate A higher than those expecting research times below the research time mean (mean rank comparison=84.48 vs. 101.90). Given that Candidate A is listed as an "average researcher" and has the maximum amount of teaching preparation allowed to any of the candidates in this study, this finding raises the possibility that some committee chairpersons looking for a research-oriented candidate might be willing to trade some research ability for strong teaching preparation.

Table 33: Comparison of candidate ranking between expected research mean

Pairing	Candidate	Mann-Whitney U	Z	Mean Rank Compare**	Sig.
Below vs. Above research expectation mean	A	3326.0	-2.540	8786.0 vs. 8050.0	.011*
	B	4086.5	-.064	9546.5 vs. 7289.5	.949
	C	1981.0	-6.251	11695 vs. 5141	.000*
	D	3539.50	-1.68	8999.5 vs. 7836.5	.093
	E	2315.0	-5.385	7775.0 vs. 90.06	.000*

-* Denotes statistical significance at p<=0.05
-** Lower mean rank equals higher overall rating of candidate

Two-person Comparisons by Question #19

A chi-square analysis was performed on the two-candidate questions in the survey (questions #15-17) using the participants' answers to question #19 as the independent variable for each test. Table 34 shows the results from these tests as well as gives a brief description of the two candidates being compared in each question. No statistical differences were found in any of the two-person comparison tests when analyzed by research time mean.

Table 34: Difference between candidate's ranking and chairperson's overall experience

Question	Candidate 1	Candidate 2	$\chi 2$	d.f.	*p*-value
15	1 year as TA and formal teacher-preparation program	3 years as TA, same course all years	4.214	4	.378
16	1 year as TA, taught at a comm. college	2 years as TA and formal teacher-preparation program	4.575	4	.334
17	2 years as TA, many different courses	2 years as TA with one of those years at a liberal arts college as part of a formal teacher-preparation program	5.991	4	.200

*- Denotes statistical significance at $p<=0.05$

Rank-ordered Question by Question 19

I used a Kruskal-Wallis ANOVA test to rank differences between candidates and participant's answers to Question #19 (see Appendix A). Significant ranking differences based on participant's preferences of teaching and research oriented candidates were found for Candidate A ($\chi 2=18.661$, d.f.=2, $p<0.000$), Candidate C ($\chi 2=63.396$, d.f.=2, $p<0.000$) and Candidate E ($\chi 2=36.62$, d.f.=0, $p<0.000$).

Mann-Whitney U-tests were performed to determine the nature of the variations (see Table 35). Respondents preferring a teaching-oriented hire in their last search where significantly more likely to rank Candidate A (mean rank comparison=64.77 vs. 85.37) and Candidate E (mean rank comparison=55.35 vs. 94.91) higher than participants who sought a research-oriented hire. Both Candidates A and E had the maximum three years of teaching experience and formal teacher-preparation program participation listed in this study. Participants preferring a teaching-oriented hire were also significantly more likely to rate Candidate C (no teaching experience but a very strong research record) lower than those seeking a research-oriented or balanced candidate.

Those in the research-oriented group were more likely to rank Candidate C (mean rank comparison=45.39 vs. 75.33) higher than those in the balanced candidate preference group and rate Candidate A (mean rank comparison=61.92 vs. 40.37) and Candidate E (mean rank comparison=61.16 vs. 41.97) lower than the balanced preference group. These findings concerning the ranking of Candidate A seems to run counter to the previously mentioned finding about the positive ranking effect of expected research time.

Table 35: Comparison of candidate ranking between institution types

Pairing	Candidate	Mann-Whitney U	Z	Mean Rank Compare**	Sig.
Teaching oriented vs. Research Oriented	A	2007.5	-3.277	64.77 vs. 85.37	.001*
	C	878.5	-7.529	100.29 vs. 49.37	.000*
	E	1301.5	-6.009	55.35 vs. 94.91	.000*
Teaching oriented vs. Balanced	A	1152.0	-1.132	57.64 vs. 50.91	.190
	C	893.0	-3.035	61.09 vs. 43.51	.002*
	E	1058.0	-1.681	52.11 vs. 62.77	.093
Research oriented vs. Balanced	A	783.0	-3.718	61.92 vs. 40.37	.000*
	C	583.5	-4.743	45.39 vs. 75.33	.000*
	E	839.0	-3.486	61.16 vs. 41.97	.000*

* Denotes statistical significance at p<=0.05
** Lower mean rank equals higher overall rating of candidate

Research Question #5 Summary

The expectations of STEM search committee chairpersons of a prospective hire appear to have a strong relationship to the valuation placed on teacher preparation. The two person comparison tests were inconclusive but analysis of the rank-order question provided many findings. Regardless of the technique used to identify candidate preferences, participants whose last search sought a teaching-oriented candidate tended to rank the candidates with the most teaching experience as higher. Chairpersons seeking a research-oriented candidate often preferred the candidates with the strongest research record. It was interesting to note, however, that participants seeking research-oriented candidates ranked Candidate A (3 years teaching experience, formal teacher-preparation

program participant, average research record) higher than those not seeking a research-oriented candidate. Chairpersons were willing to trade some research ability for teaching skill.

Conclusion

The findings in this study reveal much about the value STEM search committee chairpersons place on formal teacher-preparation program participation. In the next chapter I will discuss the key findings presented here in a broader context and the possible ramifications for various stakeholders. I will also discuss potential areas for future research based on the findings of this study.

CHAPTER FIVE: DISCUSSION AND POLICY IMPLICATIONS

The purpose of this chapter is to summarize the major findings of this study as they relate to the research questions. I then offer recommendations to key stakeholders and discuss possible limitations to my findings. Finally, I conclude with a presentation of ideas for future research.

Summary of Research Findings

The purpose of this dissertation was to gain a better understanding of the value placed on formal teacher-preparation program (FTPP) participation during the pre-interview stages of the STEM faculty hiring process. Although the existing literature asserts that STEM doctoral students benefit personally from such training, no research had been done on how those who do the hiring value FTPP participation. This study sought to fill this gap by examining the following questions.

- Do job postings reflect the value search committee members have for FTPP participation?
- What effects, if any, do expectations of teaching and research duties have on a chairperson's valuation of FTPP participation?
- Do search committee chairpersons in different STEM fields and institutional types place different values on FTPP participation during the pre-interview stages of the hiring process?
- What effects do time delays between graduation and faculty application, such as post-doctoral experiences, have on the value search chairpersons place on FTPPs?
- Does the STEM search committee chairperson's experience influence his/her valuation of FTPP participation?

The primary purpose of this study was to examine the value of FTPPs in the STEM faculty hiring process. In addition, the findings revealed much about how teaching is perceived within the STEM disciplines. To best organize these findings I first describe research results about the value of FTPPs in the hiring process. I then discuss the additional findings that relate to the perception of teaching by those hiring in the STEM disciplines.

Chairperson FTPP Valuation Findings

Before proceeding, here is a brief review of how the survey data were collected. A complete description of the survey instrument can be found in Chapter 3 and in Appendix A. The survey instrument consisted of four sections. The first section asked participants about themselves, their prior search committee experience, and their institution. The second section gathered information about the last search the participants chaired. The third section asked participants to compare two candidates based on different teaching credentials (see Table 36). The final section consisted of a rank-order question where participants were asked to rank five candidates with varying qualifications within the context of the last search they chaired.

Table 36: Questions #15-17 answer choices

Question #	Candidate #1	Candidate #2
15	Candidate with one year experience with FTPP participation	Candidate with three years experience in same course
16	Candidate with one year experience as teaching assistant and independently taught summer course at a community college	Candidate with two years experience with FTPP participation
17	Candidate with two years experience in multiple courses in department	Candidate with two years experience with one at neighboring liberal arts college as part of an FTPP;

Expectations of Candidates' Duties

I found that a chairperson's expectations of work time duties for a new hire may influence the value placed on FTPP participation to a limited degree. Although the chi-square tests examining the two-candidate comparison questions proved inconclusive, examination of results from Kruskal-Wallis ANOVAs and Mann Whitney U-tests to answers to the rank order question found significant differences.

Chairpersons who indicated that they were looking for a candidate who would primarily teach preferred candidates with strongest teaching backgrounds. The amount of research training was not a significant factor in the ranking for these types of positions. Although chairpersons seeking research-oriented candidates were likely to rank a candidate with a "strong" research background highly, the findings also revealed that these chairpersons were willing to give some additional credit for candidates with a strong teaching background. The only candidate who earned this extra credit was an FTPP participant with three years worth of teaching experience (the maximum teaching amount in my study) and an average research record compared to the rest of the applicant pool. It remains unclear whether FTPP participation alone, the overall level of teaching experience, or a combination of the two made the difference.

Postdoctoral Experience is More Important than FTPP Participation

One of the main reservations of many faculty members in the STEM fields about FTPP participation for their doctoral students is the potential for delay in degree completion (Austin, 2003; Speck, 2003). Although some literature on doctoral student outcomes across academic fields suggests that such concern may be unfounded (Connolly, 2002; DeNeef, 1996; Ferren, Gaff, & Clayton-Pedersen, 2002), it appears to

be a legitimate concern among STEM faculty. A possible explanation for this belief is that doctoral students in the STEM fields have taken more and more time to reach matriculation in recent years (National Academy of Sciences, 2000; National Research Council, 1998; Schuster & Finkelstein, 2006). In addition, an increasing number of STEM disciplines are expecting new faculty candidates to have postdoctoral experience. Adding a postdoctoral experience means a substantial delay between obtaining the Ph.D. and applying for a faculty position. In this context, the value of a FTPP credential could fade over time (Fairweather & Rhoads, 1996).

My results supported this hypothesis. I found that postdoctoral experiences are negatively related to the value placed by search committee chairpersons on FTPP participation. Although the chi-square tests examining the two-candidate comparison questions proved inconclusive, the Kruskal-Wallis ANOVA and Mann Whitney U-tests performed on the rank order question revealed two significant findings. First, search chairpersons from departments that required or preferred candidates to have postdoctoral experience ranked the most research-oriented candidate higher while the candidate with the weakest research record was significantly more likely to be ranked lower. The opposite was found for chairpersons in departments that did not require or expect postdoctoral experience from their candidates. When combined with the previous section's findings, the outcomes indicate that any value gained by a doctoral student participating in an FTPP is likely lost during the postdoctoral experience. Given the research emphasis of most postdoctoral experiences one should expect to see a similar trend in candidate ranking with the chairpersons who sought research-oriented candidates (as discussed in the previous section), but that did not occur. I assert that the time delay

between graduation and application created by the postdoctoral experience played a significant role in the value of an FTPP credential.

In sum, the necessity in many STEM fields for prospective faculty members to obtain a postdoctoral experience is problematic for FTPP supporters. This potential conflict will only grow because the average length of a postdoctoral experience is getting longer in duration (National Academies of Sciences, 2000; National Research Council, 1998; Regets, 1998; Schuster & Finkelstein, 2006).

FTPP Valuation by STEM Field

The findings indicate a relationship between FTPP valuation and STEM field although this perception is not uniform across fields. Search committee chairpersons in different STEM fields make different value judgments when presented with candidates with and without FTPP credentials.

Of all the STEM fields analyzed, the biological sciences showed the clearest valuation of FTPP participation. When asked to evaluate a candidate with an independent teaching experience against one with FTPP participation and more overall teacher training, chairpersons in the biological sciences significantly preferred the candidate with experience teaching a class independently. Although this finding may seem to show a negative valuation of FTPP participation I assert that the message is mixed. As was mentioned in Chapter 4, Fleet et al. (2006) found that biology departments tend to value candidates with independent teaching experiences more than those with only teaching assistantship experience. Their finding means that FTPP participants given opportunities to take more responsibility in their teaching could be advantaged. On the other hand, if a candidate with a single independent teaching experience has more credibility with a

search committee chairperson than a candidate who has spent more time and effort to develop teaching skills in a formal program, then participation in an FTPP may not provide a competitive advantage. The value placed on FTPP participation, and teaching for that matter, by chairpersons in the biological sciences is further muddied by the job advertisements, which were found to be among the most likely to require candidates to have teaching experience. The lesson here is that proponents of FTPPs in the biological sciences might enhance the competitive position of program participants by placing more emphasis in their programs on developing independent teaching skills.

Significant and nearly significant results were observed in other STEM fields although the trends were less clear than in the biological sciences. For example, the findings indicated that chairpersons in the engineering and technology fields valued an FTPP candidate with more overall teacher training more highly than a less experienced non-FTPP candidate who had once taught independently. The differences in the amount of teacher preparation alone may have been responsible for the preference, but I believe the FTPP experience actually made the difference. The two candidate comparison question prior to this one (question #15) asked participants to compare a candidate with three years experience as a teaching assistant to an FTPP candidate with only one year's worth of experience. If time alone were what mattered, the analysis of question #15 should have shown a significant advantage for the candidate with three year's experience. The results did not support this view. For this reason I believe that search committee chairpersons in the engineering and technology fields may value the FTPP credential more than the quantity of teaching training received.

Although it is unclear how FTPP participation may or may not have played in the finding, chairpersons in the mathematics fields tended to rank the candidate with strong research skills and no teacher training as significantly weaker than every other STEM field examined, except for the chemical sciences where no difference was found. A possible explanation for this finding could be the type of students faculty in these fields tend to teach. At many institutions, the majority of students taking mathematics courses are non-majors. Perhaps this demand for teaching outside the mathematics discipline places additional value on teacher training despite the value placed on research skills in the STEM disciplines?

FTPP Valuation by Institution Type or Chairperson's Experience

The effect of institutional type and chairperson's experience on the value of FTPP participation during the pre-interview stages of the STEM faculty hiring process was inconclusive. Chi-square tests found no significant differences between FTPP and non-FTPP credentials. Similarly, the Kruskal-Wallis ANOVA and Mann Whitney U-tests did not identify a significant effect for FTPP participation. These findings will be discussed in the "general value of teaching section".

Job Advertisements and FTPPs

I found no evidence that that value of an FTPP can be inferred from job postings. Job advertisements, however, provide strong clues to the overall value of teaching in the STEM disciplines. I discuss these findings in the next section.

Findings Related to STEM Valuation of Teaching in General

One of the potential benefits/pitfalls of conducting an exploratory study is that the researcher may discover interesting findings not directly related to the research questions.

Although the focus of my study was the valuation of FTPP participation to STEM search committee chairpersons I found many significant indications about the overall value of teaching during the early stages of the hiring process. I identified three themes in relation to this issue. The first involves the experience/rank of the search committee chairperson. The second deals with chairperson expectations for teaching and research duties to be performed by the hire. The third theme involves the possible tradeoff of research potential for teaching experience.

Chairperson's Rank and Experience Level

I found that a chairperson's academic rank and overall search experience level had an effect on the value they assigned to a faculty candidate's teaching credentials. Chairpersons who had less overall search committee experience were more likely to rate a teaching-oriented candidate higher than chairperson with more overall search committee experience. I also found that full professors were more likely to rank a research-oriented candidate higher than their junior counterparts. These findings suggest that junior chairpersons, at the associate professor level with less overall experience[12], are more likely to place a higher value on teaching credentials whereas more experienced chairpersons place a higher value on a candidate's research credentials.

There are several possible explanations for this finding. One explanation could be that the more experienced chairpersons have a broader perspective of long-term departmental needs than their less experienced counterparts. With many STEM departments relying increasingly on the soft money that comes from research funding (Massy & Wilger, 1995; Nyquist et al, 1999), more experienced chairpersons might see an advantage in preferring a candidate who could fulfill such need. Less experienced

[12] As is explained in Chapter 4, chairperson rank and search experience level were positively correlated.

chairpersons might not be aware of the situation. This viewpoint supports the idea of teaching taking a backseat to research (Baldwin & Chronister 2001; Kennedy, 1997; Schuster & Finkelstein, 2006). Another explanation could be that a critical mass of associate professor level chairpersons have been exposed to the idea that teaching skills should have a higher value in the faculty candidate consideration process and are now putting the concept into practice. With an increasing number of faculty retirements bringing change to the make up of STEM departments nationally (Austin, 2003, Baldwin & Chronister, Finkelstein et al, 1998), is a change in the value placed on teaching occurring? Such a finding would lend support to the theory that early career exposure to an idea will spur further involvement and advancement of that idea once new faculty members have been hired.

Another difference found between chairpersons with different experience levels concerned the strategies used for advertising a position. I found that chairpersons with the rank of full professor were more likely than associate professor chairpersons to use direct mail outs to individual departments (which could be in the form of e-mail or regular post) as a means to advertise an open position. There could be many different explanations for this finding. One explanation could be that senior level faculty members are intentionally using their personal network to try to ensure they hire a quality candidate (Burke, 1988, VanderWaerdt, 1982). A second explanation could be more senior chairperson's awareness of the high cost of print advertising. For example, as of the time of this writing, the lowest rate available for placing a faculty advertisement in the *Chronicle of Higher Education* is $225.00 with an additional $1.40 charge per word. Print space for largest advertisements can be much more expensive. Writing and mailing

out advertisements via e-mail and/or regular mail can be a much more cost effective approach. While these strategies sound very reminiscent of the "good old boy" hiring network that was discussed in Chapter 2 they are legal so long as other means of job advertising are also being utilized (Perlmann & McCann, 1996). Another explanation for the difference could be that associate professor chairpersons would also prefer to use a direct mail out strategy, but have not developed the number of personal contacts needed to make using such a strategy effective.

Expectations of Candidates' Duties (and Teaching/Learning Values)

Although this topic was discussed in the FTPP valuation findings section, chairperson expectations of how a prospective hire will spend his or her work time also affects the overall valuation of teaching. If a faculty member's time is considered the most valuable resource (Fairweather, 1993; Massy & Wilger, 1995, Tobias, 1992), it is likely that how a prospective hire will spends his or her time is a major consideration of a search committee. The chi-square, Kruskal-Wallis ANOVA, and Mann-Whitney U-test results support this hypothesis. Chairpersons at research institutions ranked research-oriented candidates higher and chairpersons at teaching-oriented institutions tended to rank teaching-oriented candidates higher. This result is in line with Fairweather and Rhoads (1996) finding about the expectations of both of these institution types.

The amount and type of experience in teaching prior to applying for a position also affected search committee chairperson's assessment of the candidate. Question #17 (see table 36) asked participants to compare two candidates with the same amount of teaching experience although the details of their experience differed. Chairpersons at liberal art institutions tended to prefer the FTPP candidate who had teaching experience

at a liberal arts institution whereas chairpersons of comprehensive institutions tended to prefer the non-FTPP candidate who had been a teaching assistant in several different courses. These findings indicate that the type of teaching involvement during a given period of time plays a central role in the evaluation of teaching credentials. Although no detail was given as to the type of teacher training received, search chairpersons at liberal art institutions preferred a candidate with an experience at an institution like their own. Chairpersons at comprehensive institutions did not place as much value on the teaching experience gained at a liberal art institution and selected the candidate with the largest variety of experiences. Perhaps the results would have been reversed had the external teaching experience taken place at a comprehensive institution as distinct from a liberal arts college.

Tradeoffs between Research and Teaching Experience

Findings throughout this study also indicated that STEM search chairpersons who sought research-oriented candidates were willing to consider trading off some desired research experience in exchange for strong teaching skills. Although it is common for teaching loads to be somewhat negotiable (Baldwin & Chronister, 2001, Bok, 2003; Leslie, 2002), the findings beg the question of whether requested research experiences are negotiable as well during the STEM hiring process. If such a finding is proven true, it could mean that teaching is no longer considered as only being of secondary importance as Kennedy (1997) suggested.

Implications for Stakeholders

Several different audiences might benefit from these research results. These audiences include STEM doctoral students, STEM faculty advisors, search committee

chairpersons, FTPP facilitators, and institutional leaders. Below I will provide recommendations for these stakeholders to consider based on the findings.

Recommendations for STEM Doctoral Students

One of the most important things that doctoral students need to understand when considering participation in an FTPP is they are ultimately responsible for the decisions that they make. Before signing up for an FTPP, students should think about what they stand to gain and lose from such an experience. As this study has shown, the value placed on different teaching credentials is dependent on the characteristics of the employer. Assuming that a STEM doctoral student wants to become a faculty member, the student should seek to discover the types of qualifications typically necessary to gain a position at distinct types of institutions. It may turn out that FTPP participation is beneficial, but it can also turn out that focusing one's energies on other types of professional preparation would be more beneficial.

In addition, STEM doctoral students participating in an FTPP should be aware of the potential opportunity costs of such participation. The more time that is spent on teaching results in less time spent on research and visa versa (Fairweather, 1993). As the study's results show, in many instances an FTPP experience did not provide any advantage over any other type of teaching experience. In some situations FTPP experience provides a significant advantage in the early stages of the hiring process. The point is that students need to be aware of the long-term career ramifications of a choice before committing a major amount of their time in an FTPP.

In places where FTPPs do not exist or are restricted to non-STEM students, STEM students who want to build on their teaching skills should be encouraged to take

advantage of informal training opportunities available on their campus. There is also a wealth of information about teaching development issues, teaching techniques, and other teaching related information available on the Internet for those who are interested. [13] Students should also be encouraged to discuss these types of concerns with their advisor as they may be able to assist and/or know of other resources on campus that may be of use.

The final recommendation for students is to gain a better understanding of the faculty hiring process. Often there are many qualified candidates for a position. Those that do the best job of presenting themselves as meeting an employer's needs are advantaged (Burke, 1988; Perlman & McCann, 1996; Seldin, 2004). Fortunately, students can usually identify faculty members who have recently chaired and/or served on a search committee. These individuals can provide students with first-hand insights into how the search process works. Depending on the situation and department policy, there may also be opportunities for a student to serve as a graduate student representative on a faculty search committee. Knowledge of the hiring process provides students with knowledge on how to best present their application materials to meet the needs of a specific search.

Recommendations for STEM Faculty Advisors

Faculty advisors need to be aware of the very important role they have in the development of their doctoral students. Advisees often look to their advisor for guidance. Students often model their professional behavior by observing the actions of their advisor (Austin, 2002; Austin, 2003; Paglis, Green, & Bauer, 2006; Rice et al., 2000). As it

[13] For example, the Center for the Integration of Research, Teaching, and Learning (CIRTL) offers a wide array of teaching resources designed specifically for STEM doctoral students. More information can be found at http://cirtl.wceruw.org/.

relates to this study, an advisor's valuation of FTPP participation can have a profound impact on student views of these programs. If a STEM student should inquire about participating in an FTPP, the advisor should not wholeheartedly agree or disagree with the idea but should have a discussion with the student about the potential long-term ramifications of such a decision. Students may be unaware of how their current activities can impact their chances of obtaining the desired type of position.

I also recommend that advisors review the findings of this study before making recommendations about whether it is wise to participate in an FTPP to their students. Faculty members are often limited in their knowledge of other institution types (DeNeef, 2002). The amount of teacher training needed for a position may or may not require a student to have to commit time to an FTPP experience per se, but the advisor may be unaware of such a reality. Certain STEM disciplines may also have additional needs and qualifications that would greatly enhance a candidate's overall value to a search committee in the advisor's field (e.g. experience in industry).

Advisors who have served on and/or chaired a faculty search committee can also reflect on the experience(s) with their advisees. Faculty advisors who try this activity must be cautious, however. Privacy laws protect the identities of individual applicants and the department/institution can be held liable should any illegal considerations be revealed, regardless of whether the consideration was intentional (Sommerfield & Nagely, 1974; Toma & Palm, 1998). This discussion would allow students to better understand how academic hiring works from the employer's side. Students may also obtain a better perspective of how teaching and/or FTPP participation are valued at their advisor's type of institution.

The final recommendation for STEM faculty advisors is that they become better acquainted with the FTPP program(s) that exist at their institution. This step will allow the faculty member to better determine if the offerings of FTPP program(s) best meet the professional teaching needs in their discipline. As has been shown in this study, different STEM disciplines value different aspects of the teaching experience. If these needs are not being met, it may not be in the student's best interest to participate.

Recommendations for STEM Search Committee Chairpersons

Chairpersons of STEM search committees need to become more familiar with what participation in an FTPP entails before deciding whether the qualification is desirable or undesirable. The wide variety of FTPPs that exist can make assessing the quality of this credential difficult in some cases (Tuckman, Gapinski & Hagemann 1977;Roesset &Yao, 2002). Not all FTPP programs are alike. Gaining some familiarity with the various types of training commonly found in different FTPPs can be beneficial in assessing whether the credential fits the needs of the search. Reviewing this study and/or having a conversation with local FTPP leaders about this topic could provide such knowledge.

Search committee chairpersons should also make an effort to communicate their teaching needs for new hires with FTPP leaders. The more FTPP leaders know about what STEM employers expect from new hires in terms of teaching preparation, the better an FTPP can be set up to meet those needs.

Recommendations for FTPP facilitators

The findings of this study are also relevant to those that facilitate FTPP programs with STEM participants. The first recommendation is to communicate more with recent

faculty search committee members from various STEM disciplines and institutions. The information provided from such communications could allow for adjustments that would enhance the value of the FTPP experience to certain academic employers. By meeting with search committee members, FTPP leaders could gain a better understanding of how program participation is currently impacting their participants' chances of being hired to a faculty post. Although the primary goal of an FTPP is not to get doctoral students hired into faculty positions per se, to ignore the teaching development needs of specific disciplines only serves to push STEM students away from participating in these programs.

Secondly, FTPP leaders might utilize the data in this study to explore possible changes to current program configurations. For example, this study found that the biological science fields placed a high value on independent teaching experiences. Accordingly, FTPP leaders might explore the possibility of altering their programs to allow participants in the biological sciences more independent teaching opportunities. Although the size and/or political situation of an FTPP may not allow for such dramatic changes in the short-term, the findings here can assist program leaders to make more informed choices when developing long-term strategies for the development of future faculty members.

The final recommendation is for FTPP leaders to better monitor their participants after program completion. Such information could be used for follow up studies examining the career paths of FTPP participants. Assuming the outcomes are positive, FTPP facilitators can also use such information to promote their success.

Recommendations for Institutional Leaders

The findings of this study are also relevant to institutional leaders as those in this group are charged with allocating key resources and making policy decisions. My first recommendation would be for leaders to read the findings of this study. Given the national scope of this project, institutional leaders will gain insight on how peers at similar institutions and their own STEM units are valuing FTPP participation during the hiring process. For leaders unfamiliar with FTPPs and/or do not have FTPPs at their institutions, this study could also provide some information about the operation and intended outcomes for these programs. Leaders can also learn about disciplinary differences as it relates to desired teacher training.

The second recommendation for leaders that have FTPPs at their institution is to strongly consider whether STEM postdoctoral workers should be afforded the opportunity to participate in such programs. My study clearly illustrated the disadvantage FTPP participants had in STEM disciplines that expected candidates to have postdoctoral experience. As was mentioned in the previous chapter, the time between FTPP participation and application for a faculty position has a negative impact on the value of the teaching credential (Fairweather and Rhoads, 1996). This means that hiring committees in STEM fields that typically desire their faculty to have postdoctoral experience believe the value of the FTPP credential is lost over time. Could allowing postdoctoral workers access to FTPPs enhance their faculty employment prospects? This type of decision should be considered with great care and with input from all parties involved as there could be many ethical and financial considerations by taking such an action.

The third recommendation is for institutional leaders who are in environments where the teaching assistants are unionized. Institutional leaders who wish to maximize the potential of an FTPP should try to work with the union to allow flexibility in programming and more advanced teacher training. The findings of this study suggest that different STEM disciplines find different aspects of FTPPs to be more valuable than others. As was discussed earlier in this chapter, employers in the biological science fields tended to value independent teaching experiences over other types of teacher training. While an FTPP can be adjusted to provide such opportunities, in many instances the terms of a union contract may restrict such actions for a variety of reasons (e.g. pay differences for work; seniority, time commitments) and even prevent those who do want to voluntarily participate from being able to. Communication with the union on this matter would seem to be the most appropriate way to resolving this restriction.

Limitations of the Findings

Quantitative data provide a useful national portrait of hiring trends in STEM fields but are limited in the detail provided about the nature of searches and search committee decision-making. In addition, the scenarios presented to participants to evaluate (described in the *Chapter 3: Methodology*) are hypothetical, not real, although they represent a considerably range of likely applicant experiences in teaching.

The study surveyed only search committee chairpersons. Although participants were asked to answer survey questions within the framework of the last completed search they participated in, it is possible that the chairpersons' responses did reflect the consensus of the search committee.

The findings of this study may not be applicable to STEM departments in Historically Black Colleges and Universities (HBCUs). Although I had no intention of excluding HBCUs from my study, during the *Chronicle* archive search I observed that many of the STEM faculty openings advertised by HBCUs did not indicate whether or not a position was on the tenure-track. As per the eligibility requirements discussed in Chapter 3, job advertisements that failed to indicate whether an open position was on the tenure-track were excluded from the study. This criterion may have resulted in a significant number of HBCUs being left out of this study.

Finally, the use of the *Chronicle of Higher Education* in identifying a sample population may also have affected results. As the *Chronicle* is a nationally circulated publication, there is a strong likelihood that departments advertising open positions focused their recruitment efforts primarily at the national level. Accordingly the findings of this study may not necessarily apply to STEM searches conducted on a regional or local level.

Recommendations for Future Research

Future research related to the valuation STEM search committees place on FTPP participation and the overall valuing of teaching skills is in order. Based on the findings of this study I suggest the following directions for future research.

First, I suggest a study similar to this one be conducted within the next few years. Data from such a study would allow for longitudinal analysis on the progress, or lack there of, in regard to the value placed on FTPP experiences by those who do the hiring in the STEM fields. Future studies could be used to reflect on the ongoing evolution of this type of training and could serve as a valuable evaluation tool for FTPP leaders.

Second, a more detailed examination of the differences between search committee chairpersons with less experience with those with more experience is worthwhile. Are the differences in chairperson experience found in this study a result of generational differences and/or are the differences based on the professional knowledge that comes with experience? The answer to this question would be of great interest to FTPP advocates.

Third, an examination of the impact of teaching assistants unions on college-level teacher training should be explored. As was previously mentioned in this chapter, an existing union contract can potentially restrict the flexibility of an FTPP's programming. I had not considered the union contract factor before conducting my study, but if I could redo this study I would add a question asking participants to indicate whether the teaching assistants at their institution were officially unionized. It would be interesting to see if unionization had a positive or negative impact on FTPP valuation.

Finally, a study examining acceptable balance between teaching and research experiences is needed. This study indicated such tradeoffs area central part of the deliberations of the search process. If it could be shown that a fixed minimum and/or maximum amount of teaching preparation adds value to a candidate, then developers of FTPP programs and the doctoral students that participate in them could make more effective decisions.

Conclusion

Those who have previously studied the effectiveness of FTPPs have tended to focus their efforts on evaluating program participant outcomes. The job prospects of these participants are often ignored and/or assumed. This could be the result of

researchers and/or facilitators of FTPPs having a primary interest in effectively training graduate students to become better teachers. While determining the effectiveness of FTPP training at the individual level is important, these studies often seem to assume that such training is automatically advantageous to a student's employment prospects. Given the findings of this study, I would maintain that such a sweeping assumption could be dangerous. The previous research on STEM field-based FTPPs seems to support the idea that teaching skills are increasingly important for one's early career prospects, but existing evidence and my study suggest that research ability is still the dominant factor when it comes to hiring in the STEM fields.

The findings of this study highlight the importance of the pre-interview stages of the faculty hiring process to FTPP participants. As was discussed in Chapter 3 and illustrated in Figure 1, the value of FTPP training to a potential employer is often determined well before a participant gets the opportunity to showcase any acquired abilities. How an early career applicant has spent his/her time can have a dramatic impact on their chances of being hired, or at least interviewed, for a faculty position (Tuckman, Gapinski, and Hagemann, 1977). This is especially significant in the STEM disciplines given the emphasis placed on research ability at many institutions. It is also important to remember that different institutions and departments may be looking for candidates with differing credentials depending on local needs (Austin, 2003). My findings showed that participation in an FTPP does not tend to equate to any overall hiring advantage, but there can be certain situations where such training is advantageous and others where it is a hindrance.

Appendix A

Survey Instrument

Faculty Search Committee Chairperson Survey

Survey Description and Consent Page

My name is Jeremy Hernandez and I am a doctoral candidate in the Higher, Adult, and Lifelong Education program at Michigan State University. This study is designed to explore the value placed on formal college teaching preparation programs in the hiring process of new science, technology, engineering, and mathematics (STEM) faculty from the perspective of those who do the hiring.

Procedures: My colleague and I are requesting that you participate in a short online survey regarding the last faculty search you chaired. The first and second parts of this survey will ask you a series of general questions regarding the last faculty search you chaired. The third part will ask questions regarding qualifications of fictional candidates within the context of your last search. This e-survey will take approximately 10-15 minutes to complete.

Risks and Benefits: The only possible personal/institutional identifiers that may be collected will be the type of institution type you work at (e.g. research university, liberal arts college, etc.), your academic discipline (e.g. Chemistry), your rank (e.g. Associate professor), and the academic rank for the position being filled (e.g. assistant professor level). In transcribing, analyzing, and reporting data, and we will report data in such a manner that your identity will be protected. Your privacy will be protected to the maximum extent allowable by law.

Payment: You will receive no monetary compensation for participating in this study.

Subject's Rights: It is possible that you may become uncomfortable about answering certain questions based on your experiences as a faculty search committee chairperson. We remind you that you may, at any time and without penalty, elect not to answer a question or terminate the survey. On the other hand, many hiring chairpersons enjoy the opportunity to reflect on their search experiences. If you would like, we can provide you with a copy of the findings of this study, a bibliography of resources for further reading on the topic, or both. There will be an optional question at the end of this survey where you can provide us with your e-mail address if you would like more information in the future.

If you have questions or concerns about your rights as a research participant, please feel free to contact: Peter Vasilenko, Ph.D., Director of the Human Subject Protection Programs at Michigan State University: (517) 355-2180, fax: (517) 432-4503, email: irb@msu.edu, or regular mail: 202 Olds Hall, East Lansing, MI 48824.

If you have any questions regarding this study, please contact the investigators, Dr. Jim Fairweather and Jeremy Hernandez at 416 Erickson Hall/Michigan State University/East Lansing, MI 48824; (517) 353-0933; herna163@msu.edu

Filling out this e-survey indicates that you voluntarily agree to participate in this study.

_____ _____

Name Date

This survey is broken into three distinct parts. Part One of the survey will ask demographic questions about you, your institution, and your previous experience(s) working on search committees. Part Two contains specific questions regarding the last faculty search you participated in and finally in Part Three you will be presented with a variety of fictional applicant credentials to compare/contrast.

Part One

The following questions ask about the academic institution where you currently work.

1. Which of the following would you say best describe the academic institution where you are currently employed?
    a. Research college/university
    b. Comprehensive college/university
    c. Liberal Arts institution
    d. Other (please specify):

2. Is your institution...
    a. Public
    b. Private

3. What is your primary field of study (e.g. Organic Chemistry, Civil Engineering, Applied Mathematics, etc.)? _____

4. What is your current academic rank (please select all that apply)?
    a. Instructor
    b. Assistant Professor
    c. Associate Professor
    d. Full Professor
    e. Professor Emeritus
    f. Other (please specify): _____

The next series of questions will ask about your past experience(s) both chairing and serving on faculty search committees

5. How many faculty search committees have you participated in during your career (either as chairperson or as a member)?
    a. 0-5
    b. 6-10
    c. More than 10

6. Including the most recently completed search, how many times have you chaired a faculty search committee?
    a. None (selecting this answer will terminate the survey)
    b. Between 1-5 times
    c. Between 6-10 times
    d. More than 10 times

Part Two

The following series of questions are about the last completed faculty search you chaired (regardless of whether it was successful/unsuccessful).

7. What academic discipline was targeted in the last completed faculty search you chaired (e.g. Organic Biology, Civil Engineering, Physics, etc.)? _____

8. How long ago was the last completed faculty search you chaired (regardless of it being successful/unsuccessful)?
    a. Within the last year
    b. Within the last two years
    c. More than two years ago

9. What possible rank(s) did the last completed faculty search committee you chaired seek to hire (assuming hiring someone at the assistant professor rank was legitimately possible)?
    a. Assistant professor rank only
    b. Assistant or Associate professor rank (preferably Assistant level)
    c. Assistant or Associate professor rank (preferably Associate level)
    d. Assistant or Associate professor rank (no predetermined preference in rank)
    e. Open rank search
    f. I have never chaired a search where hiring someone at the Assistant professor level was possible. ***This choice terminates the survey***

These questions are in relation to the last completed faculty search you chaired.

10. Did the last search you chaired result in a candidate being offered the position? *Please note that we are only asking if an offer of employment was made, not whether the offer was accepted or declined.*
    a. Yes
    b. No

11. To the best of your recollection, what percentage of time was a prospective hire expected to commit to each of the following:
    a. ____ % Research and/or Scholarship
    b. ____ % Teaching
    c. ____ % Service (includes extension work)

12. Excluding summer semesters/terms, was the prospective hire expected to teach courses for academic credit on a regular basis?
    a. Candidate would be expected to teach every term.
    b. Candidate would be expected to teach courses, but not every term
    c. There were no minimum teaching expectations for the position. Teaching would be done infrequently and/or only on an as needed basis.

13. As it related to the assistant professor rank, to the best of your recollection, postdoctoral experience was:
    a. **Required** for advancement to the interview stage of the job search.
    b. **Preferred** but willing to overlook if a candidate had other desirable attributes/qualifications.
    c. **Not intentionally sought after, but definitely improved a candidate's chances** for advancement to the interview stage.
    d. **Not intentionally sought after** and unlikely to significantly improve a candidate's chances for advancement to the interview stage.

14. To the best of your recollection was this faculty opening advertised in any of the following forums (please check all that apply):
    a. Discipline specific journals
    b. Relevant professional societies/organizations, including listservs
    c. Your academic department's website
    d. Your institution's website (e.g. Human Resources website)
    e. Targeted mail out to specific academic departments (via regular mail or e-mail)
    f. Academic employment websites (e.g. higheredjobs.com)
    g. None
    h. I do not remember
    i. Other (please specify): _____

Part Three (only 6 more questions left!)

This part of survey deals with the early stages of the faculty search process, within the context of the last faculty search you chaired (where hiring someone at the rank of assistant professor was possible). Specific attention will be will be placed on the consideration given to teaching credentials at this stage of a search.

Please read the following definition before proceeding.

For the purposes of this study, a formal teacher preparation program is defined one that is designed to help graduate students organize and develop their teaching experience in a systematic and thoughtful way, with assistance from faculty, campus offices, and programs in a manner similar to that already in place for research experience. Often students who complete these formal programs receive a notation on their college transcripts and/or develop a teaching portfolio/dossier to highlight, organize and reflect upon their teaching experiences.

Part Three continued...

In the next five questions, you will be presented with a series of fictional academic credentials to evaluate. These are the type of credentials you might see when comparing applicants during the initial review of applications for a faculty opening (at the rank of assistant professor) in your department. You will be asked if an applicant's stated qualification(s) would be considered more, less, or equally valuable than another's within the context of the last faculty search you chaired.

> In all cases, please assume that the applicants in question have submitted all required application materials and are nearly equal in qualification except the credential(s) being asked about.

****

{Please note answers for 15-19 are randomized in online version of survey}

15. Please read the two candidate descriptions below and select the one you perceive as having the stronger credential(s). If you believe that both candidates' credential(s) are about equal, please indicate so by checking both boxes.
    a. Candidate claims to have one year's worth of experience as a teaching assistant and has participated in a formal teacher preparation program
    b. Candidate claims to have three years of experience as a teaching assistant in the same exact introductory course.

16. Please read the two candidate descriptions below and select the one you perceive as having the stronger credential(s). If you believe that both candidates' credential(s) are about equal, please indicate so by checking both boxes.
    a. Candidate claims to have one year of experience as a teaching assistant and was the lone instructor of a discipline related course at a local community college last summer.
    b. Candidate claims to have two years of progressive experience (where additional classroom related responsibilities are added over time) as a teaching assistant and has participated in a formal teacher preparation program.

17. Please read the two candidate descriptions below and select the one you perceive as having the stronger credential(s). If you believe that both candidates' credential(s) are about equal, please indicate so by checking both boxes.
    a. Candidate claims to have two years experience as a teaching assistant for a variety of courses in their department.
    b. Candidate claims to have two years experience as a teaching assistant with one year being at their home institution and one at a neighboring liberal arts college as part of a formal teacher preparation program.

18. Please read the two candidate descriptions below and select the one you perceive as having the stronger credential(s). If you believe that both candidates' credential(s) are about equal, please indicate so by checking both boxes.
    a. Candidate claims to have two years progressive experience (where additional classroom related responsibilities were added over time) as a teaching assistant but has not participated in any teaching activities within the last three years.
    b. Candidate claims to have participated in a formal teacher preparation program and served a teaching assistant for two years in a variety of courses in their department.

19. Please read the two candidate descriptions below and select the one you perceive as having the stronger credential(s). If you believe that both candidates' credential(s) are about equal, please indicate so by checking both boxes.
    a. Candidate claims to have three years of progressive teaching experience (where additional classroom related responsibilities are added over time) as a teaching assistant and has participated in a formal teacher preparation program, but has little research experience.
    b. Candidate claims to have no teaching experience, but has what you would consider a very strong research record and has provided a very well written teaching philosophy statement.

(The Final Question)

In this final exercise you, in the role of a faculty search committee member, will be asked to rank order fictional candidates based on academic credentials you may see when comparing applicants' qualifications during the initial review of applications for a faculty opening at the assistant professor level in your current department. In this scenario you will are asked to order rank each applicant from 1 (most desirable) to 5 (least desirable) based on their stated qualification.

Please assume that all applicants have submitted the required application materials (e.g. a cover letter, recommendation letter(s), any required written samples, etc.). Unless otherwise indicated, also assume candidates meet al.l minimum requirements for the open position except for the items being asked about.

20. Within the framework of the last search you participated in, please rank order these five candidates listed below from most (1) to least (5) desirable. *{Answers are randomized in online survey}*

___ Candidate has what you would consider an average research record compared to the rest of the applicant pool, has three years experience as a teaching assistant, and has participated in a formal teacher preparation program.

___ Candidate has presented what you would consider an average research record when compared to the rest of the applicant pool, has one-year experience as a teaching assistant, and has participated in a formal teacher preparation program.

___ Candidate has presented what you would consider a very strong research record when compared to the rest of the applicant pool, but has no teaching experience.

___ Candidate has what you would consider an average research record when compared to the rest of the applicant pool and has two years experience as a teaching assistant.

___ Candidate has what you would consider a below-average research record when compared to the rest of the applicant pool, has participated in a formal teacher preparation program, and has three years of experience as a teaching assistant (with one being at a neighboring institution that is the same type as yours). Has also submitted what you consider a very well written teaching philosophy statement.

Thank You!

Optional: If you are interested in receiving more information about the findings of this study when it is concluded please provide us with your e-mail address (submitted e-mail addresses will be separated from the previous information provided so as to protect your privacy):

Thank you for participating in this study!
Jeremy J. Hernandez (herna163@msu.edu)

Appendix B

Categorization coding of STEM fields used in this study

Biological Sciences
Anatomy
Animal science
Audiology
Biology – generic term used by many smaller departments
Biological sciences – generic term used by many smaller departments
Botany
Cell biology
Conservation biology
Developmental biology
Ecology
Genetics
Genomics
Marine biology
Microbiology
Molecular biology
Physiology
Plant biology
Plant physiology
Virology
Wildlife sciences

Chemical Sciences
Analytical chemistry
Biochemistry
Biophysical chemistry
Chemistry - generic term used by many smaller departments
Environmental chemistry
Inorganic chemistry
Organic chemistry
Physical chemistry

Engineering/Technology
Biotechnology
Chemical engineering
Civil engineering
Computer science
Computer security
Computer systems
Construction management
Electrical engineering
Electromechanical engineering

Engineering/Technology (cont.)
Engineering - generic term used by many smaller departments
Engineering science
Engineering technology
Industrial engineering
Information systems/technology – excluded cases found in business schools
Manufacturing engineering
Mechanical engineering
Software engineering
Technology - generic term used by many smaller departments
Telecommunication systems
Water resources engineering

Math sciences
Algebraic mathematics
Applied mathematics
Data mining
Math education – only used where program was located exclusively in math department
Mathematics - generic term used by many smaller departments
Statistics
Technical mathematics

Physical sciences
Agricultural sciences
Astronomy
Earth science
Environmental studies
Environmental toxicology
Geographical information science
Geography – only in cases where found in Geology departments
Geology
Geomicrobiology
Hydrology
Marine resource management
Meteorology
Paleontology
Physics
Remote sensing
Systematics

Appendix C

Descriptive Statistics

Advertisement data				
	Minimum	Maximum	Mean	Standard Deviation
STEM field	0	4	2.3100	1.4412
Rank sought (ad)	0	2	0.1759	0.4118
Institution type (ad)	0	3	1.0858	0.7761
Teaching duties mentioned	0	1	0.6720	0.4697
Statement of teaching req	0	1	0.5386	0.4987

Survey data				
	Minimum	Maximum	Mean	Standard Deviation
Institution type (survey)	0	2	1.1294	0.7505
Public/Private	0	1	0.3689	0.4837
Chairperson rank	0	5	2.5194	0.7306
Search experience	0	2	0.8039	0.7433
Chair experience	0	3	1.1029	0.4143
Search field	0	4	2.3981	1.4438
Time since search	0	2	0.3850	0.5731
Rank sought (survey)	0	4	0.6020	1.0153
Job Offered	0	1	0.0035	0.1851
Expected Hire Research %	0	85	31.3782	16.8454
Expected Hire Teaching %	10	100	55.1192	17.6494
Expected Hire Service %	0	75	13.5026	9.1618
Will teach how often	0	2	0.0091	0.3215
Postdoctoral requirement	0	3	1.6970	0.9175
Advertising				
Journals	0	1	0.2150	0.4119
Professional Organizations	0	1	0.1200	0.3258
Listservs	0	1	0.8850	0.3198
Department websites	0	1	0.4500	0.4987
Institutional websites	0	1	0.1990	0.4002
Direct mail out	0	1	0.5771	0.4953
Employment website	0	1	0.4876	0.5011
Don't remember	0	1	0.9950	0.0070
Two-candidate q's				
#15	0	2	0.9740	0.7619
#16	0	2	0.7188	0.7753
#17	0	2	1.0729	0.6348
#18	0	2	1.0785	0.4462
#19	0	2	0.7895	0.7474

Rank order question				
Candidate A	1	5	1.5401	0.7912
Candidate B	1	5	3.0000	0.9447
Candidate C	1	5	3.4064	1.5949
Candidate D	1	5	3.2193	0.9617
Candidate E	1	5	3.8289	1.4228

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