

A Study of Public University Alumni Interest in Nontraditional Certification to Teach Science and Mathematics

an Iowa Mathematics and Science Education Institute Study



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Introduction

Iowa needs more mathematics and science teachers. In addition to the existent programs to prime the production pipeline are “nontraditional” or “alternative” models emerging at several Iowa private colleges plus the new *Iowa Teacher Intern License Pathway—Answering the Call to Teach*, a Board of Regents, State of Iowa, collaborative for secondary teacher preparation. This study was conducted by the Iowa Mathematics and Science Education Institute to answer the question, “How much demand is there for such post-bachelors pathways to teaching in Iowa?” The answer can help shape policy and programming.

Science and Mathematics Teacher Populations in Iowa

Iowa faces a critical teacher shortage in the fields of science and mathematics. In 2008, 16 new physics teachers were produced by Iowa institutions of higher learning while 101 became eligible to retire. For chemistry, 38 were graduated while 115 may retire. There were 84 biology teacher graduates in Iowa with 185 current biology teachers eligible for retirement. And, 120 new mathematics teachers were produced while 214 gained eligibility to retire.* School leaders in Iowa’s rural regions face particular challenges in filling vacant mathematics and science positions at the secondary level. Our state’s ability to produce 21st century citizens, capable of thriving in a knowledge-based society and economy, hinges squarely on the recruitment, preparation and retention of high quality teachers of mathematics and science for each and every learner.

* Iowa Department of Education Director Judy Jeffrey, November 10, 2008, National Association of State Universities and Land Grant Colleges Conference, Chicago, Illinois.

Current Efforts to Address the Teacher Shortage Crisis

Existing programs created to address this crisis include the Iowa Mathematics and Science Education Partnership (IMSEP) teacher recruitment program *I-Teach Mathematics & Science* started in 2008. *I-Teach* draws talented undergraduate science and mathematics majors into teaching through informational seminars, scholarships and internships. As of January 2010, about 150 students have participated in *I-Teach*, though it remains early to predict how many will persist through the pipeline to an Iowa classroom. In 2009 *I-Teach* was augmented by a grant from the National Science Foundation (NSF) to lure science, technology, engineering and mathematics (STEM) upper level undergraduate and graduate students or professionals back to the universities to earn teaching certificates. Another initiative in the state involves several private colleges that have recently created alternative licensing programs, though not specific to the STEM disciplines. Coming online for fall of 2010 is the *Iowa Teacher Intern License Pathway—Answering the Call to Teach, a Regents Collaborative for Secondary Teacher Preparation*.

Study of Nontraditional License Market in Iowa

Could alternative pathways to teaching certification help Iowa address the critical shortage of mathematics and science teachers? To answer this question, we need to have an idea as to the demand for such programs. With the cooperation of the alumni associations at the University of Northern Iowa (UNI), the University of Iowa (U of I) and Iowa State University (ISU), IMSEP surveyed a sample of their alumni who earned a bachelor's degree in a science, technology, engineering or mathematics (STEM) field between 1983 and 2008.

Background

The development and construction of this study began in the spring of 2009 after a review of relevant literature featuring C. Emily Feistritzer's *Profile of Alternate Route Teachers* report (National Center for Education Information, 2005). The alternative route is typically designed to recruit, prepare and license talented individuals wanting to pursue a teaching degree, who already have at least a bachelor's degree and often have had careers in fields other than

education. In 2007, all 50 states and the District of Columbia reported that they were implementing some type of alternative route to teacher certification. In some states, for example Texas, more teachers are produced via the alternate pathway than the traditional college major. The alternative route to a teaching license is growing in popularity with the candidate profile similar to that of the population pursuing traditional licensure in many ways, excepting age. For example, roughly the same percentage of women and men are choosing each route, and the proportion of ethnic and racial minorities choosing the alternate pathway to teaching is similar to their populations in traditional programs. Where the similarity ends is the preferred level of teaching: a higher percentage of alternative-route teachers than traditional-route teachers opt for the secondary level. When it comes to mathematics and science, a higher percentage of alternate candidates pursue these fields (19%) than the percentage of those in traditional teacher preparation programs (14%).

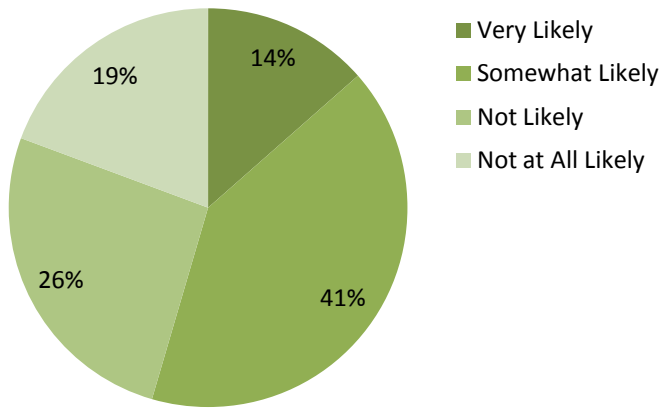
Study Design

Through a cooperative arrangement between the alumni associations of the three state public universities and IMSEP, all undergraduate STEM program graduates (qualifying fields were defined in a previous IMSEP study, *Women and Minorities in STEM Programs at Iowa's Public Universities*) of all three universities over the previous 25-year period (1983 to 2008) were identified. From the resultant total of 62,488 subjects, a computer-generated random sampling program netted 5,500 individuals from across the United States (U.S.) to be the study group. This sample size was large enough to provide a reliable indication of the responses of the total population while controlling the study's cost. A survey instrument consisting of Likert-style and open-ended elaboration questions was crafted by the study team to probe respondent perceptions of teaching and their degree of interest as governed by certain alternative program features. Of the 5,500 surveys mailed in April 2009, 951 were returned in useable form by the cut-off date in June 2009. This 17 percent return rate is well within the range of acceptable percentage of returns for claiming representation of the greater population of interest. Of returned surveys, 426 (45%) were from current residents of Iowa while the remaining 525 (55%) came from 45 other states.

Findings

More than half of all respondents expressed either likelihood or a strong likelihood to pursue mathematics or science teaching if an alternative route to licensure was made available to them and if certain conditions were present. Other findings are comprehensively represented by figures that illustrate survey outcomes. Iowa respondents were of primary interest to the study team for their relevance to an Iowa licensure-focused question. Thus, the tables below isolate solely the residents of Iowa.

1. If you were to consider a career change, now or in the future, how likely would you be to consider becoming a mathematics or science teacher [n=426]?



2. If you indicated “somewhat likely” or “very likely”, please rate how important each of the following items are to you: 1=Not at All Important to 5=Very Important

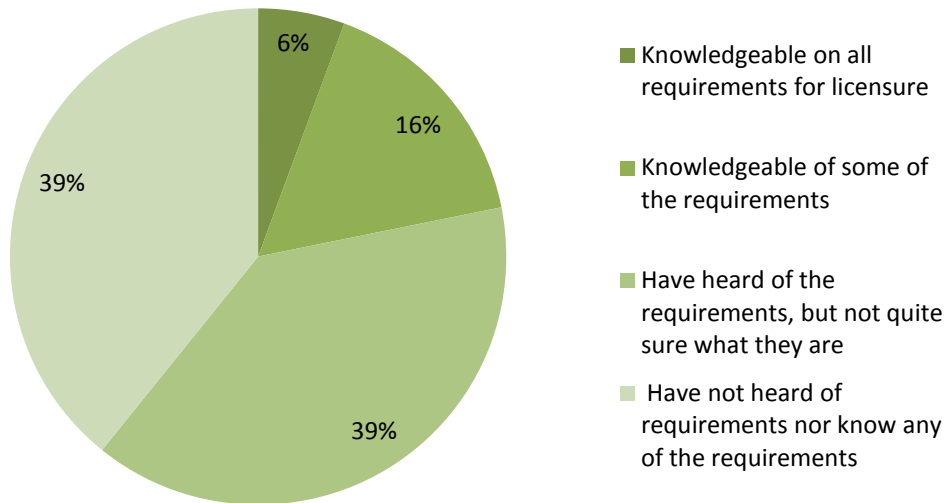
	Relative rank	Mean score
Interest in subject-matter field	1	4.19
Value or significance of education in society	2	3.98
Desire to work with young people	3	3.83
Influence of a teacher in elementary or secondary school on students	4	3.63
Holiday breaks and summers	5	3.60

Want a change from other work	6	3.04
Less difficult work than your current job	7	2.14

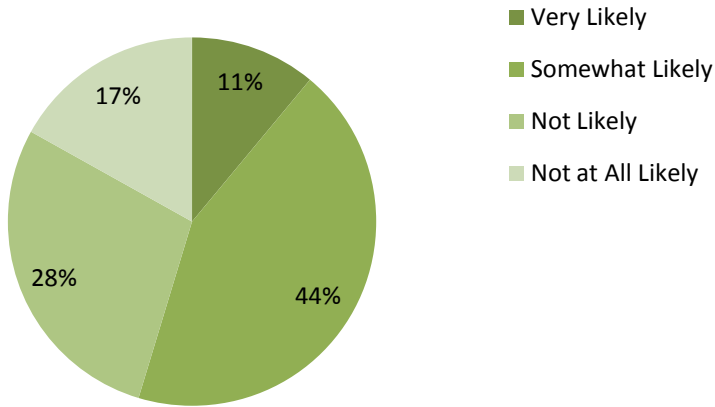
3. Please rate the following challenges to becoming a teacher: 1=Not at All Important to 5=Very Important

	Relative rank	Mean score
Compensation	1	3.86
Problems with student behavior	2	3.68
Getting licensed	3	3.44
Benefits	4	3.37
Availability of job opportunities	5	3.19
Lack of knowledge of subject	6	2.37

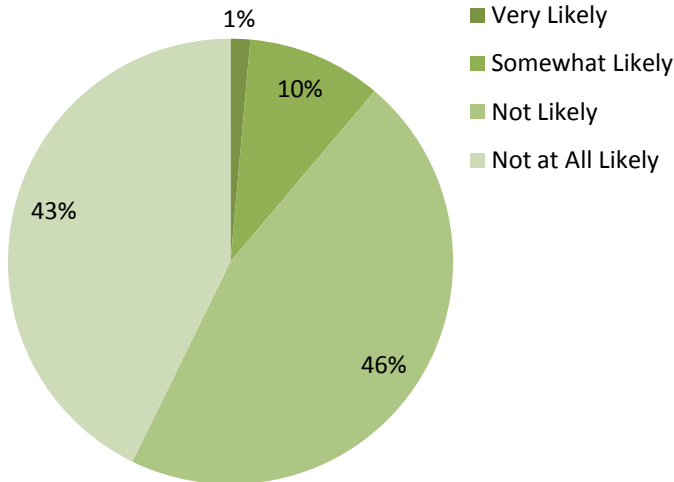
4. How knowledgeable would you say you are about the current licensing requirements for becoming a teacher?



5. If an alternate route to teaching mathematics or science was available, making it easier for you to qualify to teach, how likely are you to pursue licensure?



6. If an alternate route to teaching was not available, would you ever consider teaching mathematics or science via the typical way through the university pathway?



7. Please rate the importance of each of the following to you when considering an alternate licensure program: 1=Not at All Important to 5=Very Important

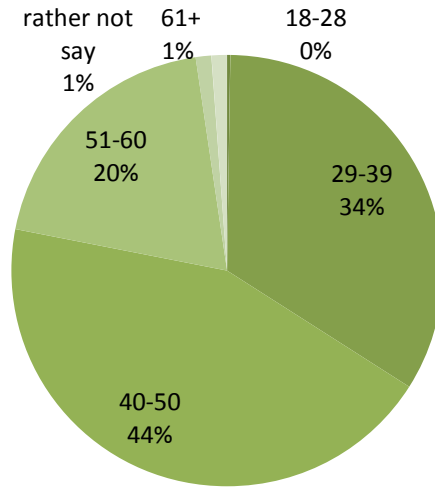
	Relative rank	Mean score
Ability to maintain current employment while participating in the program	1	4.24
Location of the program	2	4.08
Cost of the program	3	4.01
Quality of program and its instructors	4	3.97
Family obligations	5	3.96
Salary and benefits during/after the program	6	3.90
Length of the program	7	3.78
Support from a mentor or school principal	8	2.76

8. Please rank order which of the disciplines you would be interested in teaching?

SUBJECT	Relative rank	# of top three response
General Science	1	242
Mathematics	2	195
Biology/Life Science	3	181
Physics	4	120
Physical Science	5	109
Earth/Space Science	6	99
Chemistry	7	76

DEMOGRAPHIC INFORMATION

9. Your Age



10. Gender

Male	54.6%
Female	45.2%

11. Your Race/Ethnicity:

American Indian or Alaskan Native	0%
Asian American	1%
Black or African American	0%
Native Hawaiian or Other Pacific Islander	0%
Hispanic or Latino	0%
White or Non-Hispanic Caucasian	96%
Multiracial/Multi-Ethnic	1%
Rather not say	3%

12. Current Profession

Student	4
Professional, non-teaching*	315
*unique occupations listed in Appendix	
Paraprofessional/ Substitute Teacher	5
Military	2
Unemployed	7
Other	88
Rather not say	8

13. Highest Degree Earned

Bachelor	291
Masters	98
Doctorate or Professional	35
Rather not say	5

Conclusion

Could alternative pathways to teaching certification help Iowa address the critical shortage of mathematics and science teachers? Given that over half of the STEM graduates from Iowa's public universities over the past 25 years are somewhat or very likely to pursue teaching licensure if conditions were right, it is reasonable to assume that this could help solve the problem. Principally, the solution would need to be the creation of a program that permits the candidate to maintain employment, stay close to home, be affordable and be of high quality. Encouragingly, several Iowa private colleges have created alternative licensing programs, though not specific to the STEM disciplines. Available for fall of 2010 is the *Iowa Teacher Intern License Pathway—Answering the Call to Teach, a Regents Collaborative for Secondary Teacher Preparation*. This program, which meets each of the top four concerns expressed by survey participants, is supported by the Iowa Mathematics and Science Education Partnership (IMSEP) in the form of the National Science Foundation's (NSF) Robert Noyce Teaching Scholarships and with the intention to fund field supervision during the internship phase of the program provided there are additional resources available for fiscal year 2011 for this purpose.

Appendix - Occupations listed by respondents self-identified as “Professional”

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|--|---|
| 1. 3rd party logistics | 46. dietitian |
| 2. accounting | 47. director of operations, health insurance |
| 3. actuary | 48. doctor |
| 4. administrator | 49. DVM |
| 5. agriculture | 50. electrical design engineer |
| 6. civil engineer | 51. electrical engineer |
| 7. agronomist | 52. electrician |
| 8. airport engineer | 53. embryologist |
| 9. management | 54. engineer |
| 10. attorney | 55. engineer [quality assurance manager] |
| 11. bank teller | 56. engineer manager |
| 12. banking executive | 57. engineer, mechanical |
| 13. biological science lab tech | 58. engineering |
| 14. biotech sales | 59. engineering manager |
| 15. business development manager | 60. engineering research & development
director |
| 16. business owner | 61. environmental engineer |
| 17. CAD technician | 62. environmental scientist/consultant |
| 18. certified athletic trainer | 63. environmental specialist |
| 19. chief financial officer | 64. environmental specialist with county solid
waste |
| 20. chemical engineer vice president | 65. estimator for construction company |
| 21. civil engineering consultant | 66. executive management |
| 22. community banker | 67. electric utility company |
| 23. compliance specialist [soon to be
unemployed] | 68. family physician |
| 24. computational science | 69. farmer |
| 25. computer analyst/designer | 70. farmer/agronomist |
| 26. computer developer | 71. feed department manager |
| 27. computer programmer analyst | 72. finance |
| 28. computer professional | 73. fire protection engineer/consultant |
| 29. computer programmer | 74. food safety |
| 30. computer software programmer/manager | 75. forester |
| 31. computer technician in school district | 76. golf course superintendent |
| 32. construction executive | 77. health administration |
| 33. construction observer/inspections | 78. health care finance |
| 34. construction project manager | 79. home consultant |
| 35. construction project manager | 80. hospice nurse |
| 36. consultant | 81. hospital lab coordinator |
| 37. corporate trainer | 82. human resources |
| 38. counselor | 83. industrial engineer |
| 39. county naturalist environmental education | 84. industrial hygienist |
| 40. crop consultant | 85. industry research |
| 41. database administration | 86. information security |
| 42. database administrator | 87. information technology |
| 43. dental hygienist | 88. inspector, agriculture |
| 44. dental hygienists | 89. instructional technology |
| 45. dentist | |

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| 90. insurance | 138. pilot |
| 91. insurance sales | 139. principal |
| 92. insurance underwriting | 140. professional farm manager |
| 93. information technology analyst | 141. professor |
| 94. information technology director | 142. programmer/analyst |
| 95. information technology analyst/programmer | 143. project administrator |
| 96. K-12 associate support | 144. project engineer |
| 97. laboratory supervisor | 145. project manager |
| 98. laboratory coordinator | 146. project specialist |
| 99. laboratory technician | 147. public relations |
| 100. law enforcement | 148. quality engineer |
| 101. licensed civil engineer | 149. quality engineering manager |
| 102. life science | 150. research and development laboratory manager |
| 103. laboratory science | 151. registered dental hygienist |
| 104. management accountant | 152. registered nurse |
| 105. manager | 153. research development in water purification technology |
| 106. manager, radiology department | 154. research scientist |
| 107. manager, utility company | 155. researcher, student advisor |
| 108. manufacturing engineer | 156. registered nurse |
| 109. manufacturing manager | 157. registered nurse, BSN |
| 110. master plumber | 158. registered nurse, information technology specialist/systems analyst |
| 111. master plumber/HVAC | 159. registered nurse, research coordinator |
| 112. medical doctor | 160. rural mailman |
| 113. mechanical engineer | 161. sales |
| 114. medical laboratory technologist | 162. school district operations director |
| 115. medical technologist | 163. scientific manager, plant breeding |
| 116. metallurgy | 164. scientist |
| 117. meteorology | 165. self employed, computers |
| 118. microbiologist | 166. senior project manager |
| 119. microprocessor software development | 167. senior systems analyst |
| 120. mortgage loan officer | 168. senior technician |
| 121. new product development | 169. senior web developer |
| 122. nuclear medicine technologist | 170. social worker |
| 123. nurse | 171. software consultant |
| 124. nurse practitioner | 172. software development |
| 125. nursing | 173. software engineer |
| 126. office manager | 174. structural engineer |
| 127. operations management | 175. superintendent |
| 128. operations manager | 176. supply planning senior analyst |
| 129. optometrist | 177. systems analyst |
| 130. orthodontist | 178. systems architect |
| 131. pediatrician | 179. technical service agriculture |
| 132. pesticide residue chemist | 180. truck driver |
| 133. pharmaceutical sales | 181. veterinarian |
| 134. pharmacist | 182. vice president, engineering |
| 135. physical therapist | 183. writer and logistics coordinator |
| 136. physician | |
| 137. physician assistant | |



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a collaboration of Iowa's public universities in affiliation
with STEM education organizations across Iowa