AC 2009-1187: TRANSITION TO TEACHING: PERCEPTIONS, INTEREST, AND BARRIERS IN STEM EDUCATION

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Transition to Teaching:
Perceptions, Interest, and Barriers in STEM Education

Introduction

Highly trained secondary teachers with hands-on industry experience will always be needed in the education world. With an increasing number of teaching positions going unfilled each year, school corporations have great difficulty in hiring qualified individuals who are certified to teach. In response, many universities in Indiana, such as Indiana State University, Indiana University Purdue University Indianapolis, and Ball State University, offer transition to teaching programs. These educational programs allow professionals possessing baccalaureate degrees in relevant areas to take educational coursework in appropriate instructional methods, curriculum development, and assessment techniques to become licensed secondary teachers. As a result, the transition to teaching model helps career changers move from industry to the classroom.

In recent years, the U.S. government has placed emphasis on Science, Technology, Engineering, and Mathematics (STEM) education initiatives[1]. As a reaction to STEM education being viewed as a top priority, state departments of education have increased the number of STEM-related high school graduation requirements[2]. With more high school graduation requirements in STEM areas, clearly, more STEM teachers are needed to instruct in these fields.

As a result of secondary education shortages and the governmental emphasis on STEM education, there has been an increase in the number of organizations offering incentives to encourage individuals with STEM backgrounds to teach in high-need schools located in urban and rural areas. Organizations such as Math for America offer fellowships to individuals willing to become certified math educators and then teach in high-need urban areas, specifically in the following cities: New York City, San Diego, Los Angeles, and Washington, DC (www.mathforamerica.org). Likewise, North Carolina A & T State University offers fellowships and benefits to individuals interested in becoming certified to teach math or science in high-need rural schools (http://www.ncat.edu/). Responding to both urban and rural needs, the Woodrow Wilson National Fellowship Foundation offers fellowships to individuals willing to become certified and teach STEM subjects in secondary schools (http://www.woodrow.org/). All of these organizations recruit individuals possessing baccalaureate degrees in relevant areas. Additionally, individuals completing the three mentioned programs will not only become certified teachers, but also earn master degrees.

Literature Review

Over the next several years, demand for teachers in the United States is expected to grow considerably. In fact, "the U.S. Department of Education has estimated that 2.2 million teachers will be required by 2010"[3]. Nearly a third of the teaching vacancies will be attributed to retirement[4]. With predictions that almost a third of the current teaching population will retire by 2015, the result will be approximately 700,000 teachers leaving the profession due to retirement[3].

Although many teachers will be leaving education as a result of retirement, this is not the only factor contributing to teacher shortages. Other teachers are leaving the occupation after only minimal time spent in the classroom. One study indicates that almost "one-third of all new teachers in the United States leave the teaching field within their first 3 years of teaching and almost 50% may leave within

the first 5 years of their teaching career"[3]. In the near future, both retirement and low retention could contribute to the predicted teacher shortages across the United States.

Potentially, teacher shortages could affect schools across the entire United States. However, more than likely, schools that will suffer most by teacher shortages are ones located in high need urban and rural areas. Schools in these locations already have difficulty in hiring and retaining qualified and effective teachers. Both urban and rural schools continue to experience increased diversity, high childhood poverty, limited financial resources, and difficulty in employing qualified, effective teachers[5].

Urban schools must serve the needs of inner-city students. Many of these students come from impoverished families and neighborhoods. Finding teachers to instruct these students proves to be a constant issue for urban schools' administrators for many reasons. First of all, many teachers are less than enthusiastic about teaching in areas that have high numbers of students that live in poverty or are minorities[6]. Additionally, "on average, urban students score lower on standardized achievement exams than their suburban counterparts"[6]. Furthermore, in inner-city areas, crime rates are usually high and so is the cost of living. Overall, these factors discourage many educators from teaching in urban areas. As a result, urban schools are often forced to fill vacancies using alternative means and often "fill these vacancies by hiring a substitute or hiring a less than fully qualified teacher"[6].

Rural schools feel the same staff shortage pains as urban schools. Just as urban schools have many poor and minority students, rural schools face these same issues. Many rural schools see more and more diverse students because "diverse groups follow jobs in industrialized agriculture and in highly mobile light manufacturing operations"[5]. Often times in rural areas, the top students will graduate and not return to the community because of lack of opportunities. This results in declining enrollment in schools, and local businesses suffer from having fewer customers. Many young teachers find rural areas unattractive places to live because of lack of entertainment. Rural communities do not offer the same attractions as larger cities. Often times, rural communities needing to hire new teachers might not also have appropriate jobs for the teachers' spouses[7].

Clearly, urban and rural schools face many challenges with hiring and retaining teachers. These schools face especial difficulty in hiring teachers in STEM areas. By 2015, one report indicates the "U.S. will need about 280,000 new teachers in math and science"[4]. Urban and rural schools will have difficulty competing with suburban schools to hire qualified teachers in these fields. Even now when the teacher shortage is not yet a crisis, research indicates that rural and urban schools have considerable trouble in filling math and science positions[6]. In fact a national survey of urban schools in the United States "revealed nearly all of the urban districts had an immediate need for mathematics (95%) and science (98%) teachers"[8]. When schools are unable to find qualified teachers for positions, the result is classes being taught by teachers who are not certified in the area they are teaching[4].

In recent years, the federal and state governments have passed legislation to increase STEM initiatives and requirements for high school students. "Unnerved by job losses, weak test scores, and competition from an increasingly skilled foreign workforce," government has placed much emphasis on STEM education[2]. The goal of such programs is to strengthen the high school STEM infrastructure and therefore, produce more professionals in STEM areas. Some experts in the field predict that, if trends continue, then most of the world's scientists and engineers will live in Asia[9].

Since 1989, states have continued to increase the number of math and science credits needed to graduate from high school[2]. "Thirty-eight states established high school graduation standards that require three years of mathematics, and 35 states have a standard that requires three years of science"[1].

Additionally, "forty-eight states now have standards for what students should know and be able to do with technology"[2]. As states require more STEM graduation requirements, there must be more qualified teachers to instruct students in these topics.

In order to alleviate teaching shortages, states have increased legislation to allow people to become certified to teach secondary education through alternative methods. These alternative teacher certification programs began in the 1980s. Now, nearly all states have such certification plans in place. These plans vary in structure. Some programs focus on aiding former soldiers in their transition to become teacher certified while others encourage midcareer professionals to shift into the classroom. Regardless of the route to alternative certification, the goal is the same. These programs are designed to certify people to become educators with minimal coursework and in a short period of time, while allowing them to bring their industry experience into the classroom[3]. Often, these programs are referred to as transition to teaching. Specifically, in Indiana, legislators have limited transition to teaching programs to 18 credit hours to prepare professionals for the education world.

Many barriers exist in preventing individuals from entering the education world. In 2001, a study focused on individuals choosing non-education careers and found two major reasons for their choice not to go into education: "They wanted careers where their salary would keep pace with their performance, and they didn't want to return to school to take education courses that have questionable value"[10]. Another study indicates that many individuals have concerns about the working conditions for teachers. A survey of potential teachers found that over forty percent had concerns about salaries and thirty percent felt school conditions needed much improvement[11]. Another barrier that exists is the costs associated with becoming certified. Many individuals are reluctant to transition into teaching because they are unwilling to pay the tuition for certification programs[4].

In order to remove some of the barriers that currently block individuals from teaching, the government has taken many steps. The government has increased scholarship money available to those willing to become certified and then work in high-need schools[4]. Other legislation focuses on "loan forgiveness and tax incentives" for teachers in high-need subjects[9].

Organizations, like the Woodrow Wilson National Fellowship Foundation, try to further remove barriers by providing fellowships to individuals with backgrounds in STEM areas. A study by the Woodrow Wilson National Fellowship Foundation found that "more than two of every five college graduates between the ages of 24 and 60 would consider teaching as a second career in the future"[11]. In order to turn consideration into reality, organizations like the Woodrow Wilson National Fellowship Foundation award talented people $30,000 fellowships to help offset the fees associated with becoming certified. Participants are required to teach in a STEM area in a high-need school. The objective behind this plan is to provide more effective teachers desperately needed in STEM areas in high-need schools.

By investigating undergraduate STEM students' perceptions and interest in teaching, this study can add to the research in this field. Additionally, with the Woodrow Wilson National Fellowship Foundation offering fellowships to IUPUI students in the near future, the results of the survey can be used to ascertain the attitude of IUPUI students toward such programs. Finally, to help alleviate shortages in the STEM education world, data from the survey can be used to develop solutions.

Research Purpose

Certain obstacles discourage some individuals from pursuing careers in education. At the same time, some individuals in industry desire to become certified educators. With many education positions going unfilled each year and increased governmental support of STEM initiatives, fellowship-providing organizations offer incentives in an attempt to encourage individuals to embrace teaching careers. This paper investigates Indiana undergraduate STEM students' perceptions and interest in transition to teaching programs and explores what barriers exist in preventing these individuals from becoming educators. By identifying possible barriers, issues can be addressed and potential solutions can be determined.

By examining STEM undergraduate students' perceptions of teaching, much relevant information can be found. Following college graduation, these individuals will become professionals in various STEM areas. Even though the undergraduate students have not entered the workforce, they have given much thought and consideration to their career choices and preparation. Since the undergraduate STEM student and the STEM professional have pursued similar career preparation, STEM undergraduate students' attitudes toward teaching are reflective of STEM industry professionals' perceptions toward teaching.

The number of organizations offering financial support to individuals to encourage them to shift from a specific industry into education continues to increase. In Indiana, beginning next year, the Woodrow Wilson National Fellowship Foundation will select qualified individuals, possessing non-education STEM baccalaureate degrees, interested in obtaining teaching certification and will award these individuals fellowships.

By investigating STEM undergraduate students' views on teaching secondary education, interest in programs such as the Woodrow Wilson initiative and in teaching, in general, can be determined. In addition, this study may identify factors that discourage individuals from careers in education. These findings can be valuable to universities creating transition to teaching programs and lawmakers who attempt to implement legislation that minimizes barriers.

Specifically, the information gathered from this study is useful to Indiana University Purdue University Indianapolis (IUPUI). IUPUI, along with Ball State, Purdue University, and University of Indianapolis, has been selected as a site for the Woodrow Wilson Indiana Teaching Fellowship. The information can help IUPUI Woodrow Wilson Fellows overcome barriers that exist in discouraging people from pursuing education careers, and this information can then be used to recruit talented individuals with STEM experience to the Woodrow Wilson National Fellowship Foundation initiative.

In order to gain more insight into undergraduate student perceptions, the following research questions were analyzed.

1. Does interest in teaching in a STEM discipline vary between gender and among major, race, age, and collegiate level?
2. What STEM subject matter would STEM undergraduate students prefer to teach?
3. If given financial incentive, would a STEM undergraduate student's interest in becoming certified to teach increase?
4. Based on location and size of school, where would STEM undergraduate students prefer to teach?

5. What type of masters degree, that would lead to teaching certification, do undergraduate students prefer?
6. What do STEM undergraduate students view as barriers, preventing them from pursuing a teaching career?

Method

In this study, the population consisted of undergraduate students in STEM majors. In an attempt to ascertain STEM undergraduate student perceptions and attitudes toward teaching, IUPUI undergraduate students majoring in STEM areas were selected as participants. Students enrolled in Physics 152 Lab (Mechanics), Technology 104 (Technical Graphics Communications), and Electrical and Computer Engineering Technology 351 (Instrumentation Application for Technology) were administered the surveys. From these three courses, 92 surveys were collected, and 89 of the surveys were useable.

For this study, the materials consisted of a small packet of information: informed consent, brief description of the study, and the survey. To see the informed consent forms and entire survey, please refer to Appendix A. The fourteen questions on the survey measured a participant's interest in teaching and what, if any, barriers exist that would prevent him/her from pursuing an education career. Additionally, demographic data and general information about each participant were collected.

The first three questions of the survey focus on which STEM areas an individual would like to teach and in what school setting (rural or urban) and sized school the surveyed individual prefers. The next two questions concentrate on barriers that exist and prevent individuals from teaching and how these barriers can be overcome. Next, there are two questions that determine the participant's overall interest in teaching. Finally, the remaining questions are used to collect demographic data and general information about the participant.

Depending on instructor preference, the survey was given at the beginning or end of the class period with the researcher present to explain the purpose of the study. Students received a brief description of the study, and then, they were given the informed consent document. Those students who agreed to participate in the study were given surveys. Once participants were finished completing the survey, they were asked to place the document in an envelope in the front of the room.

Results

In order to address the research questions and determine STEM undergraduate interest in and perception of secondary education, many different hypotheses were tested. Demographic data was analyzed in order to see if variance existed between gender and among major, race, age, and collegiate level. Additionally, teaching preference was examined based on location and size of school and subject matter. Perceptions of barriers and whether scholarship money would increase interest in teaching were also investigated.

Research Question 1: Does interest in teaching in a STEM discipline vary between gender and among major, race, age, and collegiate level?

To test the hypothesis that undergraduate STEM students' interest in teaching varies between gender, an independent-samples t test was calculated comparing the level of interest in teaching between male and female participants. No significant difference was found ($t(85) = .600$, $p > .05$). The mean of

female participants (m=2.000, sd=.926) was not significantly different from the mean of male participants (m=2.215, sd=.969).

To test the hypothesis that undergraduate STEM students' interest in teaching varies among major, the interest in teaching levels of undergraduate students majoring in science, technology, engineering, and mathematics were compared using a one-way ANOVA. No significant difference was found (F (3, 84) = .399, $p > .05$). Students' interest in teaching in the future did not differ significantly based on major (Science, Technology, Engineering, and Mathematics). Descriptive statistics are shown in the following table.

Major	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Science	10	2.5000	1.26930	.40139	1.5920	3.4080	1.00	4.00
Technology	56	2.1429	.96160	.12850	1.8853	2.4004	1.00	5.00
Engineering	21	2.1905	.81358	.17754	1.8201	2.5608	1.00	4.00
Math	1	2.0000	.	.	.	.	2.00	2.00
Total	88	2.1932	.95722	.10204	1.9904	2.3960	1.00	5.00

To test the hypothesis that undergraduate STEM students' interest in teaching varies among race, the interest in teaching levels of undergraduate students of different races was compared using a one-way ANOVA. No significant difference was found (F (5, 77) = 1.839, p >.05). Students' interest in teaching in the future did not differ significantly based on race.

Race	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Caucasian	61	2.1148	.87747	.11235	1.8900	2.3395	1.00	4.00
African American	6	2.3333	1.03280	.42164	1.2495	3.4172	1.00	4.00
Hispanic	2	2.0000	1.41421	1.00000	-10.7062	14.7062	1.00	3.00
Middle Eastern	3	2.0000	1.00000	.57735	-.4841	4.4841	1.00	3.00
Asian	4	1.7500	.95743	.47871	.2265	3.2735	1.00	3.00
Other	7	3.1429	1.06904	.40406	2.1542	4.1316	2.00	5.00
Total	83	2.1928	.94298	.10351	1.9869	2.3987	1.00	5.00

To test the hypothesis that undergraduate STEM students' interest in teaching varies among age groups, the interest in teaching levels of undergraduate students of different ages were compared using

a one-way ANOVA. No significant difference was found (F (3, 81) = .564, p >.05). Students' interest in teaching in the future did not differ significantly based on age. Students between the ages of 18-26 had a mean interest of 2.179 (*sd*=.869); students between the ages of 27-35 had a mean interest of 2.200 (*sd*=1.373); and students 36 and up had a mean interest of 2.000 (*sd*=1.000).

To test the hypothesis that undergraduate STEM students interest in teaching varies among collegiate grade level, the interest in teaching levels of undergraduate students of different collegiate level were compared using a one-way ANOVA. No significant difference was found (F (3, 79) = 1.014, p >.05). Students' interest in teaching in the future did not differ significantly based on collegiate level. Freshman students had a mean interest in teaching of 2.300 (*sd*=.865); sophomore students had a mean interest in teaching of 1.961 (*sd*=.871); junior students had a mean interest in teaching of 2.500 (*sd*=1.087); and senior students had a mean interest in teaching of 2.280 (*sd*=1.100).

Research Question 2: What STEM subject matter would STEM undergraduate students prefer to teach?

The survey asked students to rank their interest in teaching of Science Education, Engineering Technology Education, Mathematics Education, and Computer Education from 1-4, with 1 being most interested to 4 being least interested. Of the 89 useable surveys, 72 students answered this question. Thirteen participants ranked Science Education as number one (18.1%); thirty-one of the participants ranked Engineering Technology Education as number one (34.8%); sixteen of the participants ranked Math Education as number one (18.0%); and twelve students ranked Computer Education as number one (13.5%). Next students were asked what combination of Science, Engineering Technology, Mathematics, or Computer Education they would prefer to teach. The results are in the table.

Combination Chosen	Frequency	Percent	Valid Percent	Cumulative Percent
Science/Math	15	16.9	17.6	17.6
Science/ Eng Technology	13	14.6	15.3	32.9
Science/Computer	2	2.2	2.4	35.3
Eng Technology/Math	30	33.7	35.3	70.6
Eng Technology/Computer	16	18.0	18.8	89.4
Math/Computer	9	10.1	10.6	100.0
Total	85	95.5	100.0	

Research Question 3: If given financial incentive, would a STEM undergraduate student's interest in becoming certified to teach increase?

To test the hypothesis that participants' interest in teaching secondary education would increase if they were offered a fellowship that covered tuition and expenses associated with becoming certified, a one-way ANOVA was computed comparing the responses of participants who were grouped by how much they agreed that the fellowship would increase interest (disagree, neutral, and agree). As a result of the fellowship, if students did not see themselves teaching in the future, they chose disagree; if students were uncertain, they chose neutral, and if they could see teaching in their future, students chose agree. A significant difference was found among the groups (F(2,84) = 6.654, p<.05). Tukey's *HSD* was used to determine the nature of the differences between the groups. This analysis revealed that given a

fellowship, most students would be more likely to become certified in secondary education. Group three (Agree) (m=2.553, sd=1.0319) was significantly different than both group one (Disagree) (m=1.647, sd=.606) and group two (Neutral) (m=2.031, sd=.861).

Research Question 4: Based on location and size of school, where would STEM undergraduate students prefer to teach?

Students were asked where they would prefer to teach—rural, urban, or suburban. Eighty-eight students answered this question, and twenty-eight students chose rural (31.8%); twenty-four students chose urban (27.3%); and thirty-six students chose suburban (40.9%). Additionally, students were asked in what size school they would prefer to teach (Less than 500, Between 500-1000, Between 1001-1500, or Over 1500). Of the surveyed students, eighty-seven answered the question, and twenty participants said that they would prefer to teach at a school with less than 500 students (23%); thirty-two of the participants said they would prefer to teach at a school with 500-1000 students (36.8%); twenty-two of the participants said they would prefer to teach at a school with 1001-1500 students (25.3%); and thirteen of the students said they would prefer to teach at a school with over 1500 students (14.9%).

Research Question 5: What type of masters degree, that would lead to teaching certification, do undergraduate students prefer?

Students were asked in which area they would prefer to get a master degree in with the following choices: technology, education, or mathematics. Eighty-nine of the participants answered this question, and sixty of the respondents chose technology (69.8%); nine chose education (10.5%); and seventeen chose math (19.8%).

Research Question 6: What do STEM undergraduate students view as barriers, preventing them from pursuing a teaching career?

Participants were asked what barriers exist in preventing them from teaching secondary education. Most students left this question blank (37.1%). The next most popular response was salary (31.5%). Other barriers listed included different career objectives (14.6%), communication skills (8.9%), dealing with children (4.5%), and certification requirements (3.4%).

Discussion and Limitations

Findings from this study suggest that most undergraduate students do not see themselves teaching in the secondary education field in the future. When asked whether they could see themselves teaching in the future, less than 10% of the eighty-eight students answering the question said they agreed or strongly agreed. This interest in teaching level does not vary over gender, major, race, age, or collegiate level. The results of the survey do not match up with a study conducted by the Woodrow Wilson National Fellowship Foundation that found over 40% of college graduates would contemplate teaching in the future[10]. Obviously, this is not a clear comparison because the participants in this study had yet to graduate, and the participants in Woodrow Wilson study were already in the workforce.

When asked what subject they would most prefer to teach at the secondary level, most participants ranked engineering technology as number one. Similarly, when asked to pick a combination of STEM topics to teach, the engineering technology and math combination was most popular. This could indicate one of two implications. This finding could suggest that engineering technology is most

attractive to undergraduate STEM students, or the results could be biased toward engineering technology education because the majority of respondents were engineering or technology majors (87.6%).

The results of the survey also indicate that most of the participants would choose to teach in a suburban school (40.9%), with the rest of the respondents choosing either rural (31.8%) or urban (27.3%). These findings mirror research that indicates that rural and urban schools have a harder time attracting teachers. However, the gap between suburban and rural/urban might be expected to be a little greater than what the survey results show. These responses indicate that overall respondents are least attracted to teaching in an urban setting. This is a particularly interesting finding considering these surveyed individuals have chosen to attend IUPUI, an urban campus, but do not prefer to teach in an urban school.

Additionally, the results of the study do indicate that financial assistance in the certification process does make people more likely to consider teaching in the future. This statistical finding supports the reason for increased government initiatives that award scholarship money to individuals willing to become certified in high-need areas. In addition, this confirms why organizations like the Woodrow Wilson National Fellowship Foundation take the scholarship approach in attracting individuals to STEM education.

Interestingly, participants were asked what barriers exist in preventing them from teaching secondary education. Most students left this question blank (37.1%). The next most popular response was salary (31.5%). Other barriers listed included different career objectives (14.6%), communication skills (8.9%), dealing with children (4.5%), and certification requirements (3.4%). Participants listed "paying teachers more" most often as the best way to overcome these barriers. The salary concerns match with previous research studies[5 & 10].

Multiple limitations exist in this study. For example, the attributes of the respondents of this survey make applying the results to all STEM undergraduate students difficult. First of all, of the surveyed students, only eight of them were female (9%). Also, nearly 90% of the students surveyed were engineering or technology majors. Therefore, the results could be biased toward the opinions of male students and the attitudes of engineering and technology students. To alleviate this problem, a sample with more females and more representation from science and mathematics majors would be more representative of the population.

Another limiting factor of the study was with the survey. On certain questions, students did not answer as intended. For example, the first question of the survey asked participants to rank in order (1-4) of interest to teach science, engineering technology, math, and computer education. Many students used numbers multiple times instead of using each number between one and four once. Directions on this question should be rewritten to remove any ambiguity. Additionally, the survey was not pretested. In the future, the survey should be pretested to improve reliability and validity.

Additionally, students were given an open-ended question that asked what barriers exist that would prevent them from teaching secondary education. Many students did not answer, but then, the same students indicated that they did not see themselves teaching in the future. Apparently, some barrier exists in preventing such students from teaching, even if it is a personality trait or no desire. Another problem with this question was that many participants chose not to write anything. To determine a more accurate view of barriers and to solicit more responses, in the future, this question should be rewritten in a way that gives participants specific choices from which to choose.

In the future, research on this topic can be expanded to gain more insight on the transition to secondary education field. First of all, to improve research of the same nature, the changes mentioned above can be made to the survey to obtain more reliable results. Then, results from the improved survey can be compared to the results from the first study. When developing the survey questions, *Research Methods and Statistics* by Sherri L. Jackson was used as a guide[12].

Additionally, in a more complex survey, tracking students currently majoring in STEM areas beyond graduation would be revealing. If student perceptions were obtained while they were still in college, these opinions can be compared with their perceptions toward teaching after they have become professionals with experience in their respective fields.

Summary and Recommendations

Overall, statistical analysis conducted on the survey results revealed the following findings: Survey participants' interest in teaching did not vary based on gender, major, race, and age. Of the surveyed individuals, if placed in a teaching environment, most would prefer to be certified in engineering technology education (34.8%) and teach in a suburban school (40.9%). Additionally, if given a fellowship, most participants would be more likely to become certified in secondary education. Finally, teacher salary was listed most frequently as a barrier to preventing individuals from pursuing teacher careers.

These statistical findings can help inform future policy related to STEM teacher preparation. If STEM careers and education continue to be a main concern for the U.S. government, more legislation should be designed to create opportunities that reduce barriers that prevent talented individuals from entering the teaching workforce. In the future, government officials may dedicate additional funds to fellowship initiatives to assist in paying for certification, limit requirements of the certification process by reducing the amount of required coursework, or mandate teacher salary requirements to create more financial incentives.

Policymakers concerned about current trends in teaching including substantial impending retirements, unacceptably high levels of turnover among novice teachers, chronic mal-distribution of qualified teachers between affluent and low wealth schools, and issues of diversity would do well to pay heed to the results of this study and other research by the Woodrow Wilson National Fellowship Foundation [13]. Although there has been an upsurge in programs to tap career changers in the past 20 years, much more needs to be done to create programs that meet the needs of experienced adult learners, provide the financial incentives that can overcome the practical concerns that respondents indicate, and create improved programs of preparation and support for prospective career changers. Tapping their potential will require more than just alternative routes to certification and accelerated routes to the classroom. It will take a more thoughtful approach to identifying and nurturing talent for teaching, and to developing and deploying teaching expertise in the schools where it is needed most. However, there are more than enough examples of programs that do this well. The policy changes that would open teaching to a far broader talent pool are well within the nation's grasp if the public and political will to implement them can be effectively mobilized [13].

As increased incentives are provided to individuals who are willing to transition into STEM teaching careers, more professionals will be attracted to becoming certified. Teacher preparation programs—especially transition to teaching programs—will undoubtedly grow and should be ready to handle increased enrollment volume. Additionally, teacher preparation programs must design curriculum and

resources that prepare preservice teachers to be efficient in any classroom setting, especially urban and rural classrooms. With escalated demand in urban and rural schools, preservice teachers must be aware of and capable of embracing the special needs of these schools and promoting the unique benefits that also exist in urban and rural settings.

There has been a significant increase over the past two decades in programs designed to bring mid- and second-career professionals and other delayed entrants into teaching. Research indicates that these programs have the ability to attract a more diverse pool of potential teachers in terms of age, gender, race, ethnicity, and prior experience[14]. However, more targeted efforts are needed to attract STEM teacher candidates with the most desirable mix of skills, expertise, and content knowledge and develop programs that effectively tap their potential for promoting better learner outcomes. Greater incentives (in the form of stipends, partial salary support, and loan forgiveness) are needed to support midcareer changers in making successful transitions to teaching. At the same time, teacher educators and school district leaders should expand opportunities for prospective mid- and second-career STEM candidates to explore teaching through short-term or part-time roles in schools. Finally, prospective mid- and second-career teachers want to be effective in the classroom. Their success hinges upon excellent, targeted teacher preparation, as well as supported positive initial teaching experiences. Current programs of teacher preparation, incentives for those who choose STEM fields and public policy may require considerable reengineering to accomplish the necessary goals[14].

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Appendix A

Interest in Teaching Survey
Statement of Informed Consent

You are invited to participate in a research study focusing on interest in teaching. You were selected because you are currently majoring in a Science, Technology, Engineering, or Mathematics (STEM) field. Please read this document and ask any questions you may have before agreeing to participate in this study. Adrie Koehler, a technology graduate student, is conducting the study.

Study Purpose:
The purpose of this study is to evaluate STEM undergraduate students' interest in teaching.

Procedure for the Study:
If you agree to participate in the study, you will complete a short survey. The survey should only take 5-10 minutes to complete. Once you are finished with the survey, you can place it in the envelope in the front of the room.

Confidentiality:
The survey is anonymous and all responses are confidential. Individual responses collected from the survey will not be released—only summary data will be analyzed.

Voluntary Nature of Study:
Participating in this survey is voluntary. You may choose not to take part in this study, and/or you may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled.

Compensation:
There is no cost to participants to take part in this study. Additionally, there is no direct compensation for participation in this study.

Contact for Questions or Concerns:
For questions about the study or a research-related injury, contact the researcher Adrie Koehler at (812) 249-9313. If you cannot reach the researcher during regular business hours (8:00AM-5:00PM), please call the IUPUI/Clarian Research Compliance Administration office at (317) 278-3458 or (800) 696-2949.

For questions about your rights as a research participant; to discuss problems, complaints or concerns about a research study; to obtain information; or to offer input, contact the IUPUI/Clarian Research Compliance Administration office at (317) 278-3458 or (800) 696-2949.

Interest in Teaching
Informed Consent Form

PRINT Name:_____

Please check **ONE** paragraph and sign at the bottom of the document. Thank you.

____ **YES—**I have read the Statement of Informed Consent, and I agree to participate in this study. I understand my participation is voluntary and that I may withdraw, without penalty at anytime.

____ **NO—**I have read the Statement of Informed Consent, and I do not choose to participate in this study. I understand I will suffer no penalty because of this choice.

Signature:_____

If you would like to receive a copy of the results, please enter an e-mail address:

_____

Interest in Teaching Survey

1. If you were to teach secondary education (middle school and/or high school), which area would you be interested in teaching? Please rank the following areas 1-4, with **1=most interested** and **4=least interested**.

_____ **Science Education**—teaching life science, physical science, earth science, physics, or chemistry

_____ **Engineering Technology Education**—teaching construction, engineering, manufacturing, drafting, transportation, and design

_____ **Math Education**—teaching pre-algebra, algebra, geometry, pre-calculus/trigonometry, statistics, and calculus

_____ **Computer Education**—teaching computer applications (word processing, spreadsheets, databases, and presentation software) and computer programming

2. If you could teach a combination of any two of the areas listed above, which combination would you be most interested in teaching? Place a check by **one** combination. (Refer to the definitions of teaching areas listed above, if necessary.)

_____ **Science/Math**

_____ **Science/Engineering Technology**

_____ **Science/Computer**

_____ **Engineering Technology/Math**

_____ **Engineering Technology/Computer**

_____ **Math/Computer**

3. In which setting would you most prefer to teach? (Place a check by **one** choice.)

_____ **Rural**
_____ **Urban**
_____ **Suburban**

4. In what size school would you most prefer to teach? (Place a check by **one** choice.)

_____ **Less than 500 students**
_____ **500-1000 students**
_____ **1001-1500 students**
_____ **Over 1500 students**

5. List any barriers that exist that would keep you from teaching secondary education (middle school and/or high school).

6. What can be done to overcome these barriers?

For questions 7 & 8, circle the number that indicates how much you agree or disagree with the following statements:

7. I see myself teaching at the secondary level in the future.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

8. If I were the recipient of a fellowship that covered tuition and expenses associated with becoming certified in secondary education, I would be more interested in teaching.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

9. If you were to enroll in a Graduate Degree program to get your secondary (middle school and/or high school) teaching license in a STEM discipline, which would you prefer? (Check one please).

_____MS in Technology _____MS in Secondary Education _____MS in Math

Tell me a bit about yourself:

10. Gender _____ **11.** Major _____ **12.** Race _____

13. Age (Circle one) 18-26 | 27-35 | 36 and over **14.** Collegiate Level (Circle one) Fresh | Soph | Jun | Sen