

# Redwood **Science** Project Preliminary Report<sup>1</sup> – March 2, 2006

## Factors Affecting Science Undergraduates Choice of Teaching as a Career: A Case Study at Humboldt State University<sup>2</sup>

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### Abstract

The science teacher shortage reaches beyond national boundaries as governments search for solutions to recruit and retain qualified teachers in the area of science. Educators and policymakers alike are troubled by the diminishing number of graduating science teachers. Concerns regarding who will educate future generations in science have prompted action in the United States including the formation of non-traditional recruitment programs as well as monetary incentives. Research is needed to understand how to better attract individuals to the teaching profession particularly bright science undergraduates. To address these concerns, our study aims: 1) to conduct scientific research on the factors, attitudes, and perceptions that influence and contribute to undergraduates deciding to enter a science teaching career; and 2) to apply this research to increasing the number of qualified science teachers in California. In order to meet these objectives, we will conduct a large scale survey among undergraduates at Humboldt State University that will provide both quantitative and qualitative data. The long term goal of this project is to better understand student populations and their career choices so that science and education programs can be appropriately modified to better attract and retain qualified individuals interested in entering the teaching profession. While this study will be initially limited to students attending Humboldt State University, we hope to collaborate with other California State Universities to gain a broader understanding of these issues.

1 Report available at [www.humboldt.edu/~rsp](http://www.humboldt.edu/~rsp)

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## **Background and Introduction**

The science teacher shortage is a global issue affecting many nations, including the United States, United Kingdom, Canada and Australia (Macdonald 1999). This shortage can be traced back to the early 1980's and continues to trouble educators and policymakers alike as the number of graduating science teachers continues to wane (Darling-Hammond, Hudson and Kirby 1989). Worries of who will educate future generations in science have prompted action in the United States including the formation of non-traditional and collaborative recruitment programs, loan forgiveness programs, and monetary incentives including signing bonuses (Clewell and Forcier 2000). Furthermore, with current laws mandating "highly qualified teachers" for all students, there is a palpable push to recruit the best and brightest science undergraduates into teaching. However, studies show that science teachers tend to be the lower achieving science undergraduates (Schlechty and Vance 1983; Shugart and Hounshell 1995). There is also evidence to suggest that science teacher candidates who are more academically inclined (scored higher on subject matter tests) have a higher chance of not entering the teaching profession or dropping out after a short time (Shugart and Hounshell 1995).

The extent to which high achieving science undergraduates choose not to teach is based on several factors. Undergraduates in general consistently cite poor social status, disruptive and unmotivated students, and little opportunity for advancement as major reasons why a career in teaching is unattractive (Evans 1984; Kyriacou and Coulthard 2000). The comparatively low salaries earned by mathematics and science teachers as compared to those of science professionals is another issue challenging the recruitment of quality teachers in this area (Clewell and Forcier 2000, p.20-21). There is evidence that science undergraduates may have particularly negative perceptions of the teaching profession, which may influence them to choose other careers. However, early exposure to the joys of teaching and successful teachers may impact their attitudes in a positive way.

As factors and perceptions vary among individuals, it is useful to develop profiles to group students with similar interest/lack of interest in teaching and overall perceptions of teaching (Kyriacou and Coulthard, 2000). For example, these profiles may be broadly

defined as: students definitely not considering teaching, those strongly considering teaching, and students that are unsure about their career choice. By exploring the factors that influence these student profiles we can further pinpoint target areas in need of modification. The profile of most interest is those individuals that are unsure or undecided about a career, as this group is less rooted in their decision and is still considering career pathways.

Multiple studies have evaluated various career factors influencing in-service or pre-service teachers (Espinet, Simmons and Atwater 1992; Johnston, McKeown, McEwen 1999; Loadman et al 1999; Macdonald 1999; Su 1997). Several studies outside of the United States have provided further insight into who becomes a teacher and how cultural, social, political, and economic influences play a role in how teachers are perceived in: Jamaica (Bastick 2000); Turkey (Saban 2003); Taiwan (Wang 2004); and Ghana, Lesotho, Malawai, and Trinidad and Tobago (Coults and Lewin 2002). Yet, there is a scarcity of literature that addresses groups that have not necessarily decided to pursue a teaching profession (Kyriacou and Coulthard 2000). More research is needed to understand what factors influence their career choices.

Of particular interest due to the shortage of science teachers are factors responsible for science undergraduates choosing or not choosing teaching as a profession. More sophisticated analysis and longitudinal studies with larger samples sizes are needed to address these issues (Edmonds, Sharp, and Benefield 2002). Additional data may suggest alternative strategies to increase the supply of teachers in math and science (Clewell and Forcier 2000, p.23). Scores of successful science teachers work at schools, influencing and enlightening students daily. These educators chose science teaching among a myriad of choices and as many studies show, for a diversity of reasons (Espinet, Simmons, and Atwater 1992; Jenkins 1998; Eick 2002). Using evidence-based research to understand factors that influence career choices among different populations, such as undergraduate science majors can further contribute to solutions for tackling the problem of science teacher shortages at a state and national level.

## **Project Objectives**

To address these concerns, we are conducting a survey among undergraduates at Humboldt State University to evaluate attitudes toward a teaching career and factors that influence and contribute to career choices. The survey specifically focuses on choices regarding a science teaching career. By understanding what undergraduates want from a career and their perception of what a teaching career offers, we can determine the degree of correspondence between these two perceptions and better identify critical factors that maybe changed to make teaching a more attractive career option. The long term goal of this project is to better understand undergraduate populations, specifically science majors, and their career choices so that science and education programs can be appropriately modified to better attract, recruit and retain qualified individuals interested in entering the science teaching profession. The project goals are further supported by the Glenn commission and the U.S. Commission on National Security for the 21<sup>st</sup> Century who recommend making "...it a top priority to attract and retain more qualified mathematics, science, and technology teachers.." (California Council on Science and Technology 2002, p.18). While this study will be initially limited to students attending Humboldt State University, we hope to collaborate with other California State Universities to gain a broader understanding of these issues.

## **Research Design and Methods**

The initial phase of the project involved a Pilot Survey, which was conducted in Fall 2005 primarily among undergraduates at Humboldt State University. This phase will inform us of survey questions needing modification to more appropriately address our research goals. In Spring 2006, we will conduct the official survey.

The survey questions were generated based on: 1) a review of the relevant literature to identify attitudes, factors, and perceptions that may influence career choice, and 2) questions adapted from reliable and valid questionnaire and survey instruments developed for evaluating such questions (Espinoza et al. 2004; Johnston, McKeown, and McEwen 1999; LaTurner 2002; Loadman et al. 1999). Both quantitative and qualitative data will be gathered from the survey. The initial questions provide general demographic information regarding the student's chosen major, year in program, age, gender, race/ethnicity, transfer status, GPA, and number of science courses taken. The

bulk of the survey is a series of closed-response questions regarding career choice in which the participant rates the statements using a Likert scale ranging from 1 to 5 of “strongly disagree” to “neutral” to “strongly agree” respectively. A few open-response questions are included to further understand responses to the closed-response questions. All research instruments were approved by the Humboldt State University Institutional Review Board in November 2005 (Approval Number 05-23) and will continue to be approved as modifications are made.

Our pool of subjects will include: science majors, science minors, and a small sample of undeclared majors. The criteria used to determine our sample population will be based on current Humboldt State University Census Data regarding declared majors.

**Preliminary Results from Fall 2005 Pilot Survey**

We surveyed 13 classes distributed across eight departments (Table 1).

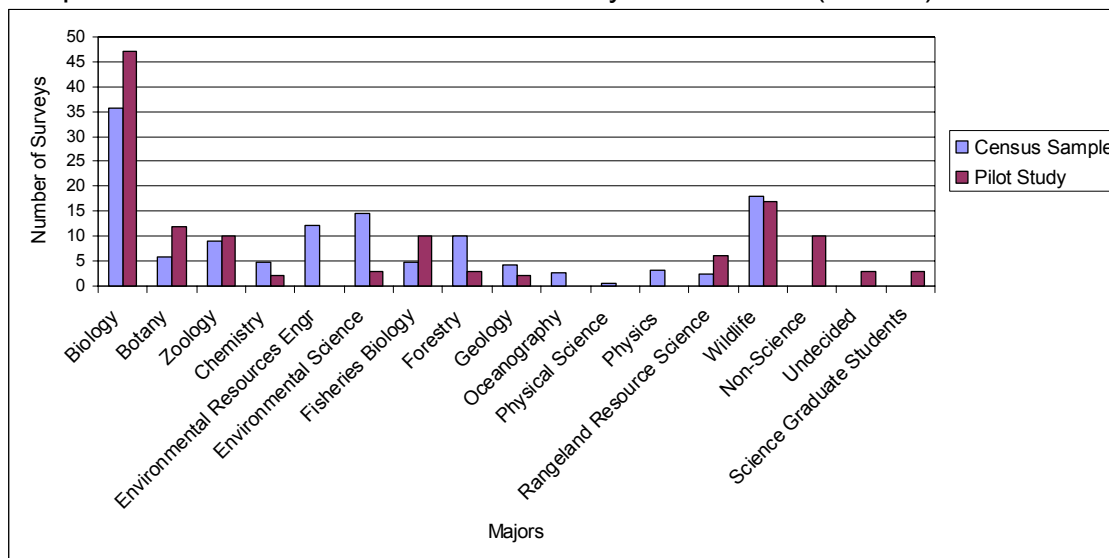
Table 1. Distribution of participants from classes surveyed.

Department	Classes	Number of Participants
Biology	4	59
Botany	1	13
Chemistry	3	20
Environmental Science	1	1
Fisheries	1	9
Geology	1	2
Wildlife	1	11
Zoology	1	13
<i>Total</i>	<i>13</i>	<i>128</i>

Our sample population was based on the Humboldt State University Census Data for majors from Fall 2005. We initially selected all majors within the Natural Sciences College (n = 55). This set was further refined to include majors with basic science course requirements. The following 14 majors were classified as science majors for this study: Biology, Botany, Zoology, Chemistry, Environmental Resources Engineering, Environmental Science, Fisheries Biology, Forestry, Geology, Oceanography, Physical Science, Physics, Rangeland Resource Science, and Wildlife. In Fall 2005, a total of 1782 undergraduate students had declared one or more of the above science majors.

During our pilot study, a total of 128 surveys were completed and included science majors (88%), non-science majors (8%), students undecided about their majors (2%), and science graduate students (2%). From the pilot survey data, 112 participants were science majors which represents 6% of the total declared science majors at Humboldt State University during Fall 2005 (n = 1782). This percentage does not include non-science majors nor does it include science graduate students. Figure 1 illustrates the distribution of majors from our pilot data and further compares it with a distribution sample based on the Humboldt State University Census Data. Ten of the 14 majors were collected for the pilot study. The distribution of our pilot study is representative of the distribution of the Census Data providing us an appropriate data set to further refine our survey instrument.

Figure 1: Distribution of majors included in pilot study (n = 128) compared with a sample based on Humboldt State University census data (n =128) for Fall 2005.



**Demographics:**

The mean age from the pilot sample was 24 years old with age ranging from 18 to 48 (Table 2). Fifty-nine percent of the surveys were completed by females and 41% by males. The majority of the participants were Caucasian/White/Non-Hispanic (70%). The current GPA overall and the current GPA for the participant’s major was predominately in the 2.50 – 3.49 range. The majority of the students in our sample plan to either complete their Bachelors degree (26%) or attain a Masters degree (32%) or a PhD degree (23%).

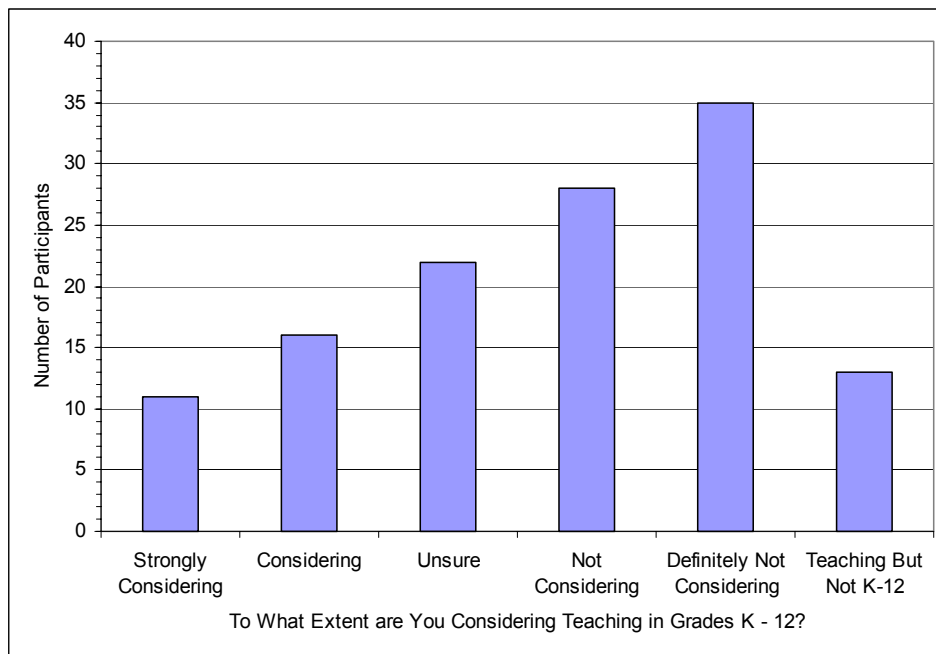
Table 2: Pilot study demographics

Sample size (n)	128
Age range	18 – 48
Mean age	24
Gender	
Female	75 (59%)
Male	53 (41%)
Ethnicity	
African American/Black	1 (1%)
Asian American/Pacific Islander	5 (4%)
Caucasian/White/Non-Hispanic	89 (70%)
Hispanic/Latin American	11 (9%)
Native American	2 (2%)
Multi-racial	4 (3%)
Other	6 (5%)
Decline to State	9 (7%)
Current Overall GPA	
3.50 – 4.00	31 (24%)
2.50 – 3.49	66 (52%)
1.50 – 2.49	13 (10%)
No response	18 (14%)
Current GPA for Major	
3.50 – 4.00	35 (27%)
2.50 – 3.49	52 (41%)
1.50 – 2.49	15 (12%)
No response	26 (20%)

*Student profiles:*

Figure 2 shows the number of participants considering teaching in K – 12 in varying degrees. A small number would enjoy teaching but are not interested in teaching in K – 12. Those ‘definitely not considering’ teaching in grades K – 12 represent the largest group (28%, n = 128) and those ‘strongly considering’ teaching represent the smallest group (9%). However, if we combine those participants that are ‘considering’ and ‘not considering’ as part of the ‘unsure’ profile then this combined group has the majority of students (55%, n = 128).

Figure 2: The extent that participants from Fall 2005 pilot study are considering teaching in Grades K – 12 (n = 128).



Of those that are ‘strongly considering’ teaching, ‘considering’ teaching, or are ‘unsure’ about teaching 71% (n = 46) prefer to teach in grades 6 – 12. A couple of participants were interested in all grades excluding middle school (4%) and several would teach in any K - 12 grade level (9%). There is less preference for teaching in elementary schools (13%).

*Factors:*

Based on our initial analysis of the open-response questions, some of the key factors reported by students that influence or discourage them to pursue a teaching career are reported in Figure 3. The most frequently reported factor was ‘want to make a difference.’ Other altruistic reasons that were frequently mentioned were ‘want to share knowledge’ and ‘like to help people.’ A number of students have had ‘positive past influences’ that have persuaded them to consider a teaching career. Influences mentioned were past teachers that were supportive, volunteer experience, and being involved in school activities. Even negative past school experiences inspired some students to consider teaching as an opportunity to make a difference. The ‘favorable schedule’ including summers off, good hours, and ability to balance family and job was also attractive in considering a teaching career.

The most discouraging factor reported in our pilot study was ‘poor pay.’ Some students just ‘don’t enjoy working with kids’ or ‘don’t want to teach’. Other factors that discouraged students were ‘negative student attitudes’ and ‘negative bureaucracy/politics.’ Students also mentioned that they ‘lack patience’ and ‘lack teaching skills’ such as ability to explain ideas, nurturing personality, and ability to work with young age groups.

Figure 3: Most frequently reported factors influencing and discouraging participants to consider a teaching career (participants, n = 128).

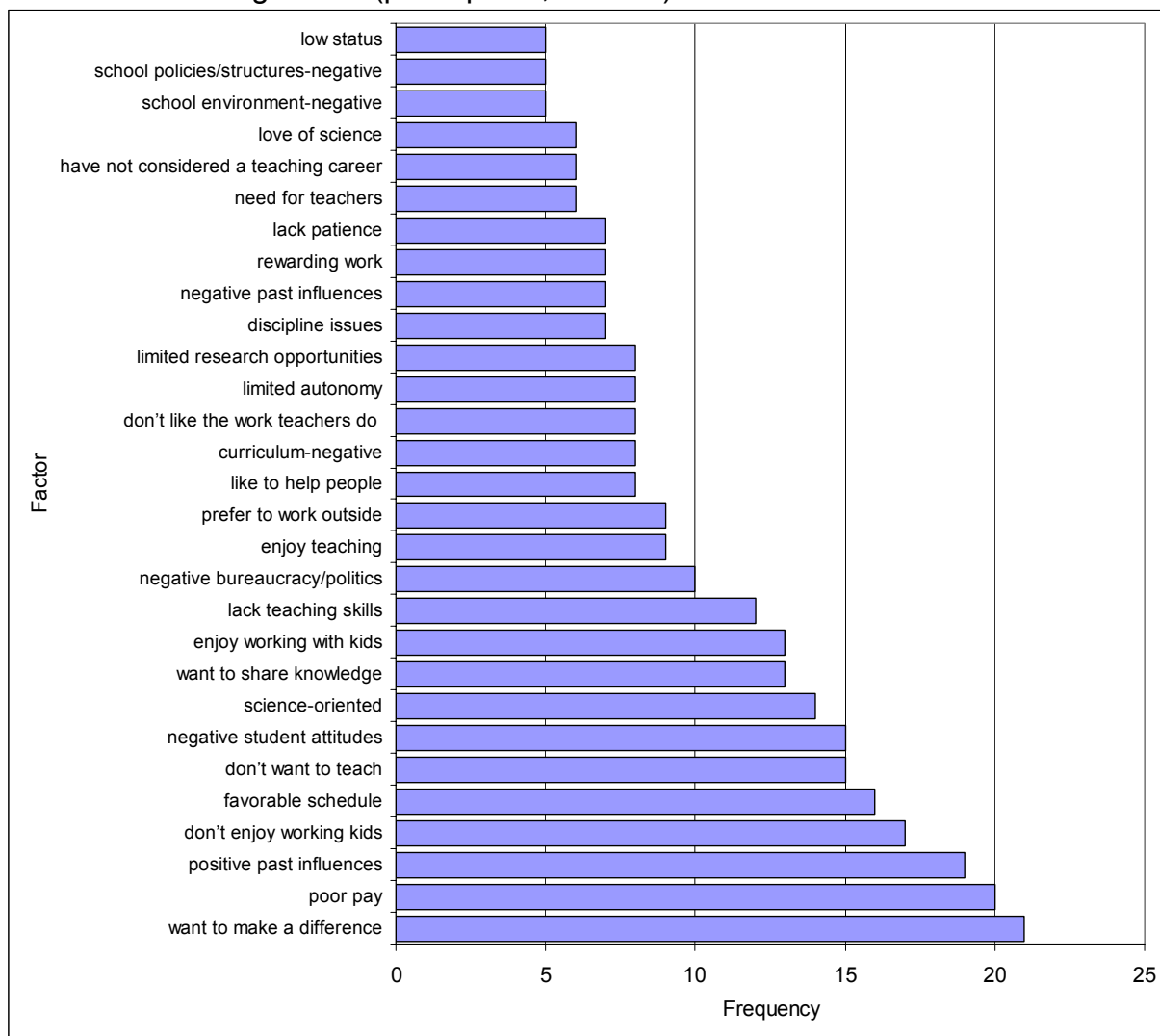


Table 3 provides data from the closed-response questions regarding a teaching salary and general attitudes about salary. The majority of students (42%, n = 128) disagree with the statement ‘Teachers are paid well.’ which corroborates with our open-response

factor of ‘poor pay’ presented in Figure 3. A further look at salary concerns of our participants shows that 34% percent reported that salary is an important career consideration and 44% ‘...want a career that offers high earnings over the length of the career.’ When a monetary figure (\$34,000) is presented as a moderate salary the responses are spread between ‘agree’, ‘neutral’, and ‘disagree’.

Table 3: Likert scale responses to questions regarding a teaching salary (n = 128).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response
Teachers are paid well.	2%	42%	29%	4%	0%	6%
Salary is an important career consideration for me.	3%	19%	28%	34%	9%	7%
I want a career that offers high earnings over the length of the career.	0%	12%	27%	44%	7%	9%
I consider \$34,000 to be a moderate salary for an entry level teacher.	10%	22%	28%	27%	1%	11%

*Perceptions of teaching:*

Based on our pilot, we observed some initial patterns regarding perceptions of teaching. The majority of students do not perceive teaching as an easy job to do well (Table 4). Fifty percent of the participants agree that ‘Teachers have a demanding and exhausting job.’ Many agree (45%) that teachers are regulated by school structures and have limited autonomy in their instruction. However on a positive note, 60% of the student participants do perceive that teachers have a stimulating and creative job. Also teachers are perceived to contribute greatly to helping people in the world (65% strongly agree, n = 128).

Table 4: Likert scale responses to questions regarding perceptions of teaching (n = 128).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response
Teaching is an easy job to do well.	41%	47%	6%	2%	2%	1%
Teachers have a demanding and exhausting job.	0%	4%	20%	50%	16%	11%
Teachers are regulated by school board guidelines and have limited autonomy in what they teach.	0%	2%	26%	45%	22%	6%
Teachers have a stimulating and creative job.	0%	2%	20%	60%	18%	1%
Teachers have contributed greatly to helping people in the world.	0%	1%	6%	27%	65%	2%

**Conclusion**

Based on our pilot study, we have some preliminary findings that show both altruistic and financial factors as influencing students' choice to pursue a teaching career. Altruistic reasons may include a desire to improve society, to make a difference in people's lives, and to share knowledge. Such factors are often stated in studies with pre-service and in-service teachers as important considerations in choosing the teaching profession (Bastik 2000). Financial aspects have also been reported in other studies (Johnston, McKeon, and McEwen 1999; Kyriacou and Coulthard 2000). This is of particular concern when trying to recruit science majors as entry level positions as a teacher often do not compete with entry level positions in the science field.

The preliminary data suggests that a number of undergraduate students from our sample are not firmly set on a career path to take and therefore may be encouraged to pursue a teaching career. Therefore it is imperative to examine critical factors, attitudes, and perceptions of undergraduate science majors to determine how and at what point academic programs can better attract and encourage students to pursue a teaching career. Based on further analysis of the factors in our survey will provide us with more evidence about target areas to focus on in attracting these types of students. We hope to further verify our preliminary findings with our survey this spring which will include a larger sample size and might illuminate other career factors unique to undergraduate science majors.

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