“Our Experiences Are Not Unique”: An Exploratory Study of Common Motivators and Inhibitors For Latinas in STEM Fields.

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Abstract
Using a combination of quantitative surveys conducted over 11 weeks, which reached 68 participants, and qualitative interviews collecting personal stories from two participants, our research team examined the general Latina experience within the academic and professional STEM community. The central hypothesis supporting this study was that Latinas in STEM experienced a sense of alienation and a general lack of support which discouraged them from both entering into and remaining in a STEM field. Our results did not broadly support this hypothesis: within our pool of respondents, the issue of alienation and lack of support was not statistically present, but this and similar issues were addressed strongly in qualitative responses, discouraging a full rejection of our original hypothesis.
Keywords: STEM, science, technology, engineering, mathematics, Latina, Latino, gender issues
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1 Introduction

Extensive research exists to show that minority ethnicities – particularly Blacks and Latinos – and women are largely underrepresented in STEM careers. However, more narrowed research on Latinos of any gender is fairly new and limited. Specifically, there is an apparent lack of literature or statistics providing information focused on Latinas as a group in the STEM fields, though the literature that does exist suggests Latinas have a disproportionately small presence in STEM compared to other groups of women. Since further research could provide insight into the depth and influences of Latina underrepresentation, the lack of scholarship is addressed on Latina presence in STEM, with an overarching focus on determining why this underrepresentation exists.

Despite the growth in STEM careers, jobs and degrees have been predominately awarded to men. In 2008, only 25% of the US computer and mathematical operations workforce were female (Denner, 2005). Additionally, women earned only 18.6% of all computer science bachelor’s degrees in the US in 2007. Though the total number of degrees awarded has been trending upward, women still earn 45% of all science and engineering master’s degrees as of 2009, though 48% of enrolled graduate students at the time were women. Female enrollment in several STEM fields is disproportionately low, including economics (37%), physical sciences (33%), computer sciences (26%), and engineering (22%).

The picture that emerges of Latina women in STEM suggests that they are included in the fastest growing demographic in the United States as members of the Latino community, but still lack equality in STEM. While this could be explained in part by biases against female participation, data showing Latina populations feeling the effects of those biases differently from other female demographics reflects an insufficiency in attributing the Latina experience to women as a whole. In order to understand the lack of Latina presence in STEM, Latina populations must be the specific focus of research and analysis.

2 Literature Review

Anthony et al. (2012) found that students who worked in more diverse groups were inspired by the diverse thinking of their peers, and exhibited enhanced critical thinking and thought processes as a result. As many fields and individual corporations seek to embrace new avenues of diversity and encourage formerly underrepresented groups to be a part of their industry, there are still areas of employment that see severe underrepresentation of various minorities among its workers; among those are the STEM industries.

Mossberger (2006) finds that environment plays a large role, in that a higher concentration of poverty in American cities led to “inferior schools and neighborhood services; elevated rates for school drop-out and teenage pregnancy,” yet because of “positive attitudes expressed by African- Americans and Latinos,

the causes of lower technology use are likely located within the institutions and opportunity structure of poor communities, rather than a culture of poverty"; these findings are consistent with the research on Latina pessimism about education and need for institutional change discussed by Cammarota (2004). Crisp, Nora, and Taggart (2009) discuss the positive indicators of STEM focus in Hispanic populations, emphasizing the positive relationship between STEM pursuit in college students and factors like high school success and institutional support.

The majority of existing research has several flaws that our study hoped to avoid. The first was that Latinas were often grouped together with Latinos, making finding gender-specific issues difficult. Secondly, Latinas were often grouped together under the umbrella term "women of color," making it difficult to determine what, if any, social, economic, or cultural influences existed in the decision to enter STEM or to avoid it. Our research specifically examines the Latina experience, apart from males of their ethnicity and apart from women of other ethnic groups.

3 Methods

A two-part online survey was used to collect demographic data from respondents, as well as supporting information regarding their family background, educational history, and early exposure to technology. The first survey was used to gather the majority of this information, while the second survey collected short essay style answers containing childhood anecdotes, experiences, and personal thoughts and feelings about STEM communities and outreach to young Latinas. The survey was open for 11 weeks and respondents were sought through contacts in STEM programs at various universities, and through employee connections at several STEM-based companies.

4 Findings

It is important to note that due to our small sample size, the data produced via the first survey cannot be held as statistically significant. While we cannot make any generalizable claims from the data we collected, it is very helpful in initiating conversation and determining fruitful directions for future research

Our surveys revealed that Latinas do feel a sense of community in their fields, and the survey responses showed little indication of weaknesses in those communities. No respondents were dissatisfied with the community environment they were part of. The fact that an overall sense of community is positive, while individual aspects of that community are possible negatives, works against our initial hypothesis that Latinas would feel a sense of alienation and a lack of support in their academic and workplace communities.

Gender as well as racial stereotypes were found to be a significant issue to survey respondents. In STEM, where such a high value is placed on intelligence – both actual and perceived – working against the stereotypes that are based in language differences was a challenge reported by respondents. Respondents to the essay survey reported that other stereotypes and judgments faced in their fields included the perceptions that Latinos are "the cleaning people," and that women in general are seen as underestimated in the field. Additionally, respondents reported feelings of inadequacy, especially in regards to their intelligence. Self-confidence as well as "appropriate" behavior as a woman were cited as issues by respondents.

Finally, we determined that the subject of the STEM pipeline, in regards to studying which stages are most effective, is too broad of a goal and too complex of an objective to be approached by a research group of our size. More specialized research is needed to develop and implement interventions based off of existing programs that effectively recruit and retain Latina interest in STEM. However, we found that exposure to STEM early in the pipeline was a common motivating factor in deciding to study or work in STEM. Respondents were often interested in STEM as early as elementary school, and generally participated in STEM-based programs before graduating high school.

5 Conclusion

After examining the data that we produced, we argue that there are a number of identifiable factors important to the recruitment and retention of Latinas in STEM. First, early exposure is key to promoting interest in a STEM related field. It does not seem to matter how this interest is first introduced; rather what matters is that an effort is made in bringing STEM to minorities in their home communities, schools, and libraries. Second, it can be suggested that once interest is fostered in Latinas, supportive systems must be in place in order to keep them there. We find that this can be in the form of a supportive mentor or in a support group.

The problems that exist for Latinas in STEM outreach exist in the infrastructure itself, primarily lack of funding and lack of community support. However, there is also the ingrained barrier of lack of confidence in intelligence, abilities, and confidence for women or ethnic minorities trying to find a place in STEM. Though STEM outreach requires significant improvements in a general sense, we feel justified by our research in contending that working against internalized negative attitudes should be a focus of programs geared toward women and ethnic minorities, or Latinas in particular.

We recommend future research be conducted specifically on the first-generation Latina experience with early exposure and entrance to STEM careers and educational programs. Additional comparative studies of other underrepresented groups, as well as extensive questions that are consciously non-intrusive would be helpful. It can be suggested that expanding access to technology programs at earlier stages in the pipeline would have an overall positive effect on bringing more Latinas into STEM fields. Finally, greater financial support from both government and community programs would be beneficial to expanding existing programs as well as building new ones.

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