

A comparison of student perceptions of the teaching profession at minority-serving and non-minority-serving institutions

Savannah L. Logan, Jared B. Breakall, and Wendy K. Adams

Department of Physics, Colorado School of Mines, 1500 Illinois Street, Golden, CO 80401

There is an ongoing shortage of STEM teachers in the United States, and the teaching profession consistently struggles to recruit a diverse body of teachers whose demographics match those of their students. The shortage of STEM teachers and the lack of diversity in the profession have negative implications for student success in STEM fields, particularly among underrepresented groups. We have developed a survey and collected data on student perceptions of the teaching profession at 46 Institutions of Higher Education (IHEs) across the country, including several Minority-Serving Institutions (MSIs). We have analyzed these data with respect to institution type to determine whether perceptions of the profession may be a factor in recruiting and retaining a diverse body of teachers. We found that perceptions generally do not differ greatly between MSIs and non-MSIs and that students at MSIs tend to have slightly more positive views than those at non-MSIs. We also found that some variation exists for individual institution types, particularly Historically Black Colleges and Universities (HBCUs) and Predominantly Black Institutions (PBIs).

I. INTRODUCTION

There is a considerable and worsening shortage of secondary STEM (science, technology, engineering, and mathematics) teachers in the United States [1]. This shortage leads to a host of problems for the U.S. educational system as well as the national technological workforce. In 2018, only approximately 20% of students in the U.S. met the STEM Readiness Benchmark, and, for underserved students, the number was only 2% [2]. Furthermore, students whose teachers do not have a degree in their content area are less likely to choose to major in STEM or even to attend college [3]. This snowballing effect leads to fewer STEM majors and ultimately a shortage of qualified technological workers to meet the national demand [4].

In addition to a lack of qualified secondary STEM teachers in the United States, the teaching profession consistently struggles with racial diversity. According to the National Center for Education Statistics and the U.S. Bureau of Labor Statistics, white workers are overrepresented in the U.S. teacher labor force while Black, Hispanic, and Asian workers are underrepresented [5,6]. This lack of representation has serious repercussions for diverse students in the U.S.; for example, Black students are more likely to graduate from high school and attend college if they have a Black teacher in elementary school, and studies have shown that having a same-race teacher in elementary school increases attendance and has a significant impact on college attendance for underrepresented students [7]. Importantly, teacher-student demographic matching affects the expectations that teachers have for their students, which impacts motivation and achievement. In one study, Black teachers had higher expectations than white teachers for the same students when the students were Black [8]. All of these factors suggest that increasing the diversity of the U.S. teacher labor force will have positive impacts on underrepresented students.

To aid in the recruitment and retention of diverse teachers, we must examine why underrepresented students choose not to enter the teaching profession at the same rate as their white peers. Recent research has suggested that perceptions of the teaching profession, including ideas about salaries, benefits, and life satisfaction, may play a role in the decision to pursue teaching careers [9]. In particular, inaccurate perceptions surrounding teaching careers tend to dissuade students from becoming teachers.

As part of the Get the Facts Out (GFO) project, we have developed an instrument that aims to examine student perceptions surrounding the teaching profession, the *Perceptions of Teaching as a Profession* (PTaP) survey. This survey addresses topics including a basic understanding of facts about teaching careers (salaries, benefits, etc.) as well as perceptions of advising, department and family support, and more. The PtaP can be used to measure how students view teaching careers, whether they are interested in

teaching, and how they feel they are supported in pursuing teaching. During the 2019-2020 academic year, we administered this survey to undergraduate and graduate students at 46 institutions of higher education (IHEs) across the country, including many Minority-Serving Institutions (MSIs). We then analyzed this data with respect to institution type to see whether perceptions differed at MSIs. Differing perceptions in the negative direction would suggest that perceptions are a potential factor in the lack of diverse teachers and could lead to the development of targeted teacher recruitment resources for MSIs. Similarities in perceptions would suggest that the same teacher recruitment materials could be used at MSIs and non-MSIs.

Our analysis found that in general, perceptions at MSIs were very similar to those at non-MSIs. Additionally, students who were not interested in teaching at MSIs tended to have slightly more positive perceptions than comparable students at non-MSIs. There were individual categories that varied for certain institution types, and perceptions at Historically Black Colleges and Universities (HBCUs) and Predominantly Black Institutions (PBIs) were the most different from non-HBCUs/PBIs. Overall, our results suggest that similar resources could be used to dispel misperceptions about the teaching profession at MSIs and non-MSIs, although the results from individual categories discussed in this paper could be used to create more targeted resources.

II. METHODS

A. Instrument design

As described in Logan et al. (2020) [10], the PtaP was developed to measure perceptions of grade 7-12 teaching careers among college students. It consists mainly of five-point Likert-scale statements with a small number of selected response items. Statements measure aspects of student perceptions of teaching careers including personal enjoyment; knowledge of facts about the teaching profession; perceptions of advising and support among peers, family, and faculty members; and more. The PtaP was developed using standard guidelines for perceptions instruments as described in [11], and a complete development and validation paper is forthcoming.

B. Data collection and analysis

During the 2019–2020 school year, PtaP data were collected from 46 IHEs across the U.S. This dataset included responses from over 2500 students. Table I below shows the total number of institutions and the number and percentage of these institutions classified as MSIs, Asian American Native American Pacific Islander-Serving Institutions (AANAPISIs), Hispanic-Serving Institutions (HSIs), Historically Black College and Universities (HBCUs), and

Predominantly Black Institutions (PBIs). These study sites were self-selected in that they agreed to participate in the GFO project and collect data internally, and they varied greatly in size, location, selectivity, and type (private vs. public). For a complete list of the GFO study sites, please see [12].

PTaP data is analyzed by measuring how well respondents agree with the response of an expert. In our analysis, the percentage of respondents who agree with the expert response is the “percent favorable” score, and 100% agreement with an expert is the best possible score for each statement. Some statements are factually true, meaning that the expert response is simply the correct answer. For other statements, such as “*If I told my advisor I wanted to be a grade 7-12 teacher, s/he would encourage me,*” the expert-like response is the response of a student who feels they are fully supported and encouraged to pursue a career in teaching.

After an initial round of data collection, a reduced-basis factor analysis was conducted to facilitate interpretation and determine underlying statement categories. This analysis was similar to the analysis performed on the Colorado Learning Attitudes About Science Survey [13]. Our factor analysis of the PTaP resulted in 11 empirical categories; each category is given a score representing the average percent favorable score of each statement within that category. For a complete list of the categories and the statements within each category, please see [14].

When analyzing PTaP data, we separate the responses of those who want to become teachers from those who do not want to become teachers. This is because the two groups have extremely different perceptions of the teaching profession, so separating the data gives us much more detailed insights into perceptions at a given institution.

For the analysis in this paper, we analyzed data from 46 IHEs in total. We grouped IHEs based on their classifications as MSIs and analyzed each group separately; our groupings for analysis included MSIs, HSIs, AANAPISIs, and HBCUs/PBIs. To make comparisons, we analyzed all IHEs that *did not* have a specific classification and compared the results to the IHEs that *did* have that classification. For example, in Section III. B., we compare all HSIs to all institutions not classified as HSIs. Due to space limitations, only statistically significant categories are included in each table. Statistical significance was determined based on non-overlapping standard errors of means. Table I lists the total number of each institutional classification present in our data. Note that three institutions in this study are classified as both HSIs and AANAPISIs.

We can compare the scores of different institutions both on individual statements and in categories to gain insights into the perceived climate for future teachers. In particular, we can identify strengths and challenges in recruiting teachers for different institutions based on this comparison of perceptions, which may aid in correcting misperceptions

and developing individualized teacher recruitment resources for each institution or institution type.

TABLE 1: The classifications of the 2019–2020 GFO study sites and a comparison to the national percentages. Note that three institutions were classified as both an AANAPISIs and HSIs. For a complete list of participating institutions, see [12].

Institution Type	Total Number	Percentage of Sites	National %
All Institutions	46	100%	-
MSI	12	26%	20%
HSI	6	13%	11%
AANAPISI	4	9%	4%
HBCU	4	9%	3%
PBI	1	2%	3%

III. RESULTS: STUDENT PERCEPTIONS OF THE TEACHING PROFESSION

Our overall results suggest that perceptions are not significantly different or are slightly more positive at MSIs when compared to non-MSIs, although some variations exist. In Tables 2–5, non-statistically significant categories (except for overall scores) have been removed due to space limitations.

A. MSIs vs. non-MSIs

In total, 546 responses from students at MSIs and 2028 responses from students at non-MSIs were analyzed. Table 2 below shows the percent favorable score in each category of the PTaP for students who do (yes) and do not (no) want to become grade 7–12 teachers at MSIs and non-MSIs.

As can be seen below, no categories were significantly different at MSIs and non-MSIs for students who wanted to become teachers. Students at MSIs score slightly lower than students at non-MSIs in *As a Career Choice*, which includes statements such as “*If I became a grade 7-12 teacher, I would not be making the most of my degree*” and “*Grade 7-12 teaching is a good career choice*” as well as *Personal Enjoyment*. For a complete list of the statements in these categories, see [14].

Interestingly, students who did *not* want to become teachers at MSIs consistently scored statistically significantly higher in their perceptions than those at non-MSIs. This was true for every category except *My Department Supports Me Teaching* and *Personal Enjoyment*. The opinions of peers are an important component in determining whether students choose to pursue teaching, and these data suggest that MSIs may on average have a healthier climate than non-MSIs for supporting the profession.

TABLE 2: Student perceptions of the teaching profession at GFO study sites classified as MSIs and non-MSIs as measured by the PTaP. The number given is the percent favorable score in each category with the standard error on the mean given in parentheses.

Category	MSI – Yes (SEM) N = 90	Non-MSI – Yes (SEM) N = 227	MSI – No (SEM) N = 302	Non-MSI – No (SEM) N = 1420
Overall	64.3 (1.2)	62.2 (0.8)	40.5 (0.8)	39.0 (0.3)
Others support...	83.0 (2.3)	79.7 (1.8)	59.9 (1.8)	56.1 (0.8)
My department supports...	80.6 (2.7)	77.9 (2.0)	62.4 (2.0)	60.0 (0.9)
My dept. values and encourages	65.3 (3.4)	61.9 (2.3)	38.8 (1.7)	33.6 (0.8)
As a career choice	70.1 (2.6)	73.6 (1.5)	42.4 (1.5)	38.2 (0.7)
Teaching is scientific	76.2 (2.6)	77.2 (1.6)	59.2 (1.7)	53.1 (0.8)
Employee benefits & stability	42.0 (3.1)	38.8 (2.0)	32.0 (1.7)	28.2 (0.8)
Personal Enjoyment	86.2 (1.8)	86.6 (1.1)	12.3 (0.9)	12.5 (0.4)

B. HSI vs. non-HSIs

Our dataset included six institutions classified as Hispanic-Serving Institutions (HSIs), and a total of 295 student responses were analyzed from these IHEs. The total number of responses from non-HSIs was 2274. Table 3 shows the scores in each category for students who did and did not want to become teachers at HSIs and non-HSIs. Students at HSIs consistently scored higher than students at non-HSIs in nearly every category, although the difference was only significant in three categories. Similar to our overall MSI data, this suggests that perceptions at HSIs may be more positive overall than perceptions at non-HSIs.

TABLE 3: Student perceptions of the teaching profession at HSIs and non-HSIs in categories with significant differences.

Category	HSI – Yes (SEM) N = 61	Non-HSI Yes (SEM) N = 255	HSI – No (SEM) N = 151	Non-HSI No (SEM) N = 1564
Overall	65.2 (1.4)	62.9 (0.8)	40.4 (1.0)	39.7 (0.3)
Teaching is scientific	79.6 (3.1)	75.9 (1.5)	58.9 (2.3)	53.7 (0.7)
Employee benefits & stability	39.3 (3.4)	39.9 (1.9)	33.0 (2.5)	28.6 (0.7)
Personal Enjoyment	88.7 (1.9)	85.6 (1.1)	9.7 (1.2)	12.7 (0.4)

C. AANAPISIs vs. non-AANAPISIs

Our dataset included four institutions classified as AANAPISIs, with a total number of 241 student responses. There were 2325 responses from non-AANAPISIs. Student perceptions at AANAPISIs were generally slightly higher than the perceptions of students at non-AANAPISIs, but not

significantly higher in most categories. Interestingly, for those who did not want to teach, perceptions at AANAPISIs were more positive overall as well as significantly higher in *My Department Values and Encourages Teaching* and *Employee Benefits and Stability*.

TABLE 4: Student perceptions of the teaching profession at AANAPISIs and non-AANAPISIs in categories with significant differences.

Category	AANAPISI – Yes (SEM) N = 55	Non- AANAPISI – Yes (SEM) N = 261	AANAPISI – No (SEM) N = 110	Non- AANAPISI – No (SEM) N = 1604
Overall	66.4 (1.3)	62.8 (0.8)	43.0 (1.2)	39.5 (0.3)
My dept values and encourage	64.4 (4.3)	62.7 (2.3)	42.8 (3.0)	34.1 (0.7)
Employee benefits & stability	40.5 (3.7)	39.6 (1.9)	35.7 (2.7)	28.5 (0.7)
Personal Enjoy- ment	89.6 (1.9)	85.5 (1.0)	10.3 (1.4)	12.6 (0.4)

C. HBCUs and PBIs vs non-HBCU/PBI sites

Our dataset included four Historically Black Colleges and Universities (HBCUs) and one Predominantly Black Institution (PBI). We chose to analyze these institutions together due to similar demographics and a small sample size from PBIs. The total number of responses from these institutions was 165. The total number of responses from non-HBCUs/PBIs was 2415. HBCUs/PBIs showed the highest variations from average perceptions of all institution types in this study. For students who wanted to become teachers, perceptions were far better at HBCUs and PBIs in all categories except *As a Career Choice* and *Teaching is Scientific*. For those who did not want to become teachers, perceptions were more similar to those at non-HBCUs/PBIs, but were better in *As a Career Choice*, *Teaching is Scientific*, and *Personal Enjoyment*. The high variation in how teaching candidates perceived the profession at HBCUs and PBIs suggests further research is necessary. Five of the six sites were concentrated in one region of the country, so a lack of geographic diversity may have played a role in our findings.

TABLE 5: Student perceptions of the teaching profession at HBCUs/PBIs and non-HBCUs/PBIs in categories with significant differences.

Category	HBCU/PBI – Yes (SEM) N = 18	Non- HBCU/PBI – Yes (SEM) N = 301	HBCU/PBI – No (SEM) N = 103	Non- HBCU/PBI – No (SEM) N = 1620
Overall	64.2 (3.1)	63.4 (0.7)	39.7 (1.6)	39.7 (0.3)
Others support	89.8 (3.8)	80.1 (1.5)	59.1 (3.1)	56.6 (0.8)

My dept supports	88.9 (5.0)	78.0 (1.7)	59.2 (3.5)	60.5 (0.8)
My dept values and encourage	76.7 (7.1)	62.0 (2.0)	36.5 (2.9)	34.5 (0.7)
As a career choice	59.3 (7.4)	73.2 (1.3)	45.6 (2.6)	38.6 (0.6)
Teaching is scientific	68.9 (6.9)	77.2 (1.4)	63.0 (3.0)	53.6 (0.7)
Employee benefits & stability	57.4 (8.7)	38.8 (1.7)	30.4 (2.8)	28.8 (0.7)
Personal Enjoy-ment	79.4 (5.3)	86.8 (0.9)	17.2 (1.8)	12.2 (0.4)

D. Overall interest in teaching at MSIs and non-MSIs

Along with measuring perceptions of the teaching profession, the PTaP includes statements to determine whether students are pursuing teacher certification and whether students are interested in teaching but hesitate to pursue the profession because of inaccurate perceptions. In Table 6, **Plan to pursue certification** includes students who agreed or strongly agreed with “*I plan to pursue certification at my institution*” or “*I plan to pursue certification through another route.*” **Has interest** includes students who agreed or strongly agreed with any of four statements on the PTaP starting with “*I would...*” such as “*I would become a grade 7-12 teacher if the pay were equal to my other career options.*” For a complete list of the statements on the PTaP, see [15]. **Neutral** includes remaining students who chose neutral on any of the “*I would...*” statements, and **Doesn’t want to teach** includes those who disagreed or strongly disagreed with all certification-related and “*I would...*” statements.

As can be seen in Table 6, a much greater percentage of students at MSIs were either pursuing certification or had an interest in becoming teachers.

TABLE 6: Numbers and percentages of students at MSIs and non-MSIs who are pursuing teacher certification, have an interest in teaching, are neutral about teaching, or do not want to teach.

	MSI – number of students	MSI – Percentage of students	Non-MSI – number of students	Non-MSI – percentage of students
Plan to pursue certification	96	17.6%	318	12.4%
Has interest	256	47.9%	1133	44.2%
Neutral	108	19.8%	614	23.9%
Doesn’t want to teach	86	15.8%	501	19.5%

V. CONCLUSIONS AND FUTURE WORK

A. Conclusions

Our results show that perceptions of the teaching profession at MSIs and non-MSIs are relatively similar, and that students at MSIs who are not interested in teaching tend to have more positive perceptions than those at non-MSIs. Relatedly, MSIs had a greater percentage of students who were pursuing certification or who were interested in teaching. These results are consistent with previous studies suggesting that more accurate and positive perceptions of the teaching profession lead to the recruitment of more teachers [10].

The results of our analysis of individual types of institutions, including HSIs, AANAPISIs, HBCUs, and PBIs, showed that overall perceptions are similar to or better than perceptions at other institutions in most cases, but individual categories varied at certain institution types. HBCUs and PBIs in particular stood out as having varying perceptions among students who were pursuing teaching, suggesting that further research is needed to understand potential reasons for these differences.

B. Future work

This work is part of a five-year longitudinal study of student and faculty perceptions of the teaching profession. We will continue collecting and analyzing data from these institutions with the hope of seeing improvements in teacher recruitment and perceptions of the profession.

In addition, in the future we will conduct analyses by race/ethnicity as well as by geographic region. We have seen hints that perceptions may vary between these groups, and these analyses would nicely complement the work discussed in this paper, particularly with regards to our limited sample of HBCUs and PBIs.

Lastly, while our current pool of study sites is relatively diverse, we would like to make efforts to recruit new sites to strengthen our data from underrepresented groups. In particular, we would like to include Tribal Colleges and universities and Native-American Serving Non-Tribal Institutions.

ACKNOWLEDGMENTS

The authors would like to thank everyone involved in our project, particularly our study sites, for their insights and support. This work is supported by the NSF under Grant Nos. 1821710 & 1821462. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of NSF.

-
- [1] F. Cross, *Teacher Shortage Areas Nationwide Listing 1990 1991 through 2017–2018* (U.S. Department of Education, Washington, DC, 2017). Retrieved May 22, 2020 from <https://www2.ed.gov/about/offices/list/ope/pol/ateachershortageareasreport2017-18.pdf>.
 - [2] ACT, *The Condition of College & Career Readiness National 2018* (ACT, 2018). Retrieved July 1, 2019 from <https://www.act.org/content/dam/act/unsecured/documents/cccr2018/National-CCCR-2018.pdf>.
 - [3] S.W. Lee & G. Mamerow (2019). Understanding the role cumulative exposure to highly qualified science teachers plays in students' educational pathways. *Journal of Research in Science Teaching*, 56(10), 1362–1383. <https://doi.org/10.1002/tea.21558>.
 - [4] National Science Board, *Science and Engineering Indicators 2016 (NSB-2016-1)* (National Science Foundation, Arlington, VA, 2016).
 - [5] T. Snyder, C. de Bray, & S. A. Dillow. Digest of Educational Statistics 2015. Retrieved June 4, 2021 from <https://nces.ed.gov/pubs2016/2016014.pdf>.
 - [6] Labor force characteristics by race and ethnicity, 2016. Retrieved June 4, 2021 from <https://www.bls.gov/opub/reports/race-and-ethnicity/2016/home.htm>.
 - [7] S. Gershenson, C. M. D. Hart, C. A. Lindsay, & N. W. Papageorge. The Long-Run Impacts of Same-Race Teachers. *IZA Institute of Labor Economics*. Retrieved June 4, 2021 from <https://www.nber.org/papers/w25254>.
 - [8] S. Gershenson, S. B. Holt, & N. W. Papageorge. Who believes in me? The effect of student-teacher demographic match on teacher expectations. *Economics of Education Review*. Retrieved June 4, 2021 from <https://www.sciencedirect.com/science/article/abs/pii/S0272775715300959>.
 - [9] W.K. Adams, A new survey uncovers strong misperceptions about the teaching profession. What can we do to get the facts out? *APS Forum on Education Fall 2017 Newsletter* (2017).
 - [10] S.L. Logan, J. B. Breakall, R.L. Pearson III, and W.K. Adams, *College faculty support for grade 7-12 teaching careers: survey results and comparisons to student perceptions*. 2020 Physics Education Research Conference Proceedings (2020).
 - [11] W.K. Adams & C.E. Wieman (2011). Development and validation of instruments to measure learning of expert-like thinking. *International Journal of Science Education*, 33(9), 1289–1312. <https://doi.org/10.1080/09500693.2010.512369>
 - [12] A complete listing of the GFO study sites can be found at www.getthefactsout.org/gfo-community. Retrieved June 2, 2021.
 - [13] W.K. Adams, K.K. Perkins, N.S. Podolefsky, M. Dubson, N.D. Finkelstein, & C.E. Wieman, (2006). A New instrument for measuring student beliefs about physics and learning physics: The Colorado Learning Attitudes about Science Survey. *Physical Review Special Topics - Physics Education Research*, 2(1), 1–14. <https://doi.org/10.1103/PhysRevSTPER.2.010101>
 - [14] Details about the PTaP can be found at <https://getthefactsout.org/perceptions-surveys-ptap-and-ptaphe>. Retrieved June 4, 2021.