

Ethnic Differences in Geoscience Attitudes of College Students

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While a gender balance remains elusive in the geosciences [*de Wet et al.*, 2002], the underrepresentation of ethnic minorities in these fields is at least a concern.

A number of cultural and social factors have been proposed to explain the poor ethnic minority representation in the geosciences, including limited exposure to nature, deficient academic preparation, inadequate financial resources to pursue higher education, ignorance of career opportunities in the geosciences, insufficient family support, and misconceptions of the field.

By administering a geoscience attitude survey to an ethnically diverse sample of urban high school and college students, a number of insights were gained into factors that might influence the decision to pursue geoscience as a college major. Moreover, significant differences in geoscience-related attitudes were found across African-American, Asian, Caucasian, and Latino ethnic groups.

Results suggest that relative to other ethnic groups, Caucasians in this ethnically diverse student survey group tend to have greater involvement in outdoor activities, greater perceived knowledge of the geosciences, and greater family support to pursue the geosciences. These factors very likely contribute to Caucasian overrepresentation in the geosciences, and provide a starting point for developing strategies to increase interest in geoscience in underrepresented groups.

Faculty members involved with the Geoscience Diversity Enhancement Project (GDEP) at California State University, Long Beach (CSULB) administered the survey. GDEP is supported by the U.S. National Science Foundation through NSF's Opportunities for Enhancing Diversity in the Geosciences (OEDG) program. Faculty members from the CSULB departments of geology, geography, and anthropology worked together on the diversity enhancement project to sponsor eight-week summer research programs during the years 2002–2004 for underrepresented students and their instructors from local high school and community colleges.

Among the program's goals are the promotion of awareness of geoscience careers, educational requirements, and research methods among local community college and high school students, particularly Latino, African-American, and other underrepresented ethnic groups.

The program also intends to encourage the study of the geosciences among these underrepresented students, and to enable a smooth transition for them to undertake advanced undergraduate study. Additional information

about the CSULB GDEP program is available online at <http://www.csulb.edu/depts/geography/gdep/>.

Recognizing the importance of evaluating this project, a number of measures on the effort's effectiveness were developed and are being conducted by the CSULB GDEP faculty. Students completed a geoscience attitude survey and participated in focus groups intended to assess career goals and perceptions of geoscience both prior to involvement in the program and at the completion of the program. Additionally, academic achievements of past student participants are being tracked.

A Measure of Geosciences Attitudes

GDEP, in combination with other OEDG-funded efforts, is addressing a growing concern that ethnic minorities are underrepresented in the geosciences. In conducting the GDEP program, a necessary first step was to gain a better understanding of the attitudes and beliefs of high school and college students toward the geosciences. Toward this end, a paper-and-pencil survey addressing geoscience-related attitudes was developed. Respondents were asked to agree with each of 21 statements using a five-point response scale.

The survey (Table 1) was based on similar measures used to assess science attitudes [e.g., *Bianchini, et al.*, 2001], but items were written to focus on geoscience attitudes. Specifically, items were developed to assess student awareness of geoscience, perceptions of the career potential for geoscience, perceptions of one's ability to succeed in geoscience and to conduct scientific research, and actual experiences with outdoor activities.

The survey was administered at the begin-

ning of each school year between 2001 and 2003 to students enrolled in science courses in local high schools, and in geoscience-related courses in local community colleges and at CSULB. In total, 620 students were assessed: 83 high school students, 348 college freshmen and sophomores, and 182 college juniors and seniors; seven respondents did not specify their class year. Sixty-one percent of respondents were female.

Together, ethnic minority respondents represented a slight majority of respondents, but the 309 Caucasian respondents composed the largest ethnic group (49.8%). Other ethnicities in the sample included 33 African-Americans (5.3%), 166 Latinos (26.8%), and 112 respondents who identified themselves as Asian, Southeast Asian, or Filipino (18.1%) (hereinafter referred to as Asians). Respondents of other ethnic groups, or those who did not indicate ethnic group membership, were relatively few and were excluded from the analysis.

Survey Results

Table 2 displays the means and standard deviations for all respondents, as well as for African-American, Asian, Caucasian, and Latino subgroups. Items are arranged in descending order of endorsement for the combined group of respondents. Prior to administering the survey, "geoscience" was defined to the respondents as including the fields of geology, geography, and archaeology.

The results offer some encouragement for those hoping to entice high school and college students into studying geoscience: Overall, students expressed an interest in outdoor activities, including hiking, camping, and boating. They also indicated that they would prefer a science project that was in an outdoor setting rather than in a laboratory, and that their families would be supportive if they decided to become geoscientists.

Table 1. Survey Items

<i>Item</i>	
1.	I enjoy going hiking and/or camping.
2.	I'd prefer to work on a science project in an outdoor setting rather than in a research laboratory.
3.	My family would be very supportive if I decided to become a Geoscientist.
4.	I enjoy boating.
5.	I think I could handle the coursework required to become a Geoscientist if I wanted to.
6.	I have a good understanding of how scientists do research.
7.	I enjoy reading nature and travel books and magazines.
8.	I have a good understanding of elementary Geoscience.
9.	Most geoscientists earn good incomes.
10.	I have a good idea of what Geoscientists study.
11.	I enjoy reading science fiction novels.
12.	Minority students receive little encouragement to study Geoscience.
13.	Many scientists had a childhood similar to my own.
14.	I consider myself well skilled in conducting scientific research.
15.	Caucasian students receive little encouragement to study Geoscience.
16.	I expect that my final grade in this class will be a(n): Response scale: A, B, C, D, F
17.	I plan on taking math courses that would prepare me to major in a science.
18.	I know what course of study is required to become a Geoscientist.
19.	I'd enjoy a career in Geoscience.
20.	I've wanted to be a scientist for as long as I can remember
21.	I am considering majoring in Geoscience.

Table 2. Item Means, Standard Deviations, and N for Each Ethnic Subgroup

Item	Total			Caucasian			African-American			Latino			Asian/Southeast Asian/Filipino		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
1 ^a	613	4.03	1.15	305	4.18	1.10	33	3.58	1.39	164	3.93	1.20	111	3.88	1.06
2 ^a	618	3.97	1.10	308	4.10	1.05	33	3.85	1.33	165	3.96	1.08	112	3.67	1.10
3 ^a	616	3.89	1.13	308	4.01	1.06	33	3.70	1.43	164	3.96	1.12	111	3.51	1.17
4 ^a	616	3.87	1.14	307	4.12	1.04	33	3.52	1.32	165	3.60	1.24	111	3.66	1.06
5	615	3.57	1.12	305	3.67	1.12	33	3.82	1.53	166	3.49	1.07	111	3.36	1.03
6	615	3.55	1.00	306	3.63	0.99	33	3.52	1.12	165	3.40	1.02	111	3.54	0.94
7	616	3.20	1.22	308	3.19	1.20	33	3.06	1.39	165	3.14	1.30	110	3.34	1.09
8 ^a	613	3.07	1.17	320	1.19	31	2.84	1.16	163	163	3.01	1.14	111	2.86	1.12
9	614	3.05	0.66	306	3.05	0.64	33	3.15	0.83	165	3.08	0.57	110	2.99	0.77
10 ^a	615	2.99	1.05	307	3.17	1.01	32	2.91	1.12	166	2.71	1.04	110	2.92	1.07
11	618	2.98	1.31	308	3.05	1.36	33	3.12	1.32	165	2.91	1.32	112	2.87	1.14
12 ^a	618	2.89	0.90	309	2.71	0.78	33	3.64	1.17	165	3.10	0.93	111	2.86	0.89
13	618	2.83	1.13	308	2.84	0.74	33	2.88	0.96	166	2.90	1.78	111	2.70	0.78
14	613	2.68	1.07	305	2.76	1.09	33	2.61	1.30	163	2.52	1.06	112	2.73	0.96
15	616	2.66	0.80	307	2.65	0.80	33	2.39	1.06	166	2.66	0.79	110	2.75	0.72
16	615	2.63	1.54	307	2.70	1.62	33	2.42	1.48	165	2.66	1.43	110	2.48	1.49
17	614	2.25	1.36	306	2.24	1.34	32	2.06	1.39	166	2.15	1.36	110	2.49	1.38
18	618	2.19	1.13	308	2.28	1.14	33	1.97	1.10	165	2.08	1.14	112	2.18	1.08
19	616	2.17	1.14	307	2.24	1.20	32	2.03	1.23	165	2.00	1.05	112	2.24	1.08
20	611	1.76	1.08	304	1.79	1.11	32	1.63	1.19	164	1.67	1.04	111	1.83	1.03
21	616	1.56	1.01	306	1.65	1.09	33	1.52	1.12	165	1.43	0.87	112	1.54	0.90

^aSignificant differences in responses exist for this item between ethnic groups. N = sample size, M = mean, SD = standard deviation

However, these attitudes do not translate into interest in geoscience itself. Near the bottom of the list is an item asserting that the individual would enjoy a career in geoscience. Further, consistent with actual enrollments at CSULB, the least frequently endorsed item posited that the student was considering majoring in a geoscience.

Perhaps an explanation for the discrepancy between enjoyment of outdoor activities and lack of interest in geoscience is that students appear to have little awareness about what geosciences are, or what geoscientists do. These items on the survey received a neutral level of endorsement. By choosing the midpoint of the agreement response scale, students were likely communicating uncertainty regarding these items.

Ethnic Differences in Geosciences Attitudes

Perhaps the most remarkable results involve differences between ethnic subgroups. Ethnic subgroup differences were examined using analysis of variance, a statistical procedure that allows the determination of significant differences in average responses across groups. Any significant differences were then followed by Tukey's Honestly Significant Difference (HSD) post hoc test. This test is a statistical procedure that helped with determining exactly which ethnic groups differed significantly from one another. Statistically significant ethnic differences were found for one third (seven out of 21) of the items. Table 2 indicates items exhibiting mean differences in responses across ethnic subgroups. Further ethnic differences would likely have been found if sample sizes were increased, particularly for the African-American sample.

Do minority students perceive there is sufficient encouragement provided to study

geoscience? The answer appears to be no. African-American respondents were more likely than any other group in this survey to report that minorities received little encouragement to study geosciences. Similarly, Latinos were more likely than Caucasians to report that minorities received little encouragement to study geoscience. Additional overt efforts appear to be needed to encourage ethnic minority participation in the geosciences.

In the study group, Caucasians were more likely than other ethnic groups to report enjoyment of outdoor activities. Caucasians were significantly more likely than African-Americans to go hiking and/or camping, and they were more likely than any of the ethnic minority groups to enjoy boating. These differences are likely attributable to both opportunity and actual experience in these activities.

In contrast to Caucasians, attracting Asians to geoscience may be particularly difficult since Asians were less inclined to prefer to work on a science project in an outdoor setting rather than in a laboratory. Further, Asians were less likely than either Caucasians or Latinos to report that their families would be supportive if they decided to become geoscientists. Perhaps this finding is attributable in part to the lack of awareness of geoscience in the Asian community. Asian students were significantly less likely to indicate a good understanding of elementary geosciences than their Caucasian counterparts. Similarly, Latinos were significantly less likely than Caucasians to indicate that they had a good idea of what geoscientists study.

Relative to other ethnic groups, Caucasians benefit from a number of advantages that might be associated with a decision to pursue geoscience: more positive perceptions of their understanding of basic geoscience and what

geoscientists study, greater family support to pursue geoscience, and more interest and involvement in outdoor activities.

There remains much work to be done in effectively recruiting ethnic minority students to the pursuit of geoscience. As a necessary first step, the current research examined perceptions toward geoscience in a highly diverse sample of urban high school and college students. Results are consistent with calls to increase educational experiences in geoscience as well as outdoor leisure activities, particularly for ethnic minority students.

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