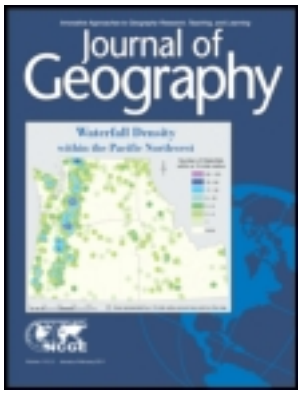

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Enhancing Diversity In The Geosciences

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Abstract

An innovative interdisciplinary project at California State University, Long Beach, was designed to increase the attractiveness of the geosciences (physical geography, geology, and archaeology) to underrepresented groups. The goal was to raise awareness of the geosciences by providing summer research opportunities for underrepresented high school and community college students and their faculty. A survey of a larger sample provided insight into strategies for enhancing geoscience awareness. A qualitative evaluation pointed to its success in meeting project goals. This unprecedented level of collaboration has set the groundwork for an institutional shift for inclusion of minorities in the geosciences and warrants replication.

Key Words: *geosciences, physical geography, diversity, underrepresented groups*

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The Geoscience Diversity Enhancement Program (GDEP) was a three-year program (2002-2004) funded by the National Science Foundation (NSF) to enhance diversity in the geosciences. The geosciences are defined as physical geography, geology, archaeology, and environmental science.[1] The purpose of this project was to design and implement an intervention to attract minority students from local community colleges and high schools to the geosciences by exposing them to research and educational experiences during an intensive summer research experience at California State University Long Beach (CSULB). This paper describes the program and reports results of the GDEP.

NSF has defined underrepresented groups in the fields of science, technology, engineering, and math (STEM) as Native Americans (American Indian and Alaskan Natives), African Americans, Latino/Hispanics and Pacific Islanders (Polynesians or Micronesians) and persons with disabilities. While members of these groups represent 25 percent of the general population, and earn almost fifteen percent of total bachelor degrees granted in science and engineering, they earn only 4.6% of all bachelor degrees in the geosciences. At the master's level, the percentages are even lower with only 3.3% of the total degrees earned in the geosciences by members of these groups (National Science Foundation 2001).

Proportions of minorities in geoscience courses are not representative of either CSULB or local area demographics. In the City of Long Beach, over half (52.7%) of the population are members of NSF-defined underrepresented groups with 69.3% of students in the Long Beach Unified School District (K-12) in these underrepresented categories. Five of the District's high schools are among the top fifteen feeder institutions to CSULB. Based on such data CSULB was designated a minority-serving institution (MSI) by the U.S. Department of Education in 2000 (Office of Civil Rights 2004; United States Department of Education 2004). In addition, Long Beach, California was ranked eighth in the list of U.S. cities with the highest percentage of foreign-born residents (30.9%). Santa Ana and Los Angeles, California, both feeder communities to CSULB, ranked second and third in that list with 48.4% of Santa Ana residents and 41.3% of Los Angeles residents born outside of the United States (Mena 2003). While not identical to minority status, foreign-born residents contribute to the diversity of a population.

Enrollment averages over the past five years (spring 2000 through spring 2005) reveal that CSULB students in the NSF-defined underrepresented groups accounted for 30.7% of the University's total enrollment. These underrepresented groups accounted for 35.4% of students in the College of Liberal Arts (CLA), and 28.3% in the College of Natural Sciences and Mathematics (CNSM). However, during this period, on average only 0.58% of NSF-defined underrepresented students at CSULB were geoscience majors. Within the geoscience disciplines, only 15.0% of the majors in the Department of Geography were from underrepresented groups, and only 17.3% of Geology majors and 26.9% of Anthropology majors were from underrepresented groups (Table 1).

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Table 1. Enrollment comparison of National Science Foundation-defined underrepresented groups by percent, 2002-2005.

	Native American	African American	Latino Hispanic	Pacific Islander Only	Asian & Pacific Islander	Asian Only	Declined to Respond-Other	*Total NSF Under-represented
LBCC	0.9	8.0	26.0	N/A	21.9	N/A	12.0	34.9
El Camino	0.5	16.6	29.0	N/A	15.1	N/A	10.9	46.2
OCC	1.0	2.0	15.0	N/A	22.0	N/A	N/A	18.0
LBUSD	0.3	19.5	46.7	N/A	N/A	16.1	N/A	66.5
City of LB	0.8	14.9	35.8	1.2	13.3	12.1	N/A	52.7
City of LA	0.8	11.2	46.5	0.2	10.2	10.0	N/A	58.7
CSULB	0.6	6.3	23.2	0.6	15.9	15.3	16.0	30.7
Geography Majors	0.4	1.2	13.4	0.0	8.0	8.0	24.5	15.0
Anthropology Majors	2.7	1.6	22.1	0.5	6.5	6.0	23.9	26.9
Geology Majors	2.0	3.0	10.3	2.0	3.3	1.3	20.6	17.3

LBCC: Long Beach Community College, El Camino: El Camino Community College, OCC: Orange Coast Community College, LBUSD: Long Beach Unified School District, LB: Long Beach, LA: Los Angeles, CSULB: California State University Long Beach.

*Community College data combines Asian and Pacific Islander in the same category. Asian is not considered an NSF-defined underrepresented group; therefore the combined category was not included in the totals for NSF-Underrepresented groups.

Sources: AreaConnect 2005; El Camino College 2005; Orange Coast College 2005; SEDL 2005.

A discrepancy between geoscience majors and University and community demographics is evident. The observed discrepancy was addressed by this NSF-funded effort. GDEP was designed to close the gap between community demographics and CSULB student demographics in the geoscience disciplines.

GDEP Goals

The GDEP program was developed to initiate an institutional shift in representation of minorities in the geosciences. The goals of this program were developed in response to the identified need to increase minority representation in and access to geoscience education and were as follows:

- Increase the number of underrepresented students who have a broad educational and research experience in the geosciences.
- Increase the awareness by community college and high school students about the geosciences, associated research careers, and the educational requirements for career development.
- Enhance the quantity and quality of geoscience research and teaching by faculty members from CSULB, community colleges, and high schools.
- Enable a smooth transition of underrepresented students from community colleges and local high schools into advanced undergraduate studies in the geosciences.

The GDEP program sought to achieve these overarching goals by involving high school and community college students, as well as their faculty, in a program of intensive summer research experiences.

Structure of the GDEP Program

GDEP incorporated a multifaceted approach to address the complexity of the problem in both the short-term and long-term. To improve the research and educational experiences of underrepresented students in the geoscience disciplines, GDEP created innovative collaborative partnerships both within CSULB (between colleges), and between CSULB and several community colleges and local high schools. NSF-defined underrepresented students and their faculty from five local community colleges and three local high schools teamed up with CSULB faculty to undertake summer research projects (Fig. 1).

Nine CSULB faculty members in geological sciences, geography, and anthropology (archaeology) participated in the GDEP. They worked throughout each academic year to design the didactic program and the field and lab based summer research projects. For the three summers of the program (2002, 2003, and 2004), high school and community college faculty committed five weeks of full-time work distributed over the eight weeks of full-time work performed by the GDEP students. GDEP students were assigned to one or more research projects and participated in an eight-week summer research experience that included participation in field, laboratory, and data analysis for these research projects. Students were mentored by faculty

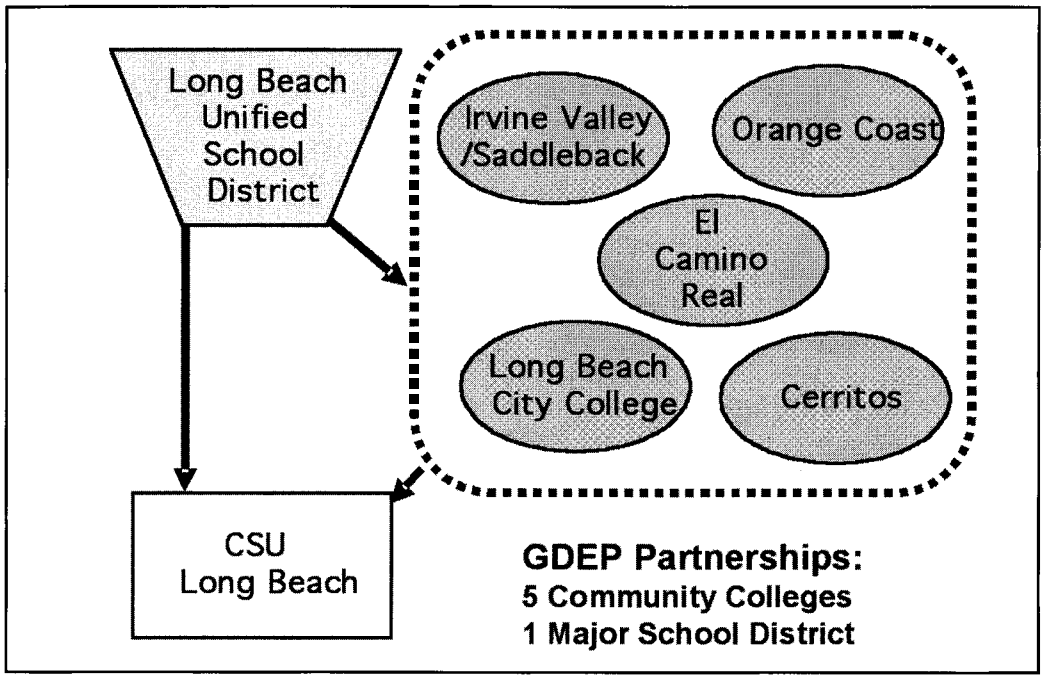

Figure 1. Geoscience Diversity Enhancement Program (GDEP) Partnerships

from CSULB, high schools, and community colleges on these research projects that culminated in oral and poster presentations. In addition to the specific research experiences, participants were trained in field and laboratory techniques, field mapping, sample analysis, and geophysical and/or geochemical instrumentation. Presentations on research ethics, safety considerations, poster and oral presentation guidelines, and careers in geoscience were also provided.

Over the course of the project, GDEP included 29 high school (HS) and community college (CC) students, 21 high school or community college faculty, 16 CSULB faculty or staff members, and 12 CSULB undergraduate and graduate students (Table 2).

Table 2. Geoscience Diversity Enhancement Program (GDEP) Participation.

Participant Group	Summer 2002	Summer 2003	Summer 2004
CC/HS Faculty	9	11	12
CSULB Faculty	10	10	13
CC/HS Students	5	12	12
CSULB Students	3	7	12
Total	27	40	49

Research Experiences

The GDEP summer research projects were wide-ranging given the diversity of the geoscience disciplines and the varied interests of the CSULB faculty involved. For example, two of the archaeology projects incorporated geophysics to investigate and map a Chumash Indian site in the Channel Islands off the California coast (2002 and 2003) and an adobe site in Malibu Creek State Park, Malibu, California (2002). A sedimentary geology project characterized the unusual Monterey Formation (2002) while a structural geology project investigated deformation bands in the San Joaquin Hills (2002). A geography project used a global position system (GPS) to ground truth elevation in the San Dimas Experimental Forest in Glendora, California (2002). Another geography project included a service-learning component to map Charmlee Park in Malibu, California, and evaluate local geology (2003). Geographers also led a research project that used satellite imagery and GPS to assess wildfire hazard in the Santa Monica Mountains (2003) and performed mapping of invasive species in the South Coast Wilderness (2004). Two out-of-state projects included fault imaging in the White Pine Range, North-Central Nevada (2002), and an investigation of marine terraces stimulated by earthquakes on the Pacific Coast of southern Mexico (2002; 2003).

In addition to the research projects, student participants were provided with a program of on-campus workshops and off-campus tours designed to:

- enhance their research and study skills,
- provide them with training in presentation techniques and web design,
- ensure that they understood field and lab safety requirements,
- expose them to global positioning system (GPS), geographic information system (GIS) and remote sensing technology, and
- introduce them to the ethics of scientific work.

Student participants were required to prepare poster presentations of their research and present them at a culminating on-campus student research symposium and were encouraged to present their research at regional and national science conferences.

Student Attitudes to the Geosciences

An initial element of GDEP was to assess student perceptions of the geosciences so that the program could more precisely respond to the reasons for underrepresented participation. To obtain this information attitude surveys were administered to non-GDEP students (N=527) taking geoscience general education courses.

In spring and fall of 2003, paper and pencil attitude surveys were distributed to sections of each department's basic general education science course (Introduction to Physical Geography, Introduction to Physical Anthropology, and General Geology) at both CSULB and the participating community colleges, and in science classes at participating high schools. These surveys required students to indicate their level of agreement with twenty-nine statements using a Likert-type response scale ranging from 1=strongly disagree to 5=strongly agree (Table 3).

The surveys were administered at the beginning of each semester to establish how students view geosciences before having taken an introductory course (pre-survey) and at the end of the same semester to see whether the course affected their perceptions (post-survey). Surveys were administered to a total of 527 students. These included nine high school students, 330 college freshman and sophomores, and 184 college juniors (four students did not specify class year). The NSF-defined minority groups represented a slight majority of respondents (55.2%) as follows: 21 African Americans (4.0%), 132 Latinos (25.0%), and 95 respondents who self-identified as Asian, Southeast Asian, or Filipino (18.0%). Caucasian respondents (236) comprised the largest ethnic group (44.8%).

Differences in responses across CSULB, community colleges, and high school groups were evaluated. A comparison of pre-test responses among all geoscience classes indicated that overall, high school students tended to differ from the college students. High school students reported greater intentions to pursue science and math, yet they reported being less familiar with geoscience than community college (CC) and CSULB students. The following items showed significant differences across groups:

Table 3. Attitude Survey Questions.

Item	Survey Questions
1	I have a good understanding of how scientists do research.
2	I consider myself well skilled in conducting scientific research.
3	I've wanted to be a scientist for as long as I can remember.
4	I have a good understanding of elementary Geoscience.
5	I know what course of study is required to become a Geoscientist.
6	I am considering majoring in Geoscience.
7	I'd enjoy a career in Geoscience.
8	I'm not certain I could ever become a Geoscientist, even if I tried.
9	I think I could handle the coursework required to become a Geoscientist if I wanted to.
10	I don't know much about possible careers in Geoscience.
11	I plan on taking math courses that would prepare me to major in a science.
12	Most geoscientists earn good incomes.
13	I have a good idea of what Geoscientists study.
14	My family would be very supportive if I decided to become a Geoscientist.
15	I enjoy going hiking and/or camping.
16	I enjoy boating.
17	I'd prefer to work on a science project in an outdoor setting rather than in a research laboratory.
18	I enjoy reading science fiction novels.
19	I enjoy reading nature and travel books and magazines.
20	Many scientists had a childhood similar to my own.
21	Minority students receive little encouragement to study Geoscience.
22	Caucasian students receive little encouragement to study Geoscience.
23	Female scientists are rarely as productive as male scientists.
24	I expect that my final grade in this class will be a(n): _____ .

Question 2: High school students considered themselves more skilled in conducting scientific research than did CC or CSULB students.

Question 3: High School students more strongly endorsed the statement "I have wanted to be a scientist for as long as I can remember".

Question 4: High school students reported lesser understanding of elementary geoscience than did community college and CSULB students.

Question 6: High school students reported slightly stronger intentions to pursue a major in geoscience than did community college students.

Question 11: High school students reported greater intentions of taking math courses in preparation for a major in science than did community college or CSULB students.

Question 17: High school students were less likely to be interested in working on a project in the field rather than in the laboratory in comparison to community college students.

Question 19: High school students were less likely than community college and CSULB students to read nature and travel books and magazines.

Question 20: High school students were more likely to assert that scientists had a childhood like their own than did community college and CSULB students.

Survey results (Table 4) indicate that in each of the three geoscience disciplines, even after completion of a geoscience class, students were unsure of the career opportunities in geoscience, and were unaware of the earnings potential of these careers. Items that scored a positive endorsement (M=3.5 or better) included questions that were intended to indicate a predilection for interest in geoscience. Students reported an interest in hiking/camping and preferred working on a science project in an outdoor setting rather than in the lab. (Students were also positive about the grade they expected to earn in the course). However, students disagreed (M=2.0 or below) with the assertions that they have always wanted to be scientists, plan on majoring in geoscience, or plan on taking the required math courses to prepare them for a career in geoscience. Students disagreed with the assertion that female scientists are less productive than male scientists.

Mean responses on seven questions from students in geography classes differed significantly between the pre- and post-surveys (Table 4). Overall, students felt that they had a better understanding of scientific research at the end of the class (question 1). Students became more positive in their perceptions of their ability to engage in research, although at the time of the post-survey they still tended to disagree slightly with this statement (question 2). Students reported that they had a better understanding of geoscience than they did earlier (question 4). While there was an increase in student response, at the time of post-survey students tended to be unsure of what course of study is required to become a geoscientist (question 5). While there was significant increase in interest at the time of the post-survey, most students were not likely to become geoscience majors (question 6). There was no significant increase in interest in the other geoscience disciplines (geology and anthropology). Students' self-reported knowledge about what geoscientists study increased significantly (question 13). Although students generally disagreed with the view that female scientists are less productive than male scientists, the geography students' perceptions of female scientist productivity became slightly more negative in the post-survey (question 23).

Table 4. Attitudinal Survey Results: Fall and Spring 2003

	Geography Only		*Geology & Anthropology*	
Item	**Pre M**	**Post M**	**Pre M**	**Post M**
1	3.43	3.71	3.54	3.83
2	2.62	2.92	2.49	2.67
3	1.60	1.72	1.86	1.79
4	2.97	3.67	3.19	3.53
5	2.05	2.99	2.26	2.78
6	1.49	1.81	1.59	1.55
7	2.15	2.16	2.39	2.41
8	3.01	3.21	3.05	2.89
9	3.63	3.54	3.63	3.53
10	2.83	2.87	3.02	2.99
11	1.87	1.88	2.15	2.06
12	2.93	3.02	3.05	2.99
13	2.98	3.44	3.13	3.58
14	3.88	3.97	3.91	3.96
15	3.97	3.90	4.10	4.11
16	3.84	3.71	3.75	3.72
17	4.01	3.99	4.13	4.05
18	2.64	2.71	3.12	3.14
19	3.20	3.06	3.38	3.34
20	2.77	2.78	2.87	2.83
21	2.81	2.78	2.74	2.72
22	2.67	2.63	2.60	2.53
23	2.00	2.29	1.93	1.76
24	3.24	3.08	2.76	2.76

Shaded cells indicates Pre-Post means are significantly different α=0.05.

Overall, perceptions of the geosciences by students in the Introduction to Physical Geography classes became more positive (37.5% of responses were above neutral in the pre survey, increasing to 50% in the post-survey). However, in the other geoscience classes, overall perceptions of the geosciences became more negative (positive responses decreased from 54.2% in the pre-survey to 41.7% in the post-survey).

The attitude surveys were administered to a population of high school and college students in introductory courses and thus provide insight into attitudinal differences between high school and college students. Results of the survey also suggest areas that faculty at all levels can improve to enhance their students' awareness of geosciences. For example, students expressed their interest in outdoor activities. Faculty could build on this interest by educating students about the field component of the geosciences, the appropriate course of study required to become a geoscientist, and geoscience career options. Survey results indicate that while students increased their understanding of geoscience, and what is required to become a geoscientist (questions 4, 5, and 13), geoscience faculty could improve the discussion about possible careers in geosciences.

Focus Group Results

While the survey results discussed above helped to provide a snapshot of the "typical" student in a geoscience course, the primary focus of our attention was on the evaluation of the actual GDEP participants. These students were the subject of intense, qualitative pre- and post-summer focus groups (N=29) to evaluate their perceptions.

In these interviews students expressed their appreciation for the opportunity to work one-on-one with faculty, graduate students, and their peers and the opportunity to get to know faculty as individuals while engaging in research and workshops. They reported coming to an understanding of why math and physics are often recommended or required for science majors in general and the geosciences in particular. They also were impressed with and surprised by the kinds of jobs that geographers, geologists, and archaeologists participate in and the good earning potential of these careers. Students appreciated the pleasant atmosphere of cooperation among CSULB geographers, geologists, and archaeologists who were participating in GDEP. Generally, the students left the program with more confidence in their abilities to pursue study in the geosciences and a commitment to the geosciences. Students indicated their intentions to either major or minor in a geoscience-related field, and indicated that they would like to seek masters and/or doctoral degrees, aspirations that were much elevated from their initial pre-GDEP goals.

The following quotes were selected from post GDEP focus group interviews with students who worked directly with CSULB geography faculty.

Program Evaluator: *What interests you about Geoscience?*

Latino Community College Student: ... most people for example when I tell them that I want to major in geography, they are like "oh, so you want to make maps"... they don't realize that there is a lot more that you have to do...that you to learn concepts about geology, and concepts about chemistry...I think if people went out and tried to explain to them that this stuff is not so bad, and there is so many applications that geoscientists have...I think people would get a better idea... because most people just want you to be a doctor or a lawyer or something like that, and they don't think of a geoscientist as a serious job...

Program Evaluator: *Compared to prior to your involvement in the GDEP program, how would you describe your ability to conduct research?*

African American High School Student: ...it has increased so much...I feel like I can go back to school and I am going to take as much AP classes as I can, because I thought college would be something out of my reach...but now that I have been here and seen what at college...they are just like other people...I thought they were the geeky kids that won the spelling contests...but they are really just human beings...so I am going to go back and take as many AP classes as I can...

Meeting the Goals

While longitudinal tracking is required to assess the long term impacts of GDEP, it is clear that many of the GDEP goals have been met in the short term.

Goal 1: *Increase the number of underrepresented students who have a broad educational and research experience in the geosciences.*

GDEP has increased the number of underrepresented students who have a broad educational and research experience in the geosciences. The program involved 29 minority students who might not otherwise have had the opportunity to have such an intense exposure to the geosciences. Thirteen of nineteen past student participants from years 1 and 2 were reached during the spring of 2004 for a brief phone interview. All thirteen (13) indicated that they would choose to participate in GDEP all over again.

While it is difficult to track the success of our program outside of CSULB, campus student enrollments provide an indication that this goal is being met. Campus wide, the

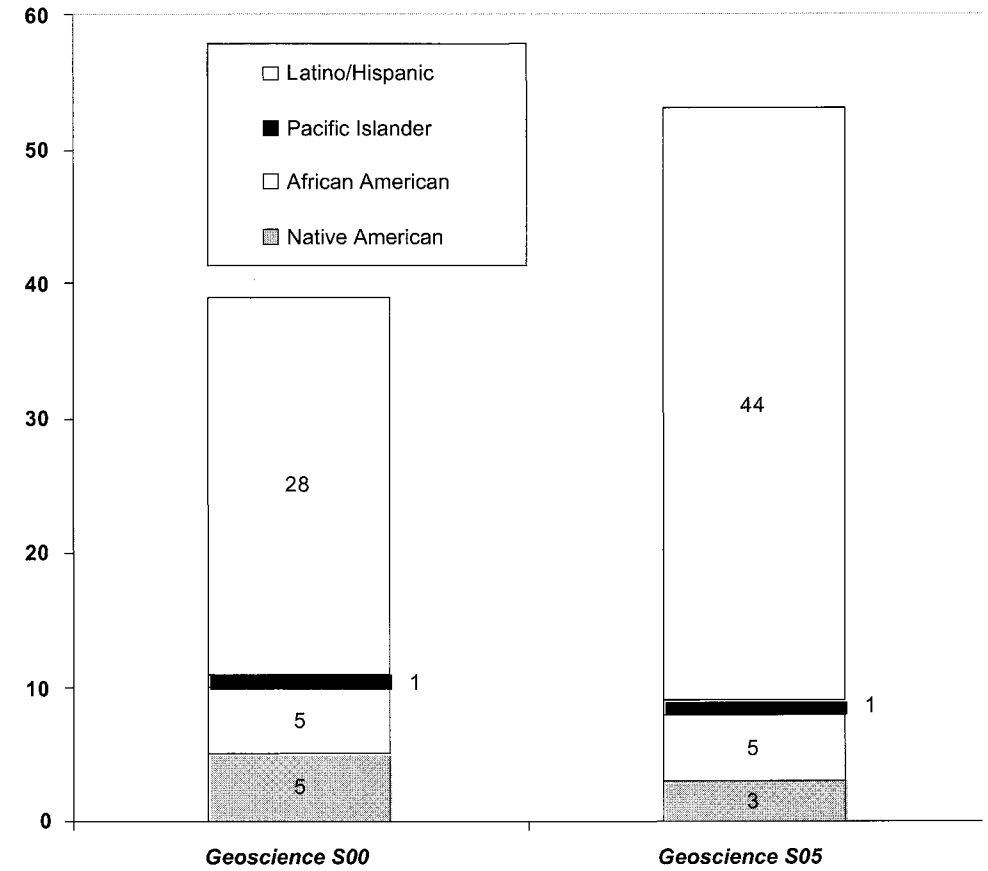

Figure 2. Underrepresented Students in Geoscience Departments Spring 2000 and Spring 2005.

number of undergraduate students in NSF-defined underrepresented groups increased by 30.7% from spring 2000 and spring 2005. Over the same time period, the number of CSULB students in NSF-defined underrepresented ethnicities that were geoscience majors increased by 12.7%. We are making progress. The percent change between spring 2000 and spring 2005 in the number of underrepresented students majoring in each of the geoscience departments has increased overall by 35.9%, and by 40% in Anthropology, 30% in Geography, and 25% in Geology. Although Native American representation decreased while African American and Pacific Islander representation remained unchanged, the number of Hispanic/Latino majors in geoscience departments increased by 57.1% (while the university experienced an increase of 30.27% in this group of students) (Fig. 2). While these results are modes, they suggest an encouraging trend.

Goal 2: *Increase the awareness by community college and high school students of the geosciences and their associated research careers and educational requirements.*

The GDEP structure was designed to increase the awareness of community college and high school students about the geosciences, associated research careers, and educational requirements. Student participants likely shared their experiences with their peers after they returned to their home institutions. Participating CSULB faculty have increased their outreach to classrooms at partner institutions, which most likely results in greater awareness of the geosciences in those communities.

Responses to the attitude surveys conducted during the program indicated that faculty could improve their dissemination of information regarding potential geoscience careers and their associated educational requirements. In response to these findings, GDEP faculty have reported that they have been making efforts to directly address geosciences in their classrooms.

Goal 3: *Enhance the quantity and quality of geoscience research and teaching by faculty members from CSULB, community colleges, and high schools.*

GDEP provided an opportunity for faculty to conduct research collaboratively. More than twenty-four (24) presentations at regional or national meetings have resulted from GDEP activities during the past three years. Research informs and enhances teaching. Faculty have reported that they have integrated examples from their GDEP supported research projects in their classes through laboratory exercises and field trips. Program collaborations among participating faculty continues. For example, CSULB geography faculty are currently collaborating with Lakewood High School teachers on an educational project based in one of the GDEP study areas.

Goal 4: *Enable a smooth transition of underrepresented students from community colleges and local high schools into advanced undergraduate study in the geosciences.*

The GDEP evaluator is conducting a longer term longitudinal tracking of GDEP student participants through yearly contact. Current data obtained from the focus group interviews and follow-up phone surveys indicate that the program has been successful in steering students to the geosciences. Continued outreach to community college and high school classrooms and guidance counselors will ensure a smooth transition of underrepresented students from community colleges and local high schools into advanced undergraduate study in the geosciences.

Conclusions

While the number of students directly involved in the GDEP experience is small, we anticipate that this program will have impact beyond the student participants. We regard this work as proceeding literally, one student at a time. We are confident that the momentum gained from recognition of our program will serve to increase the numbers of students enrolling in the geoscience fields, particularly those from underrepresented groups.

The program model developed through this initiative represents a productive step toward an institutional shift to increase the participation of underrepresented groups in the geosciences. The CSULB geologists, geographers, and archaeologists succeeded in creating a collaborative community that could design multidisciplinary goals and implement them through a complicated intra-campus and inter-campus institutional structure. CSULB is well poised demographically to contribute to enhancing diversity in the geosciences; however, such a program could be successfully implemented at other institutions, regardless of their Minority Serving Institution (MSI) status.

Short-term outcomes indicate that several of the teachers have changed their classroom teaching to incorporate additional geoscience topics and materials. For example, teachers at Lakewood and Wilson high schools have purchased inexpensive GPS units, and have incorporated GPS training and environmental monitoring of a local wetland area into their lesson design. From anecdotal evidence provided by interactions with community college faculty, the most important enhancement appeared to come from the opportunity to do research at CSULB and to join a wider community of scholars engaged in geoscience research. Several of the community college faculty indicated an interest in pursuing research topics throughout the academic year. It is likely that the positive influence that participation in this research program has had on participating faculty will influence their teaching and reach many more than those students served directly by the summer research experiences. If we were to assume that each of these faculty members teaches between 100 and 300 students per year (a conservative estimate, given the average class sizes at all educational levels in southern California), then between 3,000 and 9,000 students per year in the greater Long Beach area are potentially affected by GDEP faculty efforts.

GDEP has fostered graduate student mentorship and teaching abilities. Several graduate students have reported great satisfaction in working with the high school and community college students during the summer program and appear to have gained confidence in their own abilities in mentorship and teaching. GDEP has already resulted in numerous research presentations at local and national conferences. The program also maintains an active web presence to disseminate information on research projects and program participation (Rodrigue 2005).

Results indicate that to increase student interest in geoscience, geoscience faculty must be more proactive in providing information to students about the potential careers available in geoscience, with a special emphasis on the applied fields. Students reported feeling uninformed about careers in the geoscience field. It appears that many students do not have a roadmap to geoscience careers because they have never been exposed to this information. It is important for geoscience faculty to understand career development of young people and encourage geoscience career development through mentoring, role modeling, and providing direct hands-on success experiences. Through these activities students can envision themselves as future geoscientists.

The visibility of the geosciences in local community colleges and high schools has increased through the GDEP summer student research immersion experience and through campus visits by CSULB GDEP faculty and staff during the academic year. These outreach activities emphasize: (1) the exciting fieldwork common to geoscience disciplines; (2) related jobs and potential careers; and (3) the educational preparation students need to be competitive for those jobs and further studies. The continuation of such outreach activities with an emphasis on career possibilities increases the visibility of the geosciences at the feeder institutions thus improving the possibility of attracting majors at the four-year university level.

A "trickle-down" effect of the GDEP field research activities has been a deliberate focus on addressing the issues that limit access to geoscience majors and careers. An increased effort is being made to educate students about the applied nature of geoscience disciplines through physical and virtual field trips and lectures. This is intended to increase the attractiveness of the geoscience majors to non-GDEP students in our courses.

We encourage geography faculty in other minority-serving institutions to consider seeking out their colleagues in geology and archaeology. Research-based experiences for underrepresented groups in feeder institutions are one means of increasing minority student interest in the geosciences. Such interaction can be rewarding, improve the contacts among disciplines, boost individual research activities and facilitate access of minority students to geography and related disciplines.

The GDEP program was designed to initiate an institutional change to increase minority representation within the geosciences. The development and continuation of such programs is integral to achieving this goal, and warrants further replication.

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Notes

1. At California State University Long Beach (CSULB) the Geosciences are taught in three departments that are located in two different colleges. Geography (physical geography) and Anthropology (archaeology) are in the College of Liberal Arts (CLA) while Geology is part of the College of Natural Sciences and Mathematics (CNSM). A new major, Environmental Science and Policy, initiated in fall 2002 is located in both CLA and CNSM and was not included in this project or evaluation.

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