AN APPROACH FOR DISCOVERING AND INSPIRING FUTURE GEOSCIENTISTS IN URBAN SETTINGS AND BEYOND

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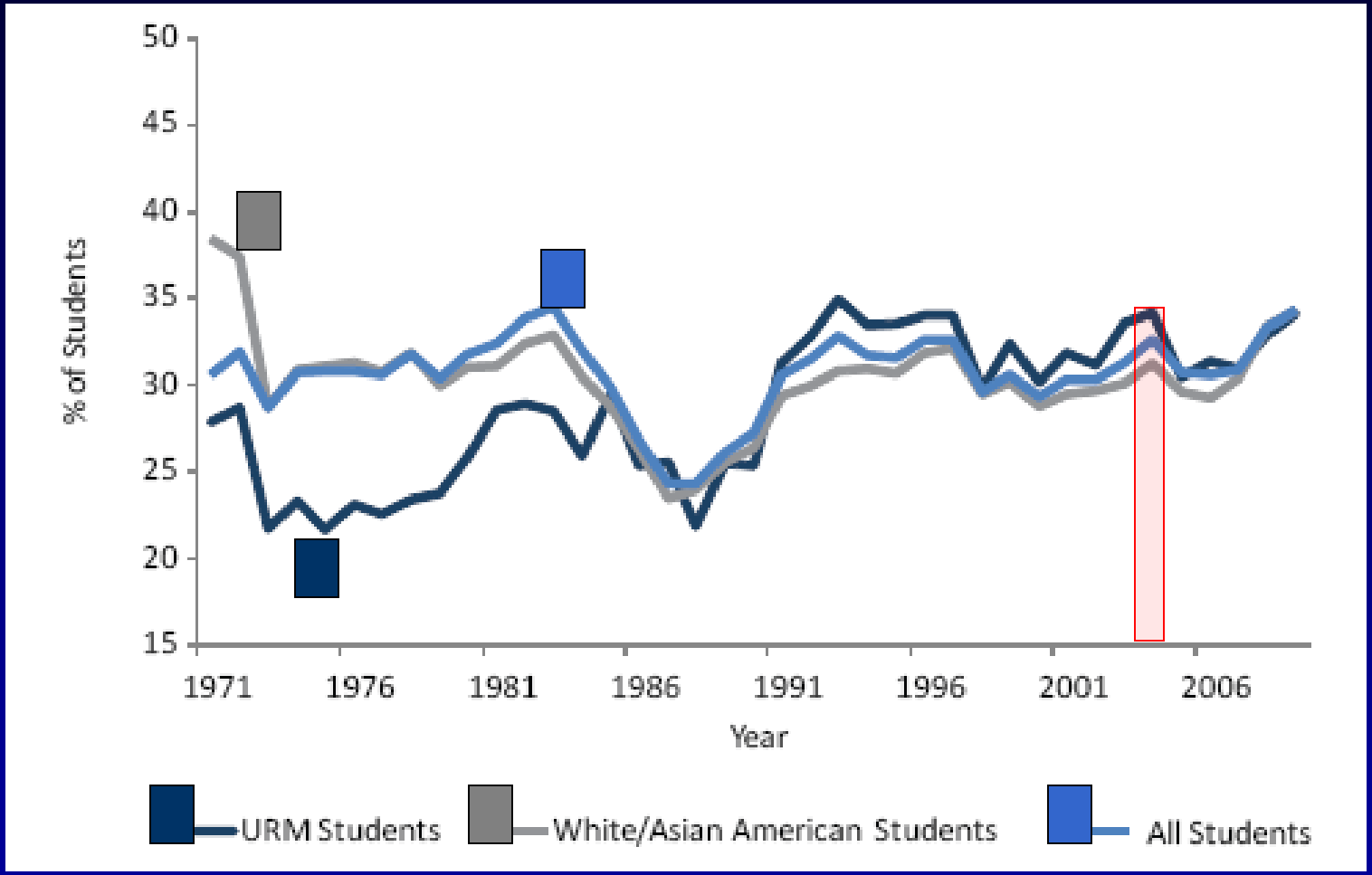
Outline

- Science, Technology, Engineering and Mathematics (STEM) Workforce
- Trends in Geosciences Workforce
- Projected Demographics of United States
- Overview of Project GAP (Geoscience Awareness Program)
- Project GAP Intervention Model
- Results
- Conclusion and Acknowledgements

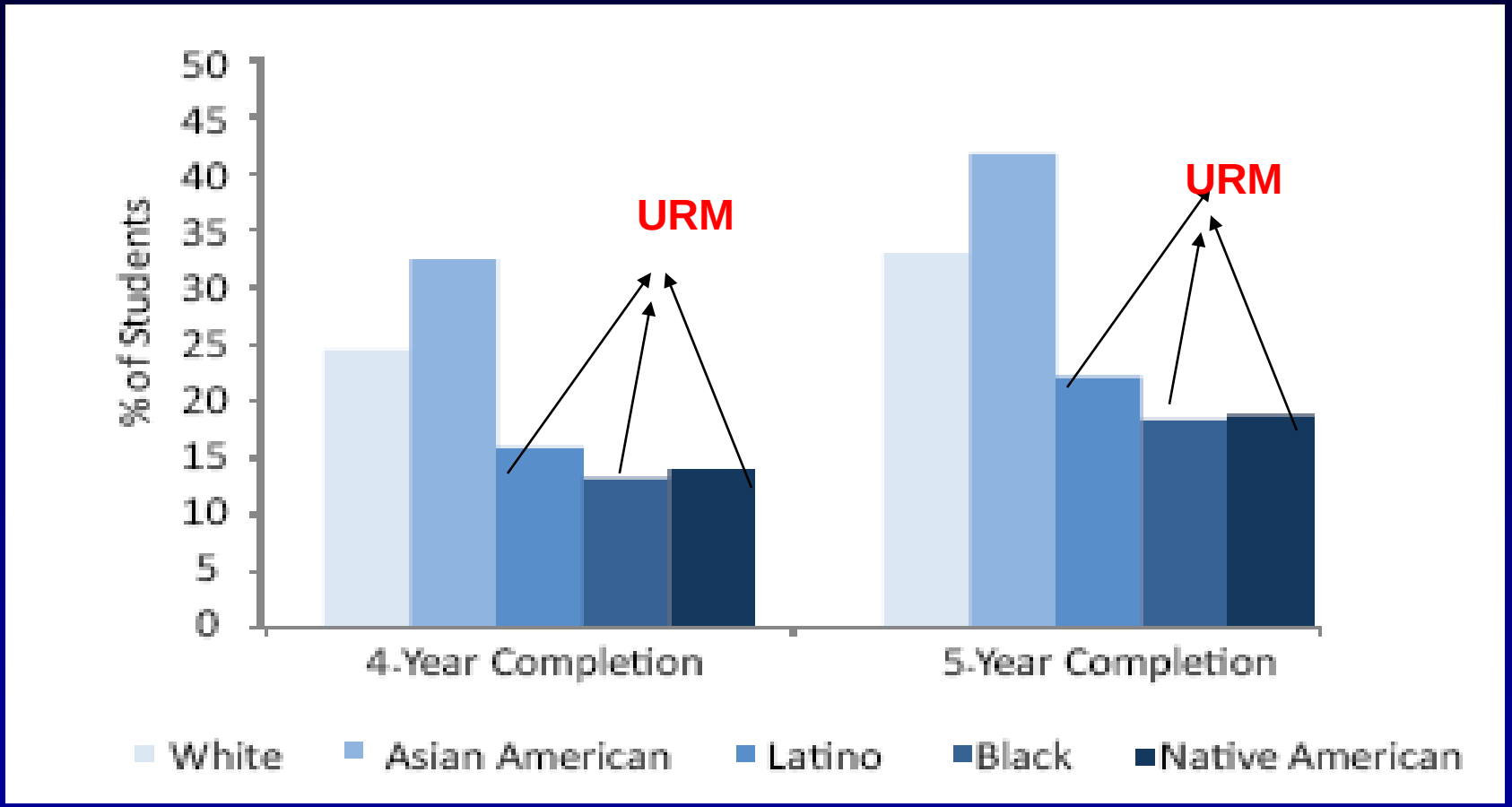
Science, Technology, Engineering and Mathematics (STEM) Workforce

Trends in Students' Aspiration to Major in a STEM Discipline by Racial Identification, 1971-2009



Reference: January 2010 Research Brief---Higher Education Research Institute at UCLA home of the Cooperative Institutional Research Program

Percentage of 2004 STEM Aspirants who completed STEM Degrees in Four and Five Years, by Race/Ethnicity



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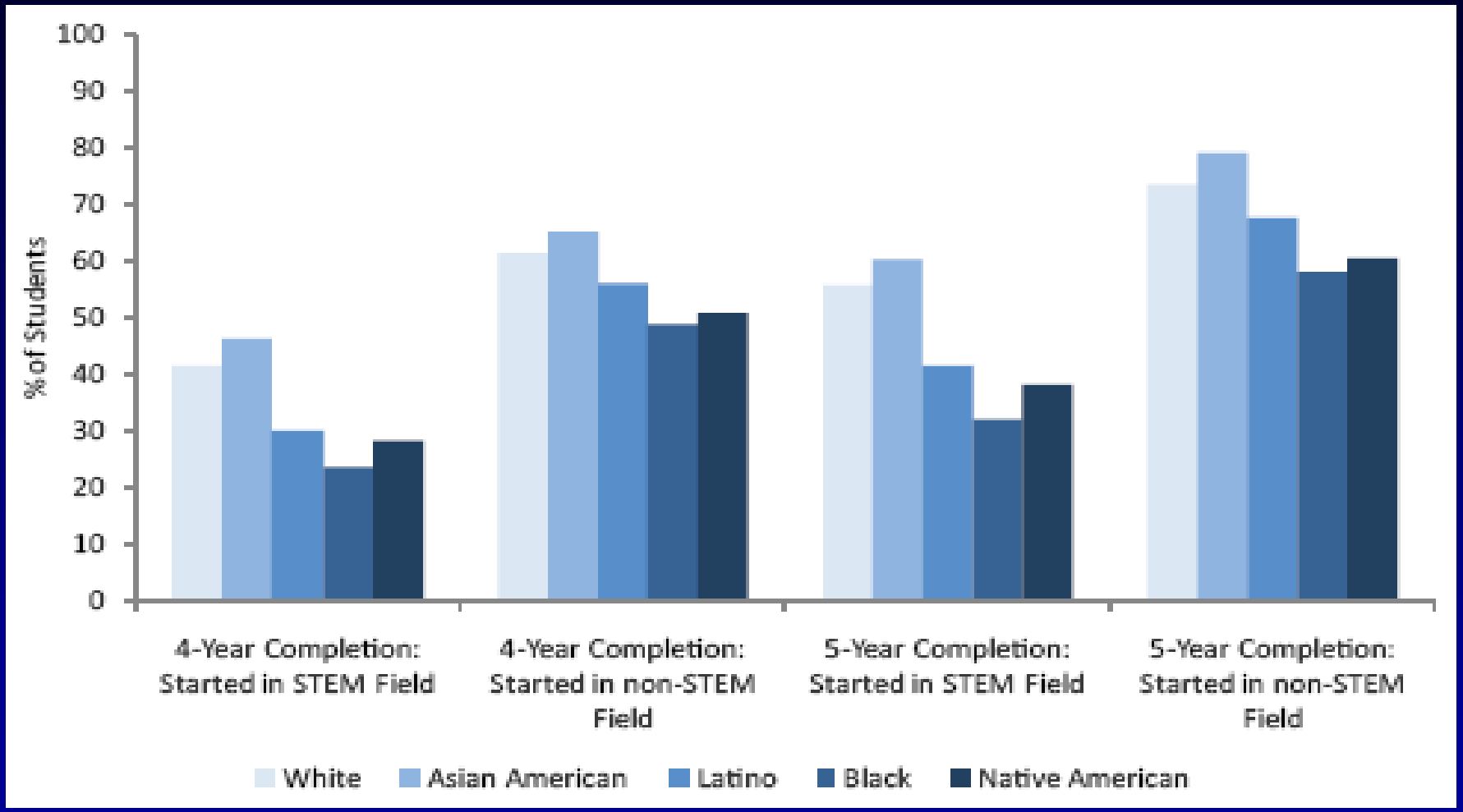
Four- and Five-Year Degree Completion Rates of 2004 Freshmen, by Initial Major Aspiration and Race/Ethnicity



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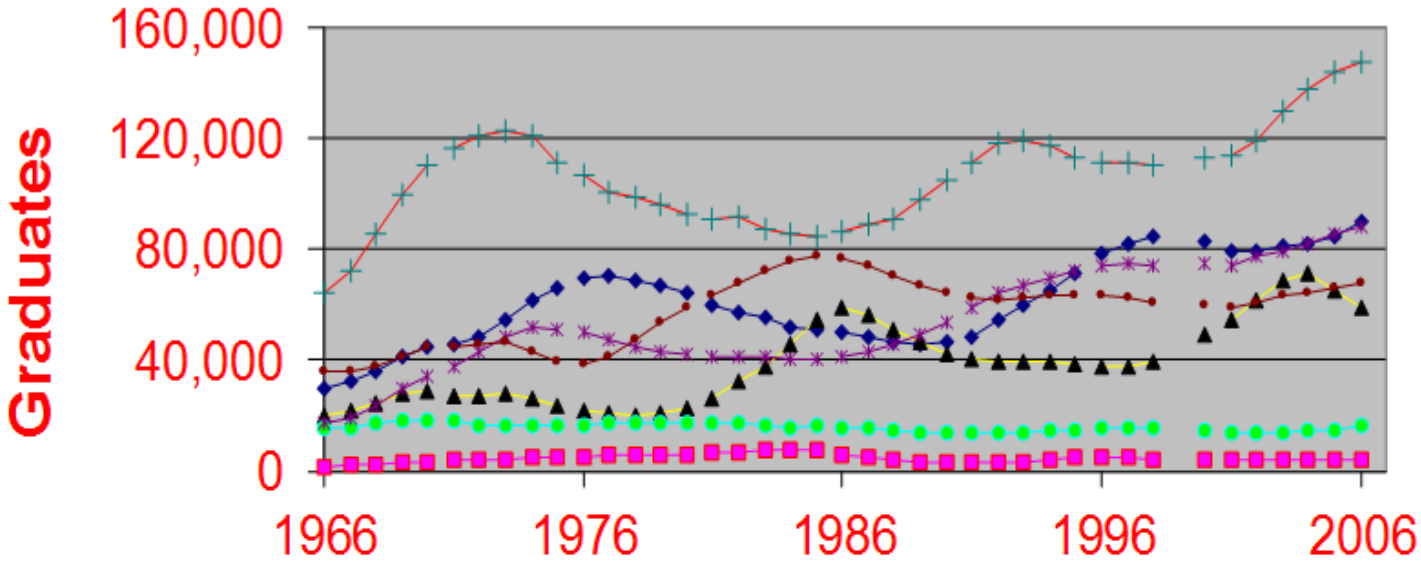
Trends in Science Degree Awarded

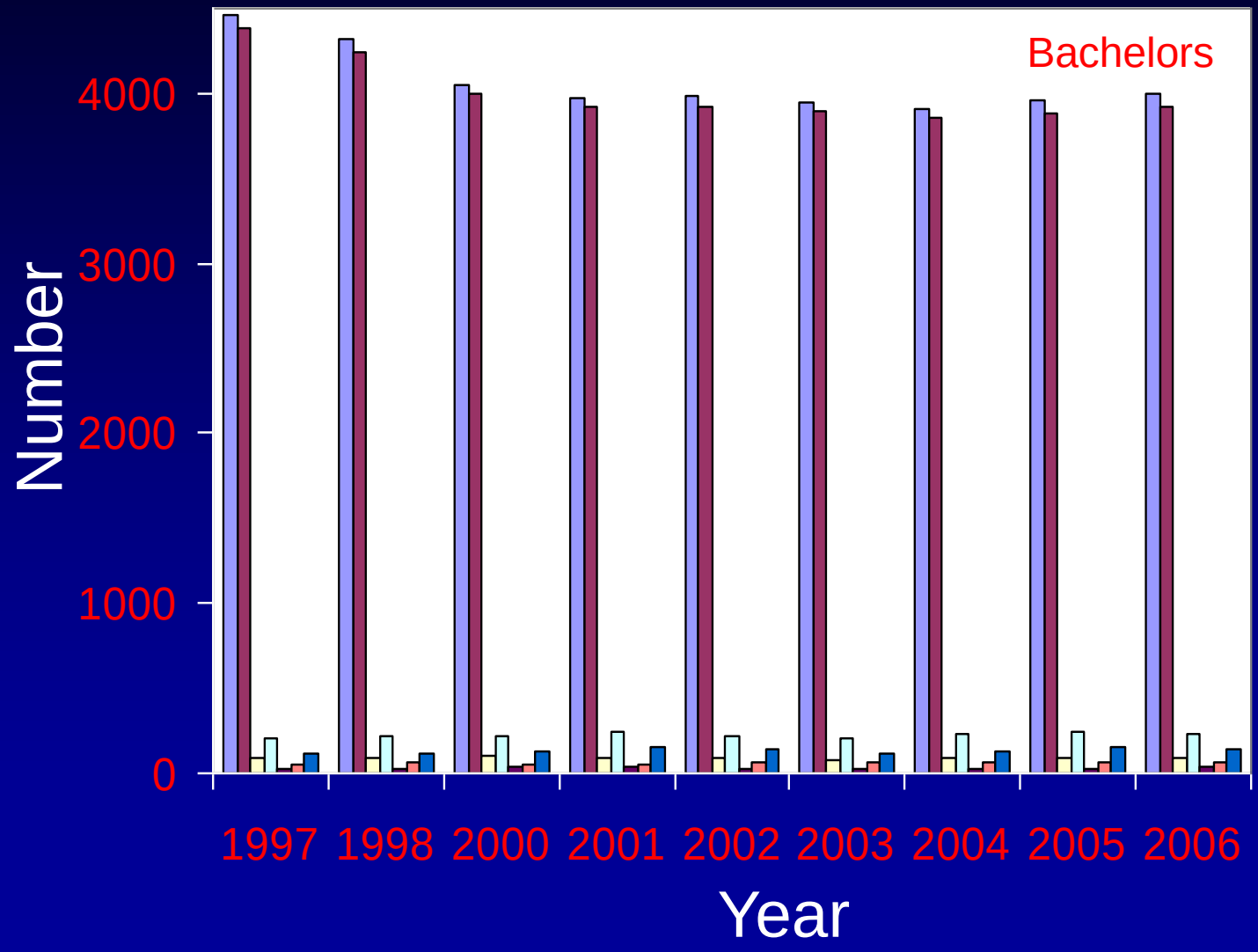


- Biological Sciences
- GeoSciences
- Mathematical and Computer Sciences
- Physical Sciences
- Psychology
- Engineering
- Social Sciences

Data compiled from NSF/SRS

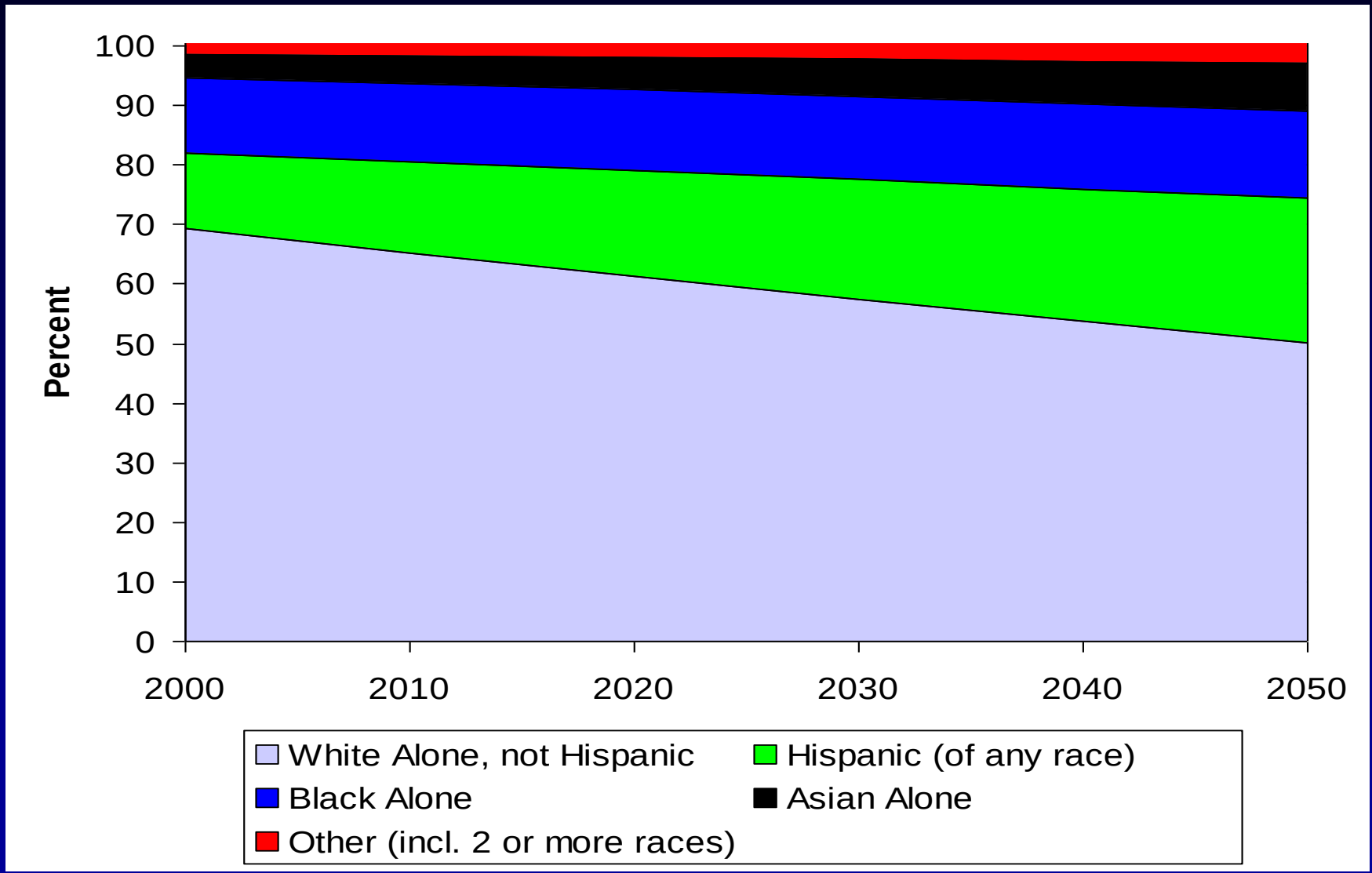
Bachelors

Trends in Geosciences Workforce



Data compiled from NSF/SRS

Population Demographics 2000-2050



Source: U.S. Census Bureau, 2004, "U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin," http://www.census.gov/ipc/www/usinterimproj/.

Overview of Project GAP (Geoscience Awareness Program)

Project GAP

Develop urban underrepresented minority (URM) students' interest in majoring in geosciences through College and Pre-college Initiatives

Approaches:

- Identify targeted audience and partnership institutions
- Develop series of lectures, presentations, brochures and educational materials about Geosciences
- Aggressively recruit URBAN URM students into Ohio State University, School of Earth Sciences programs
- Develop working relations with HBCU, NABGG, SACNAS and other Minority Scientific Organizations

Project GAP Interventions Model:
Pre-college Initiatives

- ❑ Pre-survey
- ❑ Presentation
- ❑ Hands-on activities
- ❑ Post-survey
- ❑ Brochure

Survey

TABLE I: Survey questions administered before and after Project GAP.

Questions	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. I think geological science is really interesting.	☐	☐	☐	☐	☐
2. Geoscientists or Earth scientists are mostly men who work in the field.	☐	☐	☐	☐	☐
3. I might want to be a geoscientist or Earth scientist.	☐	☐	☐	☐	☐
4. I am familiar with what a geoscientist or Earth scientist does.	☐	☐	☐	☐	☐
5. I know a geoscientist or Earth scientist personally.	☐	☐	☐	☐	☐
6. You need to know a lot of math to become a geoscientist or Earth scientist.	☐	☐	☐	☐	☐
7. Women can be geoscientists or Earth scientists.	☐	☐	☐	☐	☐
8. Geoscientists or Earth scientists cannot be trusted.	☐	☐	☐	☐	☐
9. Geoscientists or Earth scientists cannot be religious.	☐	☐	☐	☐	☐
10. My family would be proud of me if I became a geoscientist or Earth scientist.	☐	☐	☐	☐	☐

Adetunji, O.O., Ba, J.M., Ghebreab, W., Joseph, J.F., Mayer, L.P., and Levine, R. 2012. Geosciences awareness program: A program for broadening participation of students in geosciences. *Journal of Geoscience Education*, 60:234–240

Outline of Pre-college Initiative Presentation

- Selected and targeted questions
- Definition of Geosciences (connection to the outdoors)
- Earth Composition and Structure
- What do Geoscientists Do?
- Who are Geoscientists?
- Where do Geoscientists work?
- Prospective Employers
- Salary Outlook for Geoscientists
- Relevance of Geosciences to Society
- Presenting hands-on activities

Targeted Questions

- Do you want to know why earthquakes happen?
- Are you interested in traveling around the world and exploring the oceans?
- Do you want to protect our environment?
- Do you want to learn about global warming and climate change?
- Are you interested in contributing to solving our energy problem?
- Do you want to contribute to the development of new technologies?
- Do you want to make a difference in society?
- Are you interested in finding clean water for all global citizens?
- Are you interested in learning about our Earth?
- Are you interested in understanding the origin of volcanic activities?

What Do Geoscientists Do?

Disclose

Information about the earth's geologic past and present by applying sophisticated instruments to analyze the composition of earth, rock, water and fossils

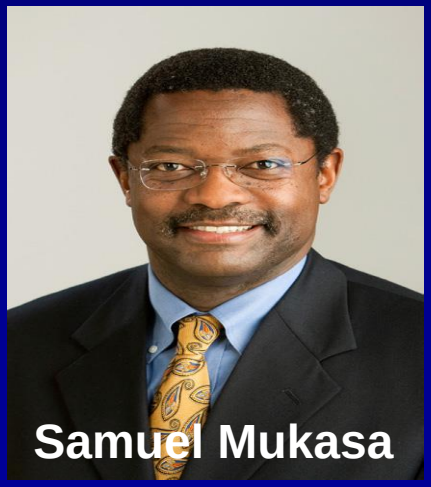
http://en.wikipedia.org/wiki/Fossil

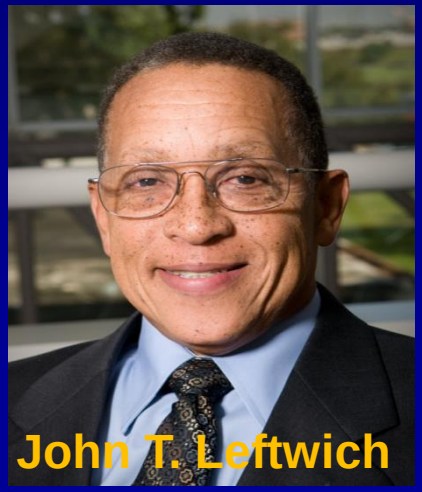
Travel

To remote and beautiful places around the globe

Who Are Geoscientists?

They are hardworking men and women from diverse background and diverse experiences.

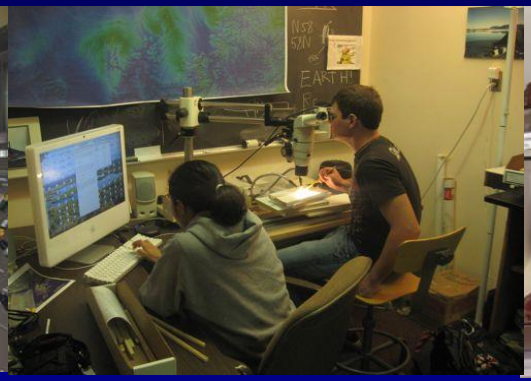




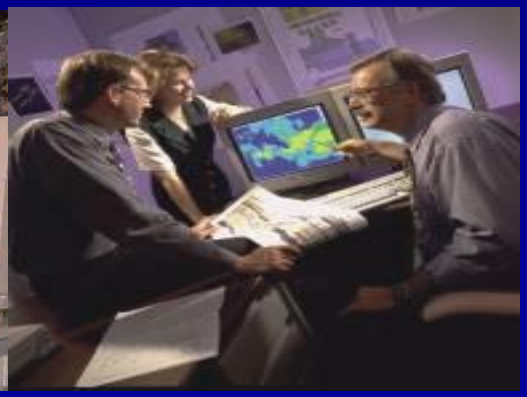
Where Do Geoscientists Work?

In the field

They work in the Lab



They work in the office



Relevance of Geosciences to Society

- Natural Disasters and Occurrence
- Energy
- Climate Change

Salary Outlook

2008-09 Average Salary By Degree

YEARS EXPER	B.S.	M.S.	Ph.D.
0-2	$ 73,000	$ 88,800	$ 95,000
3-5	88,300	112,000	147,000
6-9	90,000	141,400	105,000
10-14	102,500	122,900	155,000
15-19	124,300	166,500	134,900
20-24	147,500	172,300	215,000
25+	162,300	179,000	150,000

Reference: http://www.aapg.org/explorer/2009/06jun/salary0609.cfm

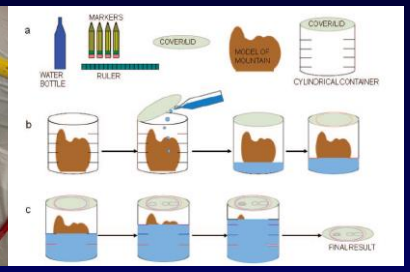
What Do You Need

- Stay in school
- Take your Math and Sciences class seriously. Especially your Chemistry, Biology, Physics and Math classes
- Social Sciences (English, History and Geography)
- Good communication skills

Hands on Activities

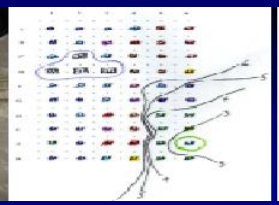
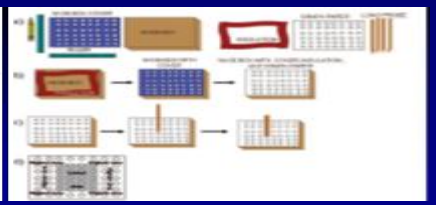
- **Topographic Maps**





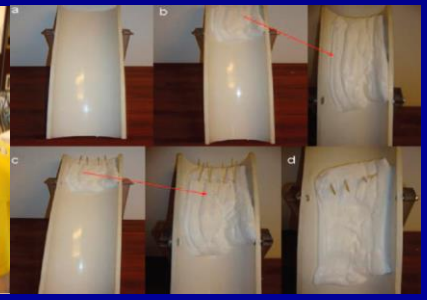
- **Unknown Surface**



- **Glacier Dynamics**



Evaluation Methods

- 71 students completed both the pre-participation and post-participation surveys.
- Agreement was treated as if it were a continuous variable
- Responses were coded as follows:

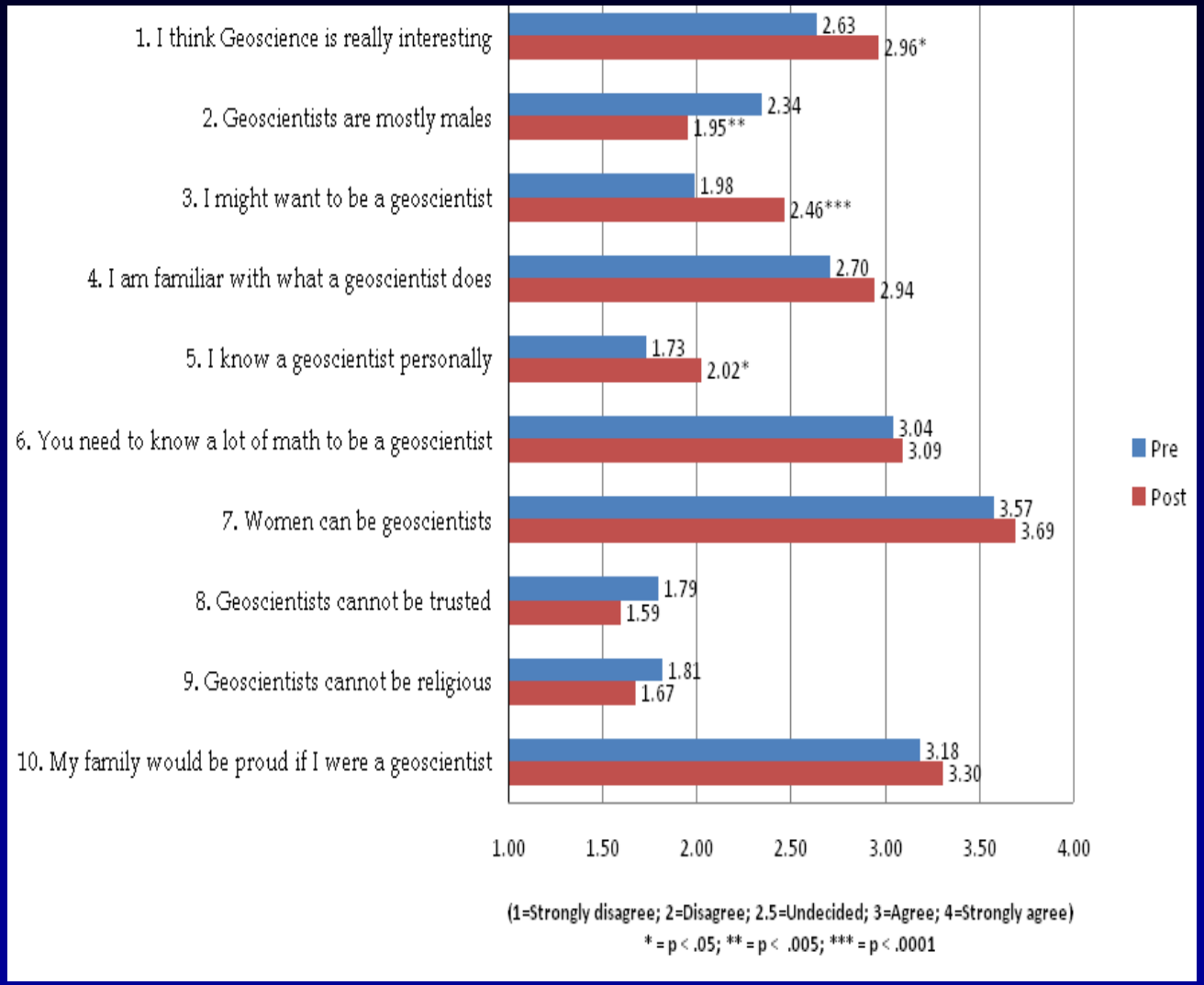
  Strongly agree(4), agree(3), undecided(2.5), disagree(2), and strongly disagree(1).
- Mean response scores were calculated for each pre-participation and post-participation questions for the 71 students.
- Within-student change scores were calculated
- The significance of the change score was determined with two-tailed dependent t-test
- Complete statistical data is given below

Results and Discussions

Highlights

- Data from Question 1(Q1) shows that the interest of the students in the geosciences increased after they participated in Project GAP

- Data from Q2 shows that after participation students were more likely to disagree with the statement ”Geologists or Earth scientists are mostly men who work in the field”

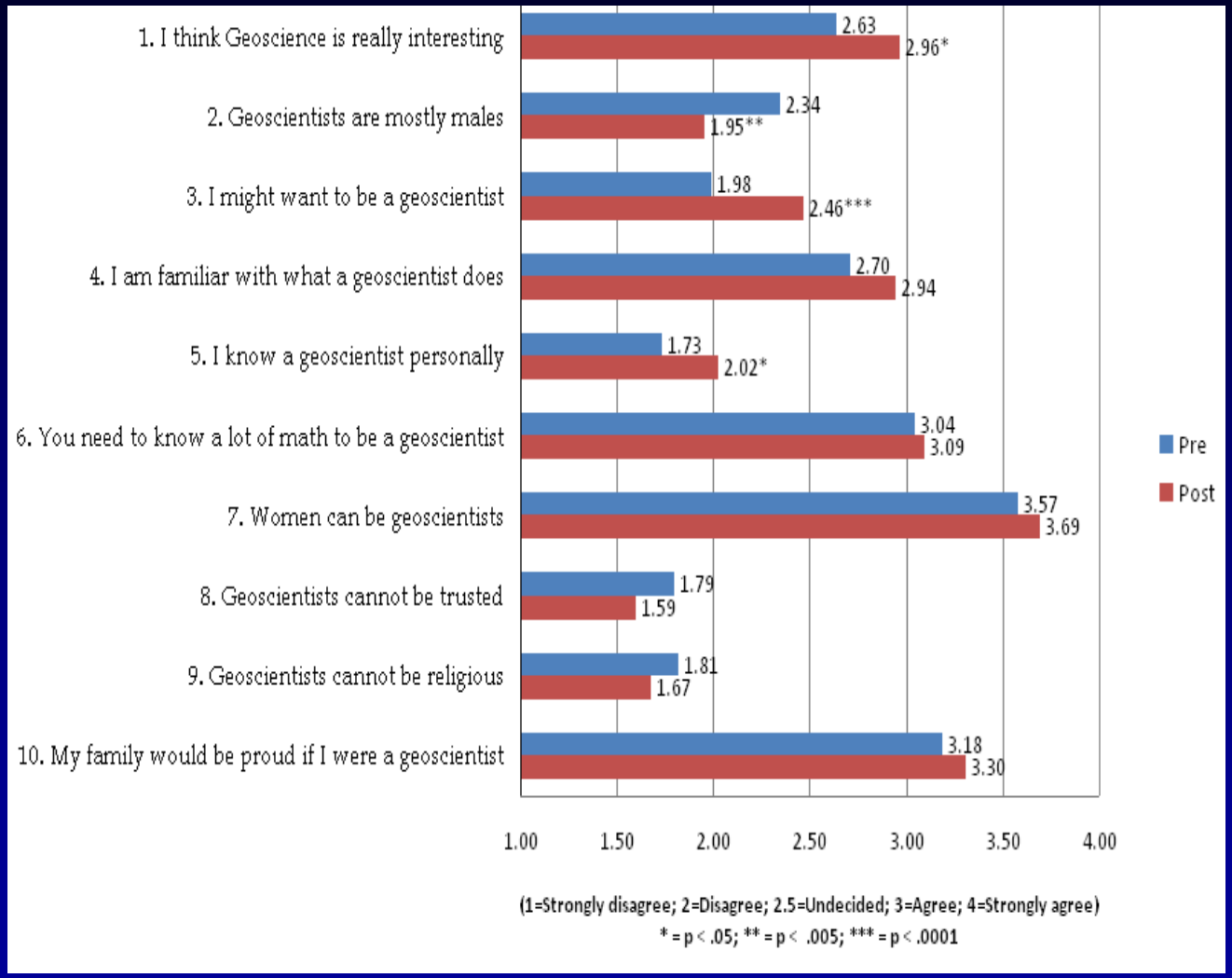


The 71 URM students’ average responses to the attitude survey questions

Results and Discussions

Highlights

- Data from Q3 shows students were more likely to agree with the statement “I might want to be a geoscientist or Earth scientist” after participation(p<.0001)
- Their average response increased from a level indicating disagree(1.98) to a level that, on average, was nearly neutral(2.46)



The 71 URM students’ average responses to the attitude survey questions

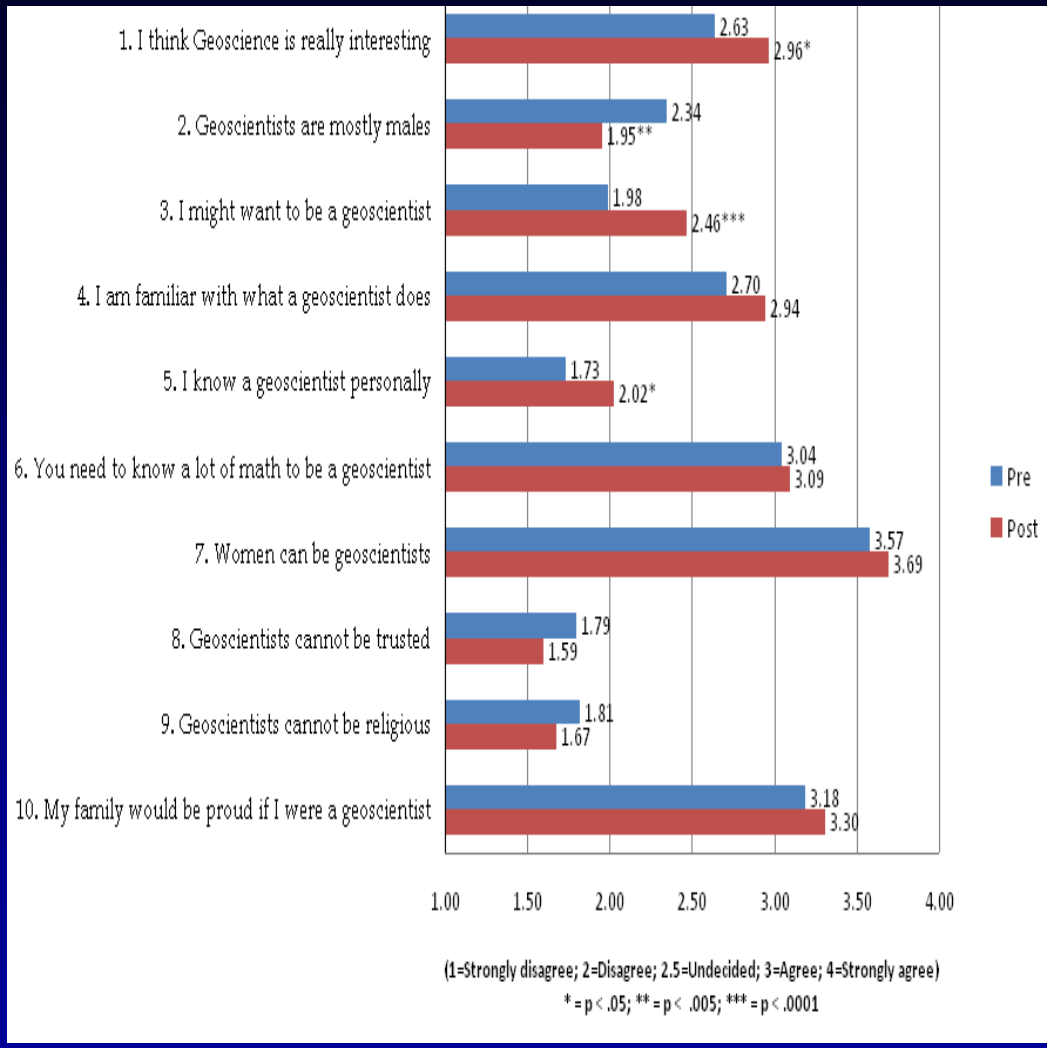
Results and Discussions

Highlights

"I might want to be a geoscientist"

Pre-participation Strongly disagree		Post-participation Strongly disagree	
19 students		8 students	
Pre-participation Agree	**Pre-participation Strongly agree**	**Post-participation Agree**	**Post-participation Strongly agree**
1 student	1 student	21 students	4 students

The data strongly suggests that there is an increase in the desire to become a geologist after participation in Project GAP's intervention



The 71 URM students' average responses to the attitude survey questions

Conclusion

- Analyses of pre and postparticipation survey responses indicated statistically significant increases in students' attitudes toward and interest in geosciences.
- With any kind of self-reported survey data, questions can be raised about possible source of bias.
- We think it is unlikely that students provided responses that they felt we wanted to hear: If this were the case, one would expect to find significant improvement in all of the attitudes that were assessed, rather than in only 4 of the 10 attitudes being measured.
- We believe these statistically significant results are a reflection of true changes in participants' attitudes and beliefs.
- We thus interpret the intervention model developed through Project GAP as being effective and potentially transportable to other underrepresented minority student populations.

Acknowledgements

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