

Engaging a diverse population in science through introductory geoscience courses

Dr. Annia Fayon; email: afayon@umn.edu

Department of Postsecondary Teaching and Learning

College of Education and Human Development

University of Minnesota - Twin Cities, Minneapolis, MN 55455

Introduction: Main point: To learn about changes in student attitudes in introductory earth science courses as a function of pedagogy; more specifically to understand how diverse populations respond to various pedagogies. This information could then be used in developing a more engaging curriculum for a diverse student population.

Main result: Differences in attitudes and changes in attitudes go beyond pedagogy and include cultural perspectives.

Methods - Attitudes survey: The Colorado Learning Attitudes about Science Survey (CLASS) (<http://class.colorado.edu/>; Adams, et al. 2006) instrument was administered to two introductory geoscience courses at UMN:

- PSTL 1171 - small class size and lecture and laboratory content are integrated.
- GEO 1001 - large lecture format, laboratory content is independent from lecture content.

CLASS was originally developed to measure student attitudes in large-lecture physics courses at the postsecondary level. Many of the questions focus on student confidence in problem solving and the ability to connect the course content within their everyday lives. Questions from this survey were modified to measure attitudes regarding earth science and the environment.

Results: Student answers are compared to ‘expert’ data and a percentage of favorable to unfavorable responses is determined (Figure 1). Data indicate favorable shifts in the averages for all students in each course. Individual student shifts show statistically significant differences between 1001 and 1171 in Overall, All categories, Physical Science - general, confidence, and sophistication. In these categories, students in 1001 responded with more favorable shifts.

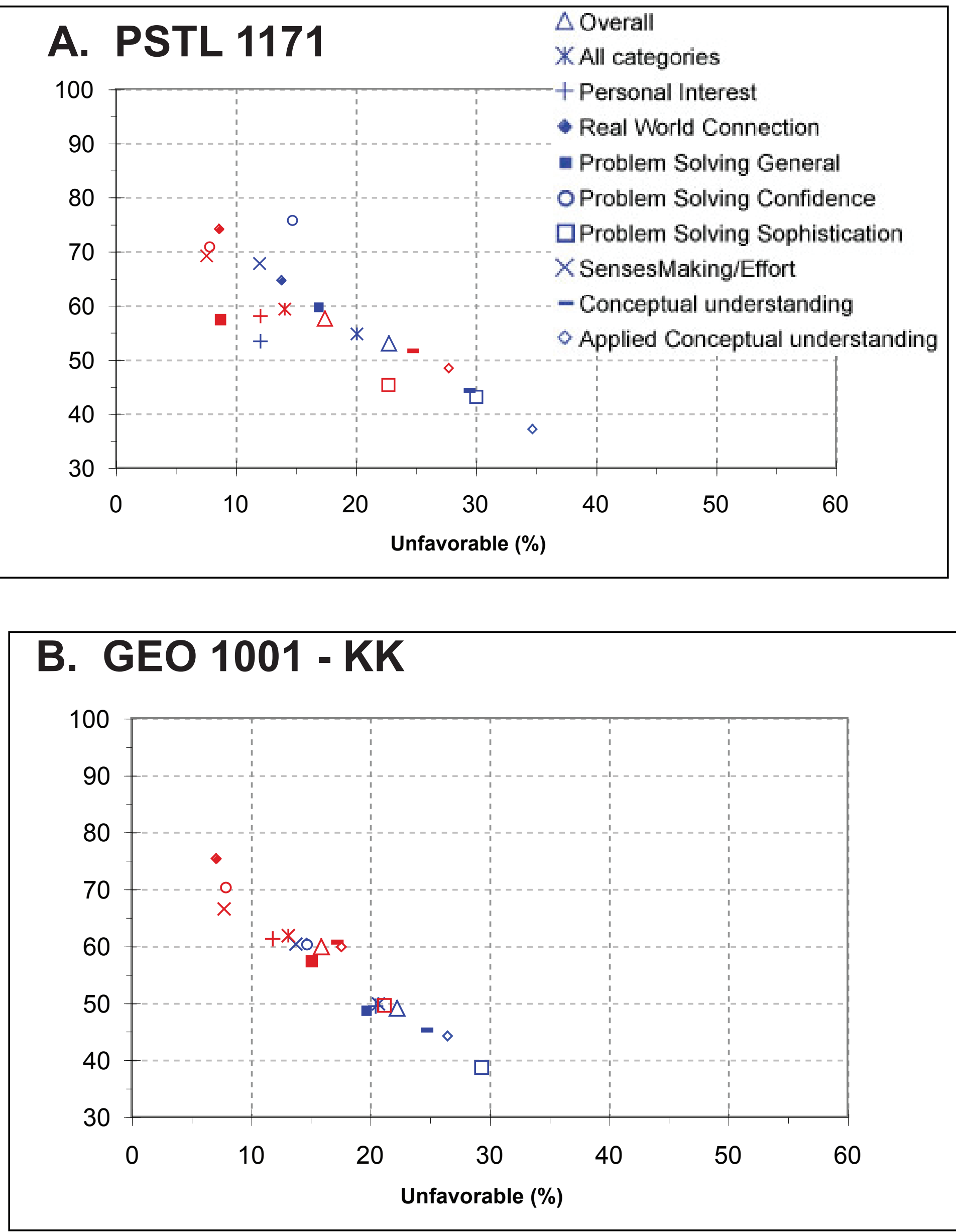


Figure 1. Pre-(blue) and post-(red) CLASS survey results for introductory geoscience courses at UMN. Positive changes in attitudes are shown by increases in favorable responses.

Table 1. Differences in the PRE responses among students of color in 1001 and 1171.

CATEGORY	significance	Average PRE - 1001	Average PRE 1171
Real World connection	0.046	48.1	64.3
Physical Science general	0.039	40.2	54.8
Physical Science confidence	0.011	45.3	70.2

Two possibilities can account for the differences in shifts:

1. initial responses similar in both classes
2. PSTL students started out with more favorable responses

Individual student’s PRE responses were analyzed to address the two possibilities. Analyses reveal that attitudes towards science, including attitudes towards learning science differed as a function of course taken and ethnicity (Table 1; Figure 3).

PRE survey responses indicate cultural diversity in attitudes towards physical science learning and the environment (conclusion Supported by preliminary cultural survey of students in PSTL 1171 by C.Eyssautier, in prep.)

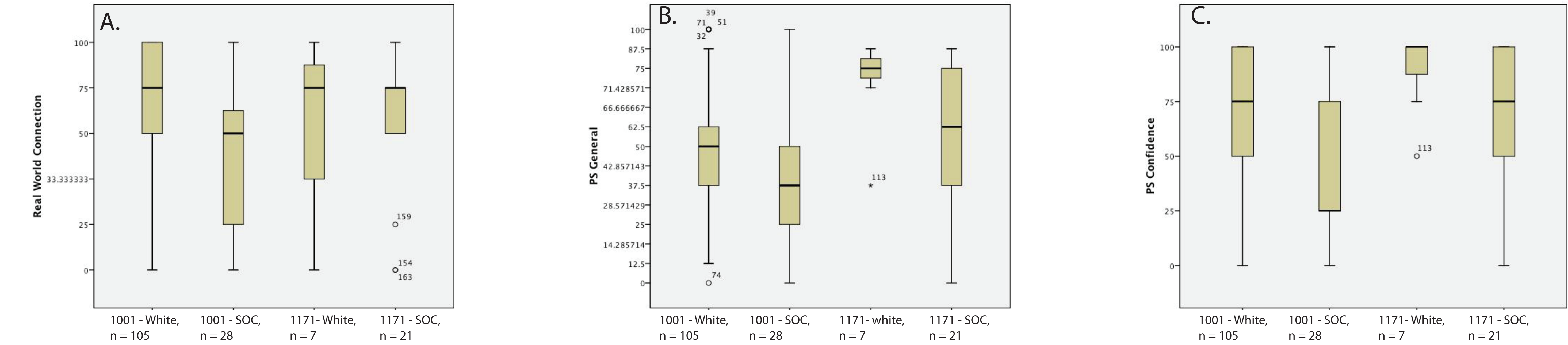


Figure 2. Box plots illustrating the differences in PRE-survey responses for both white students and students of color (SOC) in 1001 and 1171. Boxes represent the range of 67% of responses about the median, indicated by the dark lines in the boxes. Students of color in 1171 responded more favorably compared to their peers in 1001, in these PRE-survey categories: A. Real world connections. B. Physical science general, C. Physical science confidence.

Conclusions and future work:

The averages of all responses for students surveyed in introductory geoscience courses at UMN indicate favorable shifts in attitudes towards physical science and learning, regardless of pedagogy. The interesting result from this survey is in the PRE course attitudes. These results reflect differences in personal confidence in and understanding of physical sciences among white students and students of color. There are noticeable differences among students of color in 1001 and 1171. These differences likely reflect the different cultures represented in 1171.

Future work will focus on cultural experiences of students in 1001 and 1171 to assess how these experiences have shaped their understanding of the learning process.

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