
South Bay Geo-Diversity Project Evaluation Report

Year 2

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Executive Summary

The South Bay Geo-Diversity Project (SBGDP) is a multi-faceted, multi-level initiative to increase the participation of underrepresented groups in geoscience education and research. During the summers of 2003 and 2004, 29 teachers who teach at schools with high percentages of under-represented students participated in two-week intensive workshop experiences, designed to improve their knowledge of topics in the earth sciences. In summer 2004, the SBGDP also held a one-week workshop for middle and high school students. Students were recruited through San José State University's Mathematics, Engineering, Science Achievement (MESA) program and a local YMCA.

The teacher participants in the South Bay Geo-Diversity Project were primarily classroom teachers; more than half were in their first decade of teaching. Many had taught multiple subjects during their careers and had some experience in teaching earth and space sciences. Additionally, while they had some academic experiences with general geology and environmental studies, most lacked in-depth training in the geosciences.

The summer teacher workshop component was designed to provide classroom teachers with experiences in geological sciences, in a classroom setting as well as in the field. The academic year activities provided support for mentoring and coaching experiences.

The eleven students who attended the 2004 one-week summer workshop learned about topographic maps through a series of hands-on investigations, explored careers in the geosciences, and used PowerPoint to prepare a poster presentation. They participated in a topographic map "contest" that will be introduced as a competition for MESA Day (a Saturday event held each spring at San Jose State University during which MESA students take part in a series of "competitions" such as an egg drop, bridge building, etc.).

By partnering with the SJSU MESA program, National Hispanic University and San José City College during the academic year, the principal investigators were able to reach a broader audience and to impact middle, high school, community college, and university students.

Overall, the qualitative and quantitative data gathered during the project indicates that the BAESI South Bay Geo-Diversity Project was highly effective in increasing teachers' knowledge of geosciences and in improving their confidence to teach earth and space sciences. In addition, through a one-week summer workshop, visits by SBGDP staff to introductory earth science, chemistry, and physics classes at National Hispanic University and San José City College, and six half- or full-day field trips, students at the middle and high school, community college, and university levels were introduced to their local geology and to career opportunities in the geosciences.

Introduction

The South Bay Geo-Diversity Project (SBGDP) is a multi-faceted, multi-level initiative to increase the participation of underrepresented groups in geoscience education and research. The primary objectives of the South Bay Geo-Diversity Project are to:

- 1.) team with San José State University's MESA (Mathematics, Engineering, Science Achievement) Program to provide under-represented middle school and high school students with summer and academic year enrichment activities in geosciences;
- 2.) partner with San José City College and National Hispanic University to enhance student participation in the geosciences by engaging them in active learning experiences and raising their awareness of educational and career opportunities;
- 3.) involve selected high school and college students in research projects;
- 4.) supply year round mentoring and retention activities for students at all levels;
- 5.) offer professional development workshops for middle and high school teachers; and
- 6.) support these teachers' instruction of geosciences with appropriate materials.

Evaluation Overview

In evaluating the effectiveness of the overall South Bay Geo-Diversity Project and its components, pre- and post-program assessment was made through surveys. Participants' knowledge base and teaching experience were evaluated using the pre-workshop survey. This data was used to select topics for the summer workshop series and allowed the presenters to better meet the educational needs of the participants.

During the two-week summer workshop (July 12-23, 2004) for middle and high school teachers, a Kirkpatrick Level I/Level II assessment was conducted at the conclusion of each activity. The purpose of this data was to assess participants' satisfaction with the activities and to adjust components of the summer educational experience to better meet participants' needs.

Finally, a post-program survey was conducted to assess participants' learning and their overall satisfaction with the summer program and its components. A one-week workshop for middle and high school students was held from July 19-23.

Participants

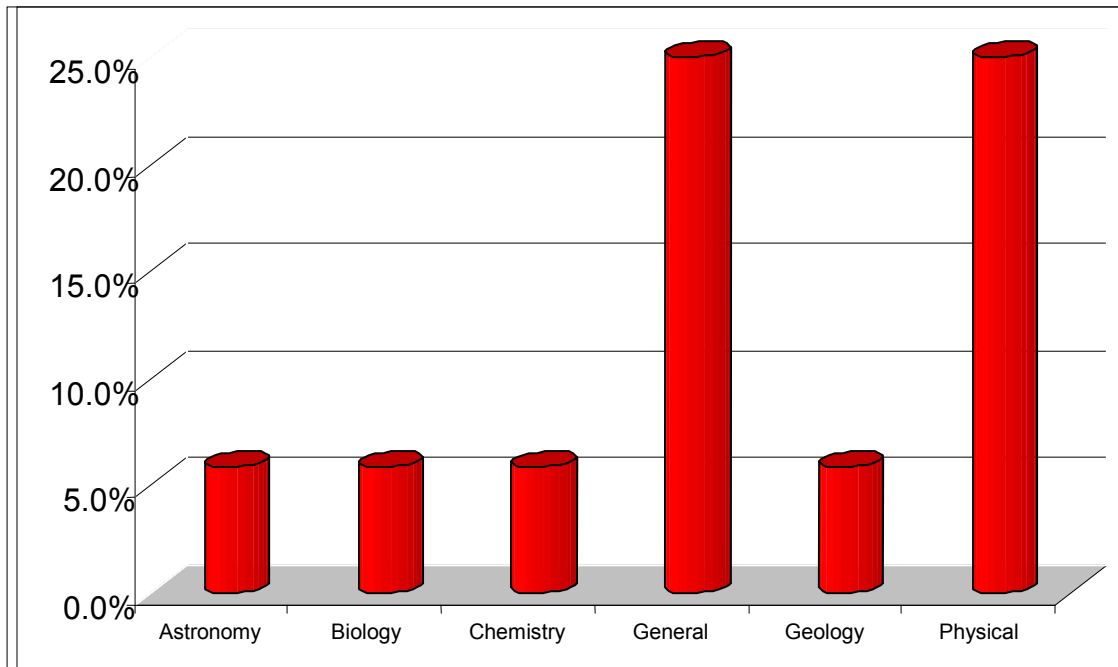
i. General Demographic Data - Teachers

Participants in the Summer 2004 South Bay GeoDiversity Project can be described as 31% male and 69% females. By age, the participants can be divided as follows: 25% in the 21 to 30 year old range, 6.3% in the 31 to 40 year old range, 6.3% in the 41 to 50 year old range, and 62.5% over 51 years of age.

ii. Teaching Experience

In terms of teaching experience, the majority of the participants ten (62%) were in their first ten years of teaching. Two of the participants had 11 to 20 years experience in the classroom. Finally four of the participants, or 25%, had 20 or more years of teaching experience, and 15 of the 16 participants, or 94%, were credentialed teachers. All of the participants had experience teaching in multiple academic assignments. Participants' knowledge base in sciences is depicted in Figure 1 below.

Figure 1. Distribution of Experience Teaching Earth and Space Sciences



iii. Summary Pre-Participation Profile

In terms of their teaching abilities in earth and space sciences, the majority of the teachers in the South Bay GeoDiversity Project, entered the summer workshop only marginally prepared to teach earth science. As shown in Table 1, teacher workshop participants gained knowledge of various earth science topics through participation in the program. The teachers' self-rating of personal knowledge of various earth science topics increased when comparing the pre- and post-workshop surveys.

Table 1. Percent of Pre- and Post- Teacher Workshop Participants Rating Themselves on their Personal Knowledge of Various Science Topics:

| n=16 | | Excellent | Good to Very Good | Satisfactory | Poor | None |
|---------------------------------|---------------|-----------|-------------------|--------------|------|------|
| General Knowledge | Pre-Workshop | 0% | 31% | 44% | 25% | 0% |
| | Post-Workshop | 13% | 50% | 25% | 13% | 0% |
| Earthquakes | Pre-Workshop | 0% | 44% | 38% | 19% | 0% |
| | Post-Workshop | 19% | 56% | 19% | 6% | 0% |
| Water and Supply | Pre-Workshop | 0% | 25% | 44% | 31% | 0% |
| | Post-Workshop | 31% | 38% | 25% | 6% | 0% |
| Faults | Pre-Workshop | 0% | 25% | 50% | 25% | 0% |
| | Post-Workshop | 19% | 50% | 25% | 6% | 0% |
| Topographic Maps | Pre-Workshop | 6% | 31% | 31% | 31% | 0% |
| | Post-Workshop | 19% | 63% | 19% | 0% | 0% |
| Water Cycle | Pre-Workshop | 13% | 38% | 38% | 13% | 0% |
| | Post-Workshop | 25% | 63% | 13% | 0% | 0% |
| California Geology | Pre-Workshop | 0% | 19% | 44% | 31% | 6% |
| | Post-Workshop | 13% | 31% | 44% | 13% | 0% |
| Streams and Ground Water | Pre-Workshop | 0% | 13% | 44% | 44% | 0% |
| | Post-Workshop | 19% | 38% | 44% | 0% | 0% |
| Careers in Earth Science | Pre-Workshop | 6% | 13% | 38% | 44% | 0% |
| | Post-Workshop | 13% | 19% | 63% | 6% | 0% |

iv. Scope and Sequence of Summer Workshop Activities

The two-week South Bay GeoDiversity Project summer workshop was held from July 12-23, 2004. The participants met three hours each day. A list of activities is provided in Table 2 below:

**Table 2. Overview of Summer Workshop Activities
"Geologic Resources and Hazards of the Bay Area"**

| Week #1 | Activities |
|----------------|---|
| Monday | Welcome, Overview Introduction to the Earth System Water on Earth/water cycle |
| Tuesday | Introduction to topographic maps; surface and groundwater; watersheds |
| Wednesday | More about water; water quality parameters; practice testing |
| Thursday | Field trip: Water quality testing of the Guadalupe River, downtown San José |
| Friday | Faults and earthquakes; finding fault features on topographic maps |
| Week #2 | Activities |
| Monday | Earthquakes and faulting (cont.) |
| Tuesday | Earthquakes: structural hazards; geoscience highlights and careers |
| Wednesday | Earthquakes (cont.) |
| Thursday | Earthquakes (cont.) |
| Friday | Field trip to Santa Teresa Hills - topographic and geologic maps |

v. Evaluation of Summer Workshop Activities

All workshop components and/or activities were assessed using a Kirkpatrick Level I/Level II evaluation instrument. The purpose of the assessment was to determine if the activities were meeting participants' educational needs and to determine if the activities were appropriate for the target audience.

Based on participant feedback, modifications in instruction were made throughout the workshop period in order to better match instruction with participant expectation and/or educational background. Additionally, data from the feedback form provided information about the quality of workshop activities. Table 3 provides a summary of representative activities and corresponding evaluation instruments.

Table 3. Overview of Evaluated Activities & Components

| Week #1 | Activities | Evaluated Components |
|----------------|---|---|
| Monday | <ul style="list-style-type: none"> - Exploring topographic maps (San Jose West quadrangle) - Making a 3D topographic map model with sandwich trays - Guest speakers from Santa Clara Valley Water District | <ul style="list-style-type: none"> - Pre-workshop survey - Kirkpatrick Level I/Level II - Kirkpatrick Level I/Level II - Kirkpatrick Level I/Level II |
| Tuesday | <ul style="list-style-type: none"> - Surf Your Watershed - Guest speakers from Santa Clara Valley Water District | <ul style="list-style-type: none"> - Kirkpatrick Level I/Level II - Kirkpatrick Level I/Level II |
| Wednesday | Parts per billion - serial dilution lab | - Kirkpatrick Level I/Level II |
| Thursday | Field Trip to Guadalupe River | - Kirkpatrick Level I/Level II |
| Friday | San Andreas Offset Lab | - Kirkpatrick Level I/Level II |
| Week #2 | Activities | |
| Monday | | |
| Tuesday | Earthquake activity (on-line) - Shaking maps and "Make a Quake" | <ul style="list-style-type: none"> - Kirkpatrick Level I/Level II - Kirkpatrick Level I/Level II |
| Wednesday | Earthquakes Lab Activity | - Kirkpatrick Level I/Level II |
| Friday | Field trip to Santa Teresa Hills | <ul style="list-style-type: none"> - Kirkpatrick Level I/Level II - Post-workshop survey |

Evaluation of Surf Your Watershed Activity

In this on-line activity, teachers visited the Environmental Protection Agency's "Surf Your Watershed" site to discover in which watersheds they are located.

At the conclusion of the activity, participants were given a one-page rapid feedback form, consisting of five evaluation criteria and an open response area. Data from that feedback is provided in Table 4 below:

Table 4. Evaluation of Surf Watershed Activity

| Statement's) | Surf watershed (Computer Experience) | | | | Percent | | | |
|---|--------------------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 10 | 3 | 1 | 0 | 71.4% | 21.4% | 7.1% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity were: | 9 | 3 | 2 | 0 | 64.3% | 21.4% | 14.3% | 0.0% |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described as: | 11 | 0 | 1 | 2 | 78.6% | 0.0% | 7.1% | 14.3% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE. I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 11 | 1 | 2 | 0 | 78.6% | 7.1% | 14.3% | 0.0% |
| | 53 | 9 | 6 | 2 | 75.7% | 12.9% | 8.6% | 2.9% |

Participant Comments:

Wow, what a gold mine! Excellent source/opportunity for local stream management. Students can do and compare with impairments listed, and become aware of becoming involved. If that makes sense?

I felt rushed.

The keys on the computer keyboards did not all work- weird even the "delete" button Surf's up!!

All of this is very interesting.

It was slow and the desired URL either won't pop-up or would take a lot of time.

Excellent

This activity was good but the server for the EPA was not working fully.

Not really sure what was expected. I needed more direction as to what I was searching for...

Evaluation of Earthquake Activity

Teachers interpreted the potential shaking potential (Modified Mercalli value) for their home and for SJSU due to earthquakes on selected faults in the Bay Area. They also used a "Make-a-Quake" Web site to illustrate the relationship among shaking, ground type, and building construction.

At the conclusion of the activity, participants were given a one-page rapid feedback form, consisting of five evaluation criteria and an open response area. Data from that feedback is provided in Table 5 below:

Table 5. Evaluation of Earthquake Activity

| Statement's) | Earthquake (Computer Experience) | | | | Percent | | | |
|--|----------------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 16 | 0 | 0 | 0 | 100.0% | 0.0% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| ARRANGEMENTS . In my opinion the physical arrangements for this activity were: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION . In my opinion the quality of this presentation could be described as: | 15 | 1 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE . I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 16 | 0 | 0 | 0 | 100.0% | 0.0% | 0.0% | 0.0% |
| | 75 | 5 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |

Participant Comments:

Good-- Interested.

Great Resource.

I really "see" my students walking through the directions on the handout no problem! I liked the written reflections about the damage from the earthquake based on where you live. Great interactive and reflective activity.

Great activity.

Easy to use- Map Quest not quite so helpful.

These activities will be a real hit with my students.

Thank you again.

Evaluation of Earthquakes Lab Activity

Teachers used the “Virtual Earthquake” Web site to review/learn about the fundamentals of seismology, including simple calculations, graphing, and problem-solving.

Table 6. Evaluation of Earthquakes Lab Activity

| Statement(s) | Location of Earthquakes | | | | Percent | | | |
|---|-------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Count | | | | Percent | | | |
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity were: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described as: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE. I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 11 | 2 | 1 | 0 | 78.6% | 14.3% | 7.1% | 0.0% |
| | 57 | 12 | 1 | 0 | 81.4% | 17.1% | 1.4% | 0.0% |

Participant Comments:

I finally understand the concept of magnitude. Thank you
 Enjoyed the 'hands-on, minds-on'
 Formula easy to use, good integration of science
 Easily useable with my own students in class
 I had done this in class and it really helps you understand how it works
 Maps and topography are boring for my students. With the extra lesson ideas it might encourage them to excel. Still no comparison to volcanoes/earthquakes/plate tectonics
 Excellent hands-on for students
 Our science resource teacher does this activity very quickly and on a grander scale with my students. I think that by doing this activity first (say on the overhead) before they go to science 'prep' I will help them better understand and enjoy an epicenter mapping/math.
 Yah, liked it

Evaluation of San Andreas Offset Lab Activity

Teachers used a map to measure geologic features that have been offset across the San Andreas Fault, and used simple calculations to determine the average rate of offset since 20 million years ago and changes in average rates over smaller time intervals.

Table 7. Evaluation of San Andreas Offset Lab Activity

| Statement(s) | San Andreas Offset | | | | Percent | | | |
|---|--------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 12 | 3 | 0 | 0 | 80.0% | 20.0% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity was: | 12 | 3 | 0 | 0 | 80.0% | 20.0% | 0.0% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity were: | 11 | 4 | 0 | 0 | 73.3% | 26.7% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION . In my opinion the quality of this presentation could be described as: | 12 | 3 | 0 | 0 | 80.0% | 20.0% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE . I would describe this activity's ability to contribute to my overall knowledge of geological | 11 | 4 | 0 | 0 | 73.3% | 26.7% | 0.0% | 0.0% |
| | 58 | 17 | 0 | 0 | 77.3% | 22.7% | 0.0% | 0.0% |

Participant Comments:

Cheap, Simple, Perfect. Spinetinglingly excellent. Visual and kinesthetic for my less attentive learners
 Needs a question to assess student understanding of when fault was normal.
 Question to show that it was moving 5 million years ago, not moving 25 years ago
 Thank you so much for all the maps and activities.
 These activities are perfect for interesting students in Earth Science
 Gets better and better everyday!!
 Gave a clear idea how hills or lakes would be formed with movement of earth in an earthquake.
 Great hands-on activity. Learned more today than I have in some classes that last an entire semester!!
 Great lesson for middle scholars!

Evaluation of Parts Per Billion Lab Activity

In this activity, teachers used food coloring and water to make a series of dilutions to demonstrate the concept of parts per million/parts per billion.

Table 8. Evaluation of Parts Per Billion Lab Activity

| Statement(s) | Parts Per Billion (Lab Activity) | | | | Percent | | | |
|--|----------------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Count | | | | Percent | | | |
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 15 | 1 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |
| ARRANGEMENTS In my opinion the physical arrangements for this activity were: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION In my opinion the quality of this presentation could be described as: | 15 | 1 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| | 72 | 8 | 0 | 0 | 90.0% | 10.0% | 0.0% | 0.0% |

Participant Comments:

I would need to extend this activity by drawing each ratio out to show the 1st few spoons and the actual content in the spoon, but I understand it is time consuming and we needed to move on.

I have done this through a SEPUP unit.

A good mental evaluation

Very much appreciated the hands-on approach to a cost effective lesson.

Exciting, very visual, easy to apply to math as well.

Awesome as always, can be adapted to so many uses!!!

Evaluation of Sandwich Trays Lab Activity

Teachers used a nested set of clear plastic sandwich trays to visualize the concepts of topographic maps and profiles in two and three dimensions.

Table 9. Evaluation of Sandwich Trays Lab Activity

| Statement(s) | Sandwich Trays Count | | | | Percent | | | |
|--|-------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 13 | 2 | 0 | 0 | 86.7% | 13.3% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 14 | 1 | 0 | 0 | 93.3% | 6.7% | 0.0% | 0.0% |
| ARRANGEMENTS . In my opinion the physical arrangements for this activity were: | 13 | 2 | 0 | 0 | 86.7% | 13.3% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION . In my opinion the quality of this presentation could be described as: | 12 | 3 | 0 | 0 | 80.0% | 20.0% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE . I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 14 | 1 | 0 | 0 | 93.3% | 6.7% | 0.0% | 0.0% |
| | 66 | 9 | 0 | 0 | 88.0% | 12.0% | 0.0% | 0.0% |

Participant Comments:

An educational activity for all ages.
 Comments from teachers who had done this activity before were helpful
 Excellent visualization for the students!
 Very good. This isn't just good for young students, but also college as well
 This is definitely an effective visual display of a 3D topographic map
 Awesome experiment!
 Good visual of what a 'topo' graph shows 2D. I like the idea of showing this as a model of different elevations. You can really see it now!!
 Would have liked time to discuss possible questions - student questions.
 Most were familiar with activity - which is good. Perhaps, however, allocate the time to troubleshoot some problems teachers may have encountered, i.e. the registration issue. Many times we get fab-fab-fab! activities, but they are encumbered with slight technical difficulties. Would be great to get this registration thing solved beforehand. In any case, an excellent activity.

Evaluation of San Jose West Lab Activity

Teachers responded to a set of questions specific to the U.S.G.S. topographic map for San Jose West. Questions ranged from simple to complex, and some entailed measurement, scaling, and calculations.

Table 10. Evaluation of San Jose West Lab Activity

| Statement(s) | San Jose West Count | | | | Percent | | | |
|--|------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING In my opinion this activity was: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| EDUCATIONAL VALUE In my opinion the educational value of this activity could be described as: | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| ARRANGEMENTS In my opinion the physical arrangements for this activity were: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION In my opinion the quality of this presentation could be described as: | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| | 59 | 11 | 0 | 0 | 84.3% | 15.7% | 0.0% | 0.0% |

Participant Comments:

Good use of scale and cultural effects by looking at a 1953, 1961, and 1981 version of San Jose West
Cool

This will be done in my classroom this next year
AWESOME! I have a greater understanding of my surrounding area and how to read the topo map, thus I can pass this onto my students. The handout and questions really had my critical thinking ability going.
Perhaps another question to add: How many benchmarks are on this quad...(value of benchmarks from whence the data came originally) and locate gaging stations on Quadulupe River... to tie in with discharge calculation and intro.

Evaluation of Guest Speakers

Kathy Machado, Education & Outreach representative from the Santa Clara Valley Water District (SCVWD), modeled a series of activities that focused on the distribution, quality, and protection of local water resources. All were hands-on activities that she regularly uses in area classrooms.

Table 11. Evaluation of Guest Speakers- Santa Clara Water District
SCVWD

| Statement(s) | Count | | | | Percent | | | |
|--|-----------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 11 | 3 | 0 | 0 | 78.6% | 21.4% | 0.0% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity were: | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described as: | 14 | 0 | 0 | 0 | 100.0% | 0.0% | 0.0% | 0.0% |
| BASED SCIENCE. I would describe this activity's ability to contribute to my overall knowledge of geological | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| | 62 | 8 | 0 | 0 | 88.6% | 11.4% | 0.0% | 0.0% |

Participant Comments:

Terrific!
 The bilingual labels and variety of activities was very good!
 Great Job I want you to visit my class!
 As always Kathy Machado presentations are awesome!

South Bay Geo-Diversity Project

SCVWD 2

| Statement(s) | Count | | | | Percent | | | |
|---|-----------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 15 | 1 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 14 | 2 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this | 13 | 3 | 0 | 0 | 81.3% | 18.8% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described as: | 15 | 1 | 0 | 0 | 93.8% | 6.3% | 0.0% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE. I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 13 | 3 | 0 | 0 | 81.3% | 18.8% | 0.0% | 0.0% |
| | 70 | 10 | 0 | 0 | 87.5% | 12.5% | 0.0% | 0.0% |

Participant Comments:

Taste Tsst = Excellent!

The "Dilemma Derby" is something I can do in my classroom

Finally sparking the poem, song rap idea (from learned content material) was a key moment for me today

The magic tricks incorporated into her presentations are wonderful- teacher love it and of course, students too- would help to remember the message

Superb never old boring always exciting!

Enjoyed very much

I learned many new things, great friendly presenter!

I especially like the magic tricks.

Not only excellent but marvelously entertaining.

vi. Evaluation of Summer Field Experiences

Field experiences were woven into the summer workshop experiences. These experiences were evaluated with the same Kirkpatrick Level I/Level II evaluation instruments that were used for the "in-class" components. Again, this evaluation served as formative evaluation for the workshop series and as a summative evaluation of the activity itself.

Evaluation of Guadalupe River Field Trip

Teachers walked a mile to the Guadalupe River and completed a set of chemical tests and physical measurements (e.g., pH, channel profile). A useful discussion ensued concerning the logistics of equipment and trip-planning vis-a-vis students.

Table 12.

| Statement(s) | Guadalupe Count | | | | Percent | | | |
|---|--------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 9 | 5 | 0 | 0 | 64.3% | 35.7% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity | 12 | 2 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| BASED SCIENCE. I would describe this activity's ability to contribute to my overall | 13 | 1 | 0 | 0 | 92.9% | 7.1% | 0.0% | 0.0% |
| | 60 | 10 | 0 | 0 | 85.7% | 14.3% | 0.0% | 0.0% |

Participant Comments:

Very applicable, engaging!

Great hands on experience and discussion of pluses/minuses of equipment and extensions and uses in the classroom

The location of the river to SJSU was excellent. Also, the "kit" we used had great directions and easy to read "result" cards.

My "hook" using this kit is to introduce my unit on Chemistry. I'm ever trying to answer their questions: Why science and why bother?

These two seminars (including PS3 Plate Tectonics) have been the best planned I've ever been to in 15 + years of attending summer school.

Good educational value in a fun setting for all ages. Invite lots of questions and curiosity of mind.

Its been a long time since I've done this so it was a great refresher. Plus it was fun to see how you can use this activity differently in the classroom.

It was definitely rewarding to explore our local water way by exploring water quality and finding marco-invertbrates.

Written directions re: water speed and measuring of volume.

Always a great experience! Testing gave us lots of ideas!

Bring fish nets!

Evaluation of Santa Teresa Hills Field Trip

Teachers made a simple geologic map and cross section of part of Santa Teresa Hills County Park. This activity entailed application of topographic map-reading skills, plus an introduction to the three-dimensionality of geologic map units.

Table 13.

| Statement(s) | Santa Teresa Hills Count | | | | Percent | | | |
|--|-----------------------------|------|--------------|-------|-----------|-------|--------------|-------|
| | Excellent | Good | Satisfactory | Needs | Excellent | Good | Satisfactory | Needs |
| PLANNING. In my opinion this activity was: | 9 | 4 | 0 | 0 | 69.2% | 30.8% | 0.0% | 0.0% |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 8 | 5 | 0 | 0 | 61.5% | 38.5% | 0.0% | 0.0% |
| ARRANGEMENTS . In my opinion the physical arrangements for this activity were: | 8 | 4 | 1 | 0 | 61.5% | 30.8% | 7.7% | 0.0% |
| QUALITY OF PRESENTATION . In my opinion the quality of this presentation could be described as: | 10 | 2 | 1 | 0 | 76.9% | 15.4% | 7.7% | 0.0% |
| CONTRIBUTION TO INQUIRY BASED SCIENCE . I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 8 | 4 | 1 | 0 | 61.5% | 30.8% | 7.7% | 0.0% |
| | 43 | 19 | 3 | 0 | 66.2% | 29.2% | 4.6% | 0.0% |

Participant Comments:

I have never done any of these activities before & it was great!
 Good to polish up my mapping skills.
 Stimulating and challenging.
 Would like clean copies for students.
 We put our learning to use and had to think also!
 I would like to take students on a field trip similar to the one you conducted.
 You are very knowledgeable in your field!
 Weather a little hot/Nothing that can be done morning better-- not an option this time.

I enjoyed the walk and the outdoors. I can truly see drawing the cross section (of a topographic map) so that they can see the elevation go up and down

It was very useful to see these concepts in person. I think its pretty cool to be exposed to these sort of things.

vii. Comparing Summer Educational Experiences

To further evaluate the effectiveness of the summer workshop activities a comparison was made of the participant evaluations of various activities. The rating scales (Excellent, Good, Satisfactory, and Needs Improvement) were converted to a numeric scale (4, 3, 2, 1) and the mean of scores assigned by the participants were compared across activities. See Table 14 below.

Table 14. Comparison of Mean Scores of Summer Project Activities

| Category of Review | SCWD | SCWD2 | Santa Teresa Mountains | Guadalupe | Parts Per Billion | Location of Quakes | San Andreas Offset | Sandwich Trays | San Jose West |
|---|------|-------|------------------------|-----------|-------------------|--------------------|--------------------|----------------|---------------|
| PLANNING. In my opinion this activity was: | 3.9 | 3.9 | 3.7 | 3.6 | 3.9 | 3.9 | 3.8 | 3.9 | 3.8 |
| EDUCATIONAL VALUE. In my opinion the educational value of this activity could be described as: | 3.9 | 3.8 | 3.6 | 3.9 | 3.9 | 3.8 | 3.8 | 3.9 | 3.9 |
| ARRANGEMENTS. In my opinion the physical arrangements for this activity were: | 3.8 | 3.9 | 3.5 | 3.9 | 3.9 | 3.8 | 3.7 | 3.9 | 3.8 |
| QUALITY OF PRESENTATION. In my opinion the quality of this presentation could be described as: | 3.9 | 4.0 | 3.7 | 3.9 | 3.9 | 3.8 | 3.8 | 3.8 | 3.9 |
| CONTRIBUTION TO INQUIRY BASED SCIENCE. I would describe this activity's ability to contribute to my overall knowledge of geological sciences as: | 3.8 | 3.9 | 3.5 | 3.9 | 3.9 | 3.7 | 3.7 | 3.9 | 3.9 |
| Average | 3.9 | 3.9 | 3.6 | 3.9 | 3.9 | 3.8 | 3.8 | 3.9 | 3.8 |

viii. Summer Workshop Activities for Students

The eleven students who attended the 2004 one-week summer workshop learned about topographic maps through a series of hands-on investigations, explored careers in the geosciences, and used PowerPoint to prepare a poster presentation describing what they had learned about maps and highlighting an earth science career of their choice. They participated in a topographic map "contest" that will be submitted as a competition for MESA Day (a Saturday event held each spring at San Jose State University during which MESA students take part in a series of "competitions" such as an egg drop, bridge building, etc.).

Evaluation consisted of pre- and post-workshop surveys measuring participant knowledge about general geology, topographic maps, careers in the Earth Sciences, and using PowerPoint (Table 15).

Table 15. Evaluation of Student Pre-and Post Workshop Surveys

| General Knowledge | Excellent | Good to Very Good | Satisfactory | Poor | None |
|----------------------------------|------------------|--------------------------|---------------------|-------------|-------------|
| Pre-Workshop | 0 | 1 | 3 | 4 | 2 |
| Post-Workshop | 0 | 3 | 7 | 0 | 0 |
| Topographic Maps | | | | | |
| Pre-Workshop | 0 | 0 | 0 | 4 | 6 |
| Post-Workshop | 0 | 5 | 4 | 0 | 1 |
| Careers in Earth Sciences | | | | | |
| Pre-Workshop | 0 | 1 | 4 | 4 | 1 |
| Post-Workshop | 0 | 5 | 4 | 1 | 0 |
| PowerPoint Presentations | | | | | |
| Pre-Workshop | 1 | 2 | 0 | 1 | 6 |
| Post-Workshop | 5 | 1 | 2 | 2 | 0 |

ix. Academic Year Activities

South Bay Geo-Diversity Project (SBGDP) Academic year activities were developed to complement the summer workshop activities and other project components. By partnering with the San José State University (SJSU) MESA program, National Hispanic University (NHU) and San José City College (SJCC) during the academic year, the principal investigators were able to reach a broader audience and to impact middle, high school, community college, and university students. Academic year activities are summarized in Table 16.

Table 16. Summary of Academic Year Activities, 2004-2005

| Activity | Description | Approximate # of participants |
|--|--|--------------------------------------|
| Fall 2004 | | |
| Visits to geology, oceanography, and astronomy classes at SJCC | SJSU Geology students and faculty presented information about earth science careers and SBDGP opportunities for students. | 75 |
| Recruitment of 2 student interns | Students worked on visitors guide to geology of Henry Coe State Park | 2 |
| Follow-up teacher workshops <ul style="list-style-type: none"> ▪ Volcanoes ▪ Earthquakes & their hazards | Full-day workshops keyed to California Science Standards. Blend of concepts and hands-on activities | 30 |
| Coastal geology field trip | Full-day field trip to study sedimentary rocks, coastal landforms, and faulting with water quality testing at local creek | 100 |
| Spring 2005 | | |
| Visits to geology, oceanography, and astronomy classes at San Jose City College (SJCC) | SJSU Geology students and faculty presented information about earth science careers and SBGDP opportunities for students | 75 |
| Visits to geology, chemistry, and physics classes at the National Hispanic University | SJSU Geology students and faculty presented information about earth science careers and SBGDP opportunities for students Physics class: Introduction to waves in context of the 2004 Asian earthquake and tsunami | 40 |
| Visit to Latino College Preparatory Academy (charter high school at NHU) | SJSU Geology faculty and students presented information about earth science careers and SBGDP opportunities for students and helped students work on their science fair projects | 100 |
| Follow-up teacher workshops <ul style="list-style-type: none"> • Asian Earthquake & Tsunami of 2004 • California's Water | Full-day workshops keyed to California Science Standards. Blend of concepts and hands-on activities | 30 |
| MESA Day at San José State University | Ellen Metzger and three SJSU Geology students presented a 50-minute hands-on workshop on mineral identification and "cookie mining" | 145 |

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| Activity | Description | Approximate # of participants |
|--|--|--------------------------------------|
| Convened a Geological Society of America Section meeting theme session on diversity in the geosciences | Six oral presentations, including one each by Sedlock and Metzger in "Earth Science for Everyone: Diverse Student Populations— Recruiting Techniques for Attracting Them, Curricular and Extracurricular Strategies for Retaining Them" session. | 25 |
| Hayward fault trip | Half-day field trip to explore effects of faulting in downtown Fremont | 75 |

The teacher workshops included middle and high school teachers from the 2004 SBGDP summer workshop as well as other local teachers including a teacher from the Deaf/Hard of Hearing Program at John O'Connell High School of Technology in San Francisco. San José State University provided two interpreters for this teacher. Findings for representative workshops are shown in Tables 17 and 18.

Table 17. Evaluation of Teacher Workshop- California’s Water

| | Percent | | | |
|---|----------------|--------------------|--------------------|----------------------|
| | Very Effective | Effective | Somewhat Effective | Not at all effective |
| 1. How effective was this workshop in teaching you earth science concepts? | 89.0% | 11.0% | 0.0% | 0.0% |
| | Very Useful | Useful | Somewhat Useful | Not Useful |
| 2. How useful was the workshop in giving you ideas and strategies to use in the classroom? | 84.0% | 11.0% | 5.0% | |
| | Very Difficult | Somewhat difficult | About Right | Easy |
| 3. How difficult was the academic content of this presentation? | 5.0% | 16.0% | 58.0% | 21% |
| | Outstanding | Good | So-So | Poor |
| 4. How would you rate the workshop leader(s) in terms of being prepared, presenting information clearly and effectively, and responding to | 90.0% | 5.0% | 5.0% | 0.0% |
| | Yes | No | | |
| 5. Do you have any suggestions or comments about this workshop (e.g., features you particularly liked or changes you would recommend if this workshop were repeated)? | 48.0% | 52.0% | 0.0% | 0.0% |

Participant Comments

More on the politics!
 One more work group activity would be helpful.
 Additional hands-on activities to try and for classroom use. Websites/links.
 A little more content/activities for high school age group. – They often get overlooked for Earth Science.
 – I know that’s partly standards driven.
 Nice to have 2 copies of activities – one to write on and one clean. Have equal measurements of sediments for permeability/porosity activities – our results were skewed.
 Maybe another lab or two if possible. But awesome presentation.
 This workshop needs more hands-on activities for students. Also, due to the varying backgrounds of students, you should not make assumptions about prior knowledge. The topics presented need to be explicitly stated and described. I think the title should be changed to California and water.

Table 18. Evaluation of Teacher Workshop - Volcanoes

| | Percent | | | |
|---|----------------|--------------------|--------------------|----------------------|
| | Very Effective | Effective | Somewhat Effective | Not at all effective |
| 1. How effective was this workshop in teaching you earth science concepts? | 72.0% | 28.0% | 0.0% | 0.0% |
| | Very Useful | Useful | Somewhat Useful | Not Useful |
| 2. How useful was the workshop in giving you ideas and strategies to use in the classroom? | 80.0% | 20.0% | 5.0% | 0.0% |
| | Very Difficult | Somewhat difficult | About Right | Easy |
| 3. How difficult was the academic content of this presentation? | 0.0% | 8.0% | 84.0% | 8.0% |
| | Outstanding | Good | So-So | Poor |
| 4. How would you rate the workshop leader(s) in terms of being prepared, presenting information clearly and effectively, and responding to questions? | 84.0% | 16.0% | 0.0% | 0.0% |
| | Yes | No | | |
| 5. Do you have any suggestions or comments about this workshop (e.g., features you particularly liked or changes you would recommend if this workshop were repeated)? | 48.0% | 52.0% | 0.0% | 0.0% |
| <p>Participant Comments</p> <p>Keep it as is!</p> <p>It was perfect! Thank you.</p> <p>A classroom where participants face speaker.</p> <p>These workshops are great – Otherwise I’d not be giving up my Saturdays. Suggestions for Spring Saturday – Scientific Method using Earth Science experiments.</p> <p>Really learn something everytime I come. Thank you for putting together a great class.</p> <p>These workshops are so great. Material can be used right away in the classroom.</p> <p>Thank you.</p> <p>The workshop was well run. The handouts were worthwhile.</p> <p>For prospective participants in the future workshop, always change and update information.</p> <p>Good balance of hands-on activities and content! I have used all activities and content presentations successfully with 6th grade from other workshops!</p> <p>Super content! Great ideas. Solid presentation. Ms. Metzger is professional, good at communicating, responsive to students’ needs, well-prepared, etc. Thank you!!</p> <p>Remote sensing. Oceanography. Fieldtrips.</p> <p>I definitely liked the viscosity activity and the design an experiment.</p> <p>Liked combination of hands-on, lecture, computer, video, etc. – kept things moving.</p> | | | | |

Students, parents, and teachers evaluated field trips using an instrument similar to the one by teachers. Representative field trip evaluations are shown in Tables 19 and 20.

Table 19. Evaluation of Coastal Geology Field Trip

| Coastal Field Trip | Percent | | | |
|---|----------------|--------------------|--------------------|----------------------|
| | Very Effective | Effective | Somewhat Effective | Not at all effective |
| 1. How effective was this field trip in teaching you earth science concepts? | 70.0% | 27.0% | 3.0% | 0.0% |
| | Very Useful | Useful | Somewhat Useful | Not Useful |
| 2. (Skip if you are not a teacher) How useful was the workshop in giving you ideas and strategies to use in the classroom? | 82.0% | 12.0% | 6.0 % | 0.0% |
| | Very Difficult | Somewhat difficult | About Right | Easy |
| 3. How difficult was the academic content of this presentation? | 6.0% | 12.5.0% | 69.0% | 12.5% |
| | Outstanding | Good | So-So | Poor |
| 4. How would you rate the field trip leader(s) in terms of being prepared, presenting information clearly and effectively, and responding to questions? | 82.0% | 18.0% | 0.0% | 0.0% |
| | Yes | No | | |
| 5. Do you have any suggestions or comments about this field trip (e.g., features you particularly liked or changes you would recommend if this field trip were repeated)? | 33.0% | 67.0% | 0.0% | 0.0% |
| <p>Participant Comments Better describe amount of walking in flyer No nearly vertical climbs down cliffs. Work out schedule a little more Small group would be easier. Excellent choice of stops. I am always so happy to have the sketchy aspects of my Earth Science knowledge explained and clarified by the experts leasing these trips! Thank you. Shorter length – students get tired Excellent variety of sites and activities within the theme of the trip. Appreciated sites accessible by public so I can visit again independently. A packet about the rocks that we would see would be helpful.</p> | | | | |

Table 20. Evaluation of Hayward Fault Field Trip

| Hayward Fault Trip | Percent | | | |
|--|----------------|--------------------|--------------------|----------------------|
| | Very Effective | Effective | Somewhat Effective | Not at all effective |
| 1. How effective was this field trip in teaching you earth science concepts? | 73.0% | 27.0% | | |
| | Very Useful | Useful | Somewhat Useful | Not Useful |
| 2. (Skip if you are not a teacher) How useful was the workshop in giving you ideas and strategies to use in the classroom? | 54.0% | 38.0% | 8.0% | |
| | Very Difficult | Somewhat difficult | About Right | Easy |
| 3. How difficult was the academic content of this presentation? | 4.0% | 15.0% | 58.0% | 23.0% |
| | Outstanding | Good | So-So | Poor |
| 4. How would you rate the field trip leader(s) in terms of being prepared, presenting information clearly and effectively, and responding to questions? | 85.0% | 15.0% | | |
| | Yes | No | | |
| 5. Do you have any suggestions or comments about this field trip (e.g., features you particularly liked or changes you would recommend if this field trip were repeated)? | 13.0% | 87.0% | | |
| <p>Participant Comments</p> <p>The trip leader made the field trip enjoyable and interesting. Instructor very helpful. I like that he showed us where the fault started and finished. Learned new things. It was very informative. Thank you. Relaxed, pleasant, easy to understand. The instructor was able to present material effectively to a wide range of participants – children, teachers, knowledgeable adults and adults without a lot of background. Helps us to relate familiar features around us to visualizing where faults run in our communities!</p> | | | | |

x. Long-term Effects

An end-of-workshop survey was conducted on the last day of the summer 2004 teacher program. This survey included the same questions on knowledge and/or self-efficacy in teaching and learning as the pre-workshop survey. The effectiveness of the overall activities involved a comparison was made of the participants' general knowledge, knowledge of topics addressed during the two-week workshop. The scale (Excellent, Good to Very Good, Satisfactory, Poor, and None) was converted to a numeric scale (4, 3, 2, 1, and 0) and the mean scores assigned by participants were compared.

Table 21. Comparison of Pre-and Post-Workshop

| Personal Knowledge & Teaching Efficacy | Pre | Post | Change |
|--|------------|-------------|---------------|
| General Knowledge | | | |
| I'd rate my personal knowledge of general geology as: | 2.0 | 2.8 | 0.8 |
| Earthquakes | | | |
| I'd rate my personal knowledge of earthquakes as: | 2.3 | 2.9 | 0.6 |
| Water and Supply | | | |
| I'd rate my personal knowledge of water and supply as: | 1.9 | 2.9 | 1.0 |
| Faults | | | |
| I'd rate my personal knowledge of faults as: | 2.0 | 2.8 | 0.8 |
| Topographic Maps | | | |
| I'd rate my personal knowledge of topographic maps as: | 2.1 | 3.0 | 0.9 |
| Water Cycle | | | |
| I'd rate my personal knowledge of the water cycle as: | 2.5 | 3.1 | 0.6 |
| California Geology | | | |
| I'd rate my personal knowledge of California geology as: | 1.8 | 2.4 | 0.7 |
| Streams and Ground Water | | | |
| I'd rate my personal knowledge of streams and ground water as: | 1.7 | 2.8 | 1.1 |
| Careers in Earth Science | | | |
| I'd rate my personal knowledge of careers in Earth Science as: | 1.8 | 2.4 | 0.6 |

From the data it is apparent that the largest change in participants' knowledge was in the area of their knowledge of water and water supply, topographic and/or geologic maps, and streams and groundwater. In terms of teaching efficacy or confidence in their ability to teach, the greatest change came in the area of participants' ability to teach general geology. All participants reported growth in their personal knowledge of geosciences and in their ability to teach concepts in geosciences. Self-efficacy, or

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confidence, to teach is frequently identified as the most important variable in teachers' success in the classroom (Henson, 2003.¹; Verdinelli, 2003², Morrell, 2003³)

Table 22. Comparison of Personal Knowledge and Teaching Efficacy

| Personal Knowledge and Teaching Efficacy | Excellent | Good to Very Good | Satisfactory | Poor | None | Excellent | Good to Very Good | Satisfactory | Poor | None |
|---|-----------|-------------------|--------------|------|------|-----------|-------------------|--------------|-------|------|
| General Knowledge | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 2 | 8 | 4 | 2 | 0 | 12.5% | 50.0% | 25.0% | 12.5% | 0 |
| I'd rate my ability to teach general geology as: | 3 | 8 | 3 | 2 | 0 | 18.8% | 50.0% | 18.8% | 12.5% | 0 |
| Earthquakes | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 3 | 9 | 3 | 1 | 0 | 18.8% | 56.3% | 18.8% | 6.3% | 0 |
| I'd rate my ability to teach general geology as: | 3 | 9 | 4 | 0 | 0 | 18.8% | 56.3% | 25.0% | 0.0% | 0 |
| Water and Supply | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 5 | 6 | 4 | 1 | 0 | 31.3% | 37.5% | 25.0% | 6.3% | 0 |
| I'd rate my ability to teach general geology as: | 5 | 6 | 4 | 1 | 0 | 31.3% | 37.5% | 25.0% | 6.3% | 0 |
| Faults | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 3 | 8 | 4 | 1 | 0 | 18.8% | 50.0% | 25.0% | 6.3% | 0 |
| I'd rate my ability to teach general geology as: | 4 | 7 | 4 | 1 | 0 | 25.0% | 43.8% | 25.0% | 6.3% | 0 |
| Topographic Maps | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 3 | 10 | 3 | 0 | 0 | 18.8% | 62.5% | 18.8% | 0.0% | 0 |
| I'd rate my ability to teach general geology as: | 5 | 8 | 3 | 0 | 0 | 31.3% | 50.0% | 18.8% | 0.0% | 0 |
| Water Cycle | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 4 | 10 | 2 | 0 | 0 | 25.0% | 62.5% | 12.5% | 0.0% | 0 |
| I'd rate my ability to teach general geology as: | 5 | 9 | 2 | 0 | 0 | 31.3% | 56.3% | 12.5% | 0.0% | 0 |
| California Geology | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 2 | 5 | 7 | 2 | 0 | 12.5% | 31.3% | 43.8% | 12.5% | 0 |
| I'd rate my ability to teach general geology as: | 2 | 5 | 8 | 1 | 0 | 12.5% | 31.3% | 50.0% | 6.3% | 0 |
| Streams and Ground Water | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 3 | 6 | 7 | 0 | 0 | 18.8% | 37.5% | 43.8% | 0.0% | 0 |
| I'd rate my ability to teach general geology as: | 3 | 5 | 8 | 0 | 0 | 18.8% | 31.3% | 50.0% | 0.0% | 0 |
| Careers in Earth Science | | | | | | | | | | |
| I'd rate my personal knowledge of general geology as: | 2 | 3 | 10 | 1 | 0 | 12.5% | 18.8% | 62.5% | 6.3% | 0 |
| I'd rate my ability to teach general geology as: | 2 | 5 | 7 | 2 | 0 | 12.5% | 31.3% | 43.8% | 12.5% | 0 |

¹ Henson, R.K., et. al.(2003), Personality Type As a Predictor of Teaching Efficacy and Classroom Control in Emergency Certification Teachers. *Education* 124 (2) ,261-8.

² Verdinelli, S. (2003) Changes in Teaching Philosophies Among In-Service Teachers After Experiencing Mastery Learning. *Action in Teacher Education*. 25 (2), 56-66.

³ Morrell, P.D., (2003). An Extended Examination of Preservice Elementary Teachers' Science Teaching Self-Efficacy. *School Science and Mathematics*. 103 (5)246-51.

xi. Summary

The primary objectives of the South Bay Geo-Diversity Project were to:

- 1.) team with San José State University's MESA (Mathematics, Engineering, Science Achievement) Program to provide under-represented middle school and high school students with summer and academic year enrichment activities in geosciences,
- 2.) partner with San José City College and National Hispanic University to enhance student participation in the geosciences by engaging them in active learning experiences and raising their awareness of educational and career opportunities;
- 3.) involve selected high school and college students in research projects,
- 4.) supply year round mentoring and retention activities for students at all levels,
- 5.) offer professional development workshops for middle and high school teachers, and support these teachers' instruction of geosciences with appropriate materials.

Overall, this project was highly successful in increasing geoscience teachers' knowledge of earth and space sciences. Additionally, the project did an excellent job in increasing teachers' confidence in their ability to teach geosciences to a highly diversified student body.

Appendix A
Data Collection Instruments
Pre-workshop Survey

**South Bay Geo-Diversity Project
Pre-workshop Survey**

1. Participant Profile

Biographical Data Tell us a little about yourself:

Name _____

Postal address _____

Email _____

Phone _____

Gender Female Male

Age Group < 20 21-30 31-40 41-50 > 51

Teaching Background

Indicate your background in teaching and learning:

Classroom teacher (Check and/or fill in all that apply):

___ Credentialed ___ Intern ___ Other

Years of experience _____

Subject area taught:

___ Science

___ Mathematics

___ Language arts and/or reading

___ Social studies and/or history

___ Other

Paraprofessional or classroom aid

Tutor or mentor

No teaching experience

Other _____

Personal Knowledge and Teaching Efficacy

1. General Knowledge

I'd rate my personal knowledge of general geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach general geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

2. Earthquakes

I'd rate my personal knowledge of earthquakes as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with earthquakes as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

3. Water Quality and Supply

I'd rate my personal knowledge of water quality and supply as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with water quality and supply as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

4. Faults

I'd rate my personal knowledge of faults as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with faults as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

5. Topographic Maps

I'd rate my personal knowledge of as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with topographic maps as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

6. Water Cycle

I'd rate my personal knowledge of concepts associated with the water cycle astronomy as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with the water cycle as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

7. California Geology

I'd rate my personal knowledge of California geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with California geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

8. Streams and Groundwater

I'd rate my personal knowledge of streams and groundwater as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with streams and groundwater as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

Appendix B
Data Collection Instruments
Post-workshop Survey

**South Bay Geo-Diversity Project
Post-Survey**

Participant Profile

Biographical Data Tell us a little about yourself:

Name _____

Postal address _____

Email _____

Phone _____

Gender Female Male

0

Age Group < 20 21-30 31-40 41-50 > 51

Teaching Background Indicate your background in teaching and learning:

Classroom teacher (Check and/or fill in all that apply):

___ Credentialed ___ Intern ___ Other

Years of experience _____

Subject area taught:

___ Science
___ Mathematics
___ Language arts and/or reading
___ Social studies and/or history
___ Other

Paraprofessional or classroom aid

Tutor or mentor

No teaching experience

Other _____

Knowledge and/or self-efficacy in Teaching and learning Evaluate your personal knowledge of the topic and then your ability to teach the subject.

1. General Knowledge

I'd rate my personal knowledge of general geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach general geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

2. Earthquakes

I'd rate my personal knowledge of earthquakes as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with earthquakes as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

3. Water Quality and Supply

I'd rate my personal knowledge of water quality and supply as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with water quality and supply as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

4. Faults

I'd rate my personal knowledge of faults as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with faults as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
| | | | | |

5. Topographic Maps

I'd rate my personal knowledge of as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with topographic maps as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

6. Water Cycle

I'd rate my personal knowledge of concepts associated with the water cycle astronomy as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with the water cycle as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

7. California Geology

I'd rate my personal knowledge of California geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with California geology as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

8. Streams and Groundwater

I'd rate my personal knowledge of streams and groundwater as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

I'd rate my ability to teach concepts associated with streams and groundwater as:

| | | | | |
|-----------|-------------------|--------------|------|------|
| Excellent | Good to very good | Satisfactory | Poor | None |
|-----------|-------------------|--------------|------|------|

Student data

Your classroom

Approximately how many students have you taught this year? _____

Approximately how many are from under-represented groups? _____

(African Americans, Hispanics, Native Americans, Pacific Islanders and persons with disabilities)

At what grade level? _____

What subject(s) are you teaching this year?

b. How many MESA students are you advising? _____

Approximately how many are from under-represented groups? _____

How many hours/week do you meet with MESA students? _____

c. Have you been able to make use of the geoscience concepts and/or activities presented in the summer 2003 South Bay Geo-Diversity workshop in either your classroom or in MESA sessions? _____

If yes, please describe.