PROJECT WISE:
WATERSHEDS INSPIRING STUDENT EDUCATION

An Environmental Science Program of the Crissy Field Center and Urban Watershed Project with Galileo Academy of Science and Technology

Final Technical Report Submitted by:

Nina S. Roberts, Ph.D.
Assistant Professor and Principal Investigator
San Francisco State University

Arjuna Sayyed
Research Assistant

July 2007
“PROJECT WISE: WATERSHEDS INSPIRING STUDENT EDUCATION”

AN ENVIRONMENTAL SCIENCE PROGRAM OF THE CRISSY FIELD CENTER AND URBAN WATERSHED PROJECT WITH GALILEO ACADEMY OF SCIENCE AND TECHNOLOGY

Dr. Nina S. Roberts, Principal Investigator
Arjuna Sayyed, Research Assistant

July 2007

EXECUTIVE SUMMARY

This report was prepared by San Francisco State University for the Crissy Field Center and the Golden Gate National Parks Conservancy. This study was funded in part by NOAA with additional support by the Crissy Field Center. The purpose of this report is to communicate the results of this study including addressing the following sample objectives: 1) Determine if and how students acquire technical skills relating to scientific inquiry; 2) Verify and substantiate whether students build personal self-confidence and civic awareness; about the environment, and 3) Explore whether students’ increase their ability and gain knowledge about the scientific process, and if this contributes to personal empowerment and critical thinking. This first of its kind evaluation employed multiple methods to assess student experiences and measure desired outcomes with Project WISE. That is, a mid-semester questionnaire, end-of-year survey, viewing of videos from previous years, program and presentation observations, review of testimonials from previous years, and intermittent (brief) interview procedures occurred with three instructors from February through July 2007. This allowed the research team to obtain as much varied information as possible given the small number of students participating in the 2006-2007 academic program (n=35). This multi-layered approach offered a more robust assessment of the project significance, broadly, as well as determining student challenges.

✓ Overall results show student involvement in the Environmental Science Pathways course definitely stimulates curiosity and cognitive learning.
✓ For these students, progress can also be measured by their personal interactions with nature and their growing knowledge of why it’s important to protect it.
✓ Results show the core of student learning is not so much in the information, but in the interaction between these youth and the natural environment.
✓ In the case of Project WISE, while science taught contributes to meeting school standards, the imagination being developed in these young minds through involvement at the Crissy Center and their national park visits may, in fact, be more important than technical precision.
An area of experiential learning that was noticeably of high significance to students in all aspects evaluated consisted of regular field trips. Results show the integral role of field trips in the students’ learning experience.

It can be inferred from this evaluation of students’ learning that they experienced an increased awareness and heightened interactions with the Presidio, National parks, and the natural environment, in general.

Results show that program participation contributes to an enhanced level of consciousness about how their behavior (and that of others) effects the environment. Similarly, expressions of “desire” to change behavior were evident.

Through a variety of course requirements, such as field work, experience in the lab, and their final group presentations, Project WISE helps students increase their interpersonal communication and public speaking abilities.

Findings clearly indicate Project WISE offers students a significant amount of hands-on experience through the use of scientific tools and equipment; this facilitates an increase in learning and comprehension.

Through their participation, students strengthen their problem solving capabilities; this is particularly relevant within an environmental context.

Results show Project WISE offers students opportunities to try new things in a variety of areas including environmental exploration (e.g., watersheds, wildlife habitat) and the exploration of scientific methodology.

Science-Based Enrichment

71% (n=22) of the 31 student respondents agreed their perspectives about science, in general, changed due to their WISE program experiences. This highly correlates with the 23 students who agreed, in some capacity, that their ability to learn science improved through their participation as opposed to traditional, fully in-class courses.

Two-thirds of these students also indicated an increased comfort of being in the Presidio and enjoyment of being at the Crissy Center. 60% indicated they developed an overall “new interest in science”.

Out of 25 responses, 92% agreed or strongly agreed they gained a greater understanding of the natural history of the Presidio; 88% (n=22) agreed in some capacity to gaining a basic understanding of the watershed process in the Tennessee Hollow watershed from their participation in Project WISE.

Over 90% of students completing the survey indicated the field experience helped prepare them to develop their project hypothesis.

Although not that strong, there is a positive correlation between students who agreed or strongly agreed they learned about reviewing and analyzing data before working on their project (88%) in relation to an increased confidence in academics at school as a result of participation (p<.05, r² = .40).

Survey Highlights (n=31 respondents out of 35 completing the program)
Of all the tools, equipment and technology students learned to use throughout the year, 100% of students learned to use “Google Docs”. The next top 10 items reported with highest ratings of use/learning: GPS, Digital Camera, Compass, and Google Earth (93%); Power Point (90%); MS Word and Maps (83%); PH Meter (80%). The dissolved oxygen meter and video camera followed with 74% of students learning to use these items.

**Personal/Social**

- Twenty students (66% out of 30 responses) agreed that their participation in Project WISE has increased their comfort of being in the Presidio. Similarly, 63% (n=19) reported that they enjoyed being at the Crissy Center.
- Nearly 81% of the 31 students who completed the end of the year survey stated that their program participation has changed their perspectives on national parks.
- 80% (n=24) of 30 student respondents indicated their experiences with Project WISE has helped them to communicate better.
- 74% of students agreed, in some capacity, that their participation in WISE has empowered them to make better life decisions impacting the environment.
- A growing body of literature reflects the health benefits of being involved in environment-based activities or outdoor recreation opportunities. This program, with science focus did not have this as an intended outcome. Only half of these students reported any perceived changes relating to their own healthy lifestyle choices. 52% (n=16) reported that their perspectives on healthy life choices did not change as a result of their program participation while 15 (48%) indicated a positive response.
- Out of all 31 students completing the survey, more than ¾ indicated they have an improved ability to work in a team and have experienced a new connection with nature.
- The majority of students (86%, n=25) completing the end-of-year survey indicated they would recommend for other students to sign up for this course in the future.

Project WISE “connects urban youth with meaningful watershed experiences by enabling active, constructive participation in stewardship and restoration activities combined with small group, hands-on, investigative projects presented to peers, land managers and others. Students will learn of the significance of watersheds, the importance of biodiversity and practice scientific methodology in the field, lab and classroom partners” (Project Summary, 2006). There are many complex and interrelated factors that contribute to student learning and overall experiences with this program. Students involved come from diverse ethnic and socio-economic backgrounds; hence, the interplay between culture, the environment, and leadership and competency of staff/instructors, all affect the way in which these teenagers learn science, perceive nature and consequently what they ultimately learn about stewardship. Although not without its challenges, this project has proved to provide transformative experiences, a perceived increase in educational attainment, and increased comfort with this unique urban national park.
ACKNOWLEDGEMENTS

First and foremost a heart felt thanks goes out to Charity Maybury, Senior Specialist, Urban Ecology, at the Crissy Center for her incredible leadership with the youth being served. Specific to this study, Charity was always available to help meet the needs of this evaluation. Doug Kern was a core component to success of this evaluation. He is the Principal Investigator of Project WISE and Executive Director of the Urban Watershed Project. His enthusiasm for educating students about environmental science and assisting with meeting our needs for this study has been vital.

Thanks goes out to Lisa Franzen, Environmental Science teacher at Galileo who has a clear commitment to ensuring her students have the best experience possible. Her cooperation in providing assistance for data collection efforts, when needed, is commendable. Paul O’Connor, Research Consultant and former graduate student at SFSU, graciously volunteered his time and expertise in assisting with various forms of analyses and providing narratives for certain sections in this report. His willingness and genuine desire to assist cannot be underestimated; I remain forever grateful to Paul for his tireless contributions.

A special thank you to Christy Rocca, Center Director, who continues to provide the roots and strength of mind for helping bring Center programs to the next level. Appreciation and acknowledgement is extended to all the 2006-2007 students in the WISE program. They were open to our presence and patient with our ongoing need to gather information about their involvement and experience. They were troopers and deserve a lot of credit for their honesty and participation in this evaluation study.

Finally, I am grateful for the continued mentoring and advice provided by Dr. Emilyn Sheffield, Professor at Chico State and Social Scientist. Her progressive thinking has also allowed me to view this work in other positive ways that are as deep as they are wide.


If this report is used, in part or as a whole, the following reference should be included:

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Introduction

Background

The Crissy Field Center (CFC) operates a variety of year-round programs for youth throughout the Bay Area including school groups, local organizations, and others. They have ongoing programs, growing relationships with schools and local community groups, and the facility is a “welcome mat” for many people visiting/recreating in the park. This Center is a resource for all community users with varied backgrounds. Subsequently, research and evaluation needs are multi-layered and will hopefully continue to occur over a multi-year period. As working with local schools is an essential component of Center goals, this report represents an evaluation of one of the signature education programs with Galileo Academy of Science and Technology.

Watersheds Inspiring Student Education (WISE) is a year-long, place-based project engaging predominately low-income, inner-city youth of color. Through lab experience, weekly on-site field work, and classroom lectures and discussions, the curriculum offers a wide variety of experiences that are not traditionally found in most high school level science courses. Furthermore, numerous partnerships have allowed Galileo Academy to offer a curriculum filled with unique experiences. These opportunities are designed to support and promote the study of the environment, enhance stewardship, and teach about environmental careers. Through their involvement, Pathways students have opportunities for weekly field trips, mentoring by professionals, and internships to gain greater knowledge and additional experience. Students also receive training in the use of state-of-the-art scientific equipment and principles. The year-long experiential component of this program, as well as fundamental opportunity to explore one of this nation’s premiere urban national parks, is tremendous. Subsequently, the link to outdoor recreation can be another means of enjoying their surroundings and the natural environment; this is inevitable and a potential mediating effect of their learning.

The direct element of the program being evaluated is the connection with the field work at the Golden Gate National Recreation Area (e.g., the Presidio/Tennessee Hollow Watershed) and the urban ecology and multi-media labs at the Crissy Field Center as the on-site, home base for student field and lab work. Note: Given the inter-agency collaboration, and multi-faceted characteristics of Project WISE, the terms ‘project, program, and course’ may be used interchangeably throughout this report.

Program Partners

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Study Objectives

Although developed as a concept in 1998, Project WISE is in its 6th year of this partnership with the Crissy Field Center and is well positioned for advancement to the next level. Through a grant provided by the NOAA “B-WET Program”, this year’s program began in August 2006. To-date, no formal or empirical evaluation process has occurred making this study both timely and conducive for further funding and potential expansion. Hence, this evaluation is valuable for program development purposes and essential to meet the requirements of the grant.

**PRIMARY GOAL:** To obtain evidence-based information from Project WISE as an educational program providing meaningful watershed experiences for Galileo students.

**OBJECTIVES:** Following the evaluation protocol as set forth by NOAA recipients of watershed education grants and relating to the Project objectives as set forth at the onset of the program, this study will:

- Determine if and how students acquire technical skills relating to scientific inquiry;
- Verify and substantiate whether students build personal self-confidence and civic awareness;
- Explore whether students’ increase their ability and gain knowledge about the scientific process, and if this contributes to personal empowerment and critical thinking;
- Understand if and how the WISE program offers a transformative experience and what is the turning point;
- Identify student interest in environmental sciences/natural resources as a career;
- Offer suggestions regarding other opportunities that can be provided to expand the program under ideal circumstances and plentiful resources; and,
- Present ideas and recommendations for how Project WISE can be elevated to the next level and ensure sustainability.

**Outcomes under study will relate to the stated objectives as well as strive to incorporate the following variables of interest:**

- Overall program satisfaction (e.g., “likes / dislikes”).
- Communication skills.
- How their end of year “project” benefits school class work/grade and fulfills Center program goals.
- Opportunity of “giving back” to community – experiential projects/hands-on.
- Interest in science at the beginning versus the end.
- Greatest source of stimulation for learning.
- Level of “relevance” to students and their personal lives (e.g., “me, my life, my health, my home, community”).
- Comprehension of the connection of parks and people-connection (comprehension and values).
- Overall education value of park to youth.
- Stewardship
- Extent of self-determination, dedication, “pushing self” to achieve (how far and why?)
Many existing studies pertaining to environmental education and youth involvement in the sciences are descriptive or correlational in nature rather than causal. Longer term programs and opportunities, such as Project WISE, have the ability to create a greater impact on student learning and potential for both attitude and behavioral changes relating to the natural world. A few studies are cited here providing a basic association to the Project WISE curriculum.

In his groundbreaking work, Louv (2005) has studied the staggering division between our youth and the great outdoors. In this landmark book, “Last Child in the Woods,” Louv has coined “nature deficit disorder” not as a medical condition, but rather as a growing phenomenon where children are spending less and less of their lives immersed in nature. He notes how this narrows their senses, both physiologically and psychologically, and completely “reduces the richness of the human experience.” One of the topic areas discussed, rightfully so, is “education as a barrier to nature.” That is throughout his research, Louv addresses the fact education reform has moved too far away from what we used to know as a “well-rounded education.”

He goes on to say, and this is a national issue, that our schools are pouring millions of dollars into educational electronics and either paying less attention to or cutting music, arts, physical education. Furthermore, while science is considered a core standard, many school districts across the country are failing to offer a true hands-on experience with nature in the outdoors, beyond the classroom. While some of the more nature-based social sciences are making a comeback, Louv contends hands-on nature education continues to be lacking.

Faber-Taylor & Kuo (2006) contend that because there is a consistent concern among researchers that children’s access to nature is rapidly diminishing and their lives are increasingly filled with technology and “programmed activities” this (among other reasons) leaves them with little time for exploring or ‘free play’ outdoors. Youth also need unstructured exploration so the benefits and values of hands-on environmental education and experiential opportunities to study natural sciences are enhanced.

Drawing on the review of literature completed by Faber-Taylor and Kuo (2006), they highlight four studies that compare outcomes associated with outdoor versus indoor classroom curricula. Three of the four studies reviewed found more learning by students following the outdoor classroom instruction than indoor. For example, based on the work of Basile, (2000), and Leiberman & Hoody (1998) youth with outdoor classroom experience scored higher on measures of knowledge transfer, performed better on standardized tests of academic achievement, earned higher grade point averages and demonstrated greater knowledge gain overall.
A recent study conducted in California by the American Institutes for Research (2005) found that students involved in outdoor education experienced an increase in mastery of science concepts, enhanced cooperation and conflict resolution skills, gains in self-esteem, and gains in positive environmental behavior. This project investigated the impact of a week-long residential program, and results also show gains in problem-solving, motivation to learn, and classroom behavior.

There is a growing body of evidence supporting the positive benefits on school achievement from place-based learning in the environment (Leiberman, 1998; Sobel, 2004). Students who participate in environment-based instructional programs score as well or better on standardized measures in four subject areas: Reading, math, language, and spelling.

Furthermore, these studies show outdoor education also fosters cooperative learning and civic responsibility, using the natural characteristics of the school grounds and local community as the foundational framework for the curricula (CA Student Assessment Project, 2000; Lieberman 1998).

According to Rickinson et al., (2004) “substantial evidence exists to indicate that fieldwork, properly conceived, adequately planned, well taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom” (p. 1). Two key findings of this 10-year review (international in scope) indicate the unsurpassed value of programs which provide longer, more sustained outdoor experiences than is often provided, and that use a range of carefully-structured learning activities and assessments linked to the school curriculum.

Regarding the health benefits of immersion in nature (e.g., through play outdoors or school-based environmental curricula), a growing body of evidence shows that an increasing separation of children from nature is a contributing factor in the dramatic rise in ailments of our youth including obesity, diabetes, ADHD, and depression (National Forum on Children and Nature, 2007).

Additionally, the dialogue at this National Forum revealed that health care providers are just now beginning to recognize the therapeutic attributes of nature for various attention disorders and/or depression in individuals of all ages (personal communication, 2007). This discovery is something that outdoor and experiential education programs have known for many decades.

Evidence of these and other studies also show that direct contact with nature may be confounded with specific activities. It is not that clear to what extent outcomes are caused by different activities taking place in different settings versus the actual setting itself, per se. Studies with outdoor curricula involving “hands-on learning” versus those with indoor curricula following a typical classroom format can result in increased learning (Sobel, 2004) or might not show any greater learning (Howie, 1974).

While there are always cautions with any research study, the thorough reviews-as reflected in this summary - support the notion that outdoor and environmental education programs are widely effective in promoting learning among youth. This fact notwithstanding, apparently several studies reviewed provide verification that inherent challenges continue to exist in maintaining environment-based curricula for schools on a longitudinal basis; this is despite the substantial (and growing) evidence of benefits for students.
Limitations of Study

Limitations of this study are primarily twofold: First, the NOAA grant requires the full academic year to be evaluated; because the evaluation did not begin until January an abridged process took place. Attempts were made, nonetheless, to gather the full academic year experiences through the procedures employed. Second, while a multiple method approach was central to this project, the written questionnaire and survey consisted of self-reported measures without a control group for depth of comparison.

Methodology

This Pathways class at Galileo Academy of Science and Technology began on August 28, 2006 yet the Crissy Center component of the program actually started on Sept. 13th. The Center team met each class at that time. The Center team is comprised of Charity Maybury, Senior Specialist/Urban Ecology, Doug Kern of the Urban Watershed Project, and Jon Muller, Environmental Technology Specialist. Ernesto Pepito, Program Coordinator for the Inspiring Young Emerging Leaders program supported the WISE program on an as needed basis.

The Center team worked with two different classes and they each meet once a week from 1:00-3:40pm. One class, the 5th period Honors Environmental Science students, met every Wednesday and the other, 6th period Honors Environmental Science students met every Thursday.

The students’ final presentations occurred on May 30 and May 31. A wrap-up session with students took place the following week during June 6 and 7.

The research plan was created in the fall of 2006 and data collection began in February 2007 beginning with an open-ended mid-semester questionnaire. Observations occurred of students working in the Center lab, video tapes from a selection of previous programs were reviewed, a series of “testimonials” as solicited by the Center staff were reviewed and analyzed, and an end-of-year program survey was developed and administered. Last, informal interviews with key project staff occurred intermittently throughout the duration of the evaluation period.

Mid-Semester Questionnaire: An open-ended, five item questionnaire was administered to the students at the onset of their second semester of the project in early February. Students hand wrote their answers thereby providing and encouraging free-flowing qualitative responses regarding their involvement in the first part of the program. Question content revolved around what they learned, their level of personal engagement, what they hoped to accomplish this spring, how they would like to change as a person, and what might they want to know [for the remainder of the course] that they haven’t already learned (see Appendix A).

End-of-Year Survey: A survey instrument (for summative purposes) was developed as the primary agreed upon methodology, and has provided sufficient data within both the time and fiscal constraints of the project period. The “education evaluation” protocol provided by NOAA’s education division (e.g., “checklist”) provided a framework for the design of the questionnaire and outcomes being measured. More specifically, the questionnaire involved items pertaining to the stated research objectives as well as variables of interest. Three teenagers
(seniors, 2M/1F) from Metwest High School, Oakland, pilot-tested the survey as an opportunity for outside students to pre-review this instrument primarily for organization, ease of comprehension, length of time to complete. General feedback was obtained and incorporated into the final version. One week after the final presentations, questionnaires were administered to the students at the school by the science teacher (see Appendix B). Completed questionnaires were picked up at the Center by the Project P.I. on 6/7/07.

Document reviews:

**Videotapes** – According to the original proposal, history of the program, as well as future vision, the Center and program partners have employed some evaluation techniques via videotaping of student experiences. A major element of this technique is where students are videotaped at the beginning of the year through an interview process then at the end of the year a video is produced that documents their final project presentations. Ideally and conceptually, video-taping would occur when students start the program, at mid-year and at the end. Segments obtained throughout the year would then be edited and compiled, showing what has been witnessed over several years of the program. This approach of the study consisted of a deliberate selection of 8 video tapes for review based upon the available information on the list provided by the director of the Urban Watershed Project (see Appendix C).

**Testimonials** – A variety of “testimonials” were provided by the Center Urban Ecologist in February 2007. These were comments provided by program partners/leaders from the previous 2005-2006 school year and appeared in both Word documents and email messages. A series of comments were also provided by one former student of this Wetlands class who was also a former I-YEL student at the Crissy Center Details were then organized and examined to determine material substance and possible addition to the study through a content analysis procedure.

**Equipment and Tools used for the Environmental Science Class**

- GPS units
- Compass
- Digital cameras
- Maps
- PC computers
- Google Earth
- Google Docs
- Power Point / Word / Excel (utilizing graphing)
- Stop motion animation
- Video cameras
- Water testing equipment: Hach brand: PH meter; Conductivity meter; Dissolved Oxygen meter
- Spectrophotometer
- Colorimeter: testing for Nitrogen and Phosphorus
- Refractometer- test salinity levels
- Soil testing kits for pH, Nitrogen, Phosphorus, Potassium, lead
- Fish and Wildlife stream bioassessment protocol
- Microscopes
- Marine Science Institute boat trip: Plankton tow, dredge, fish net, fish dichotomous key
- Macroinvertebrate metrics
- Particulate matter collection kits
- Transects and quadrats
Participants

Number of participants: September 2006 = 51 students (26 male / 25 female)

Beginning second semester (January 2007): n = 40 students

Gender: 20 male / 20 female

At the end of the year (June 2007): n = 35 students

Gender: 18 male / 17 female

Fifty students started in the program in Sept 2006 – Two primary reasons for the attrition included: 1) some dropped in the second semester and 2) families moved. Out of 50 who started, 35 completed the program. Part of the diminished number in the second semester is that seniors were advised they needed to take a different, non-science course to meet their specific graduation requirements. Note: More males than females withdrew from the program over time; this is worthy of exploring in terms of gender differences.

Age range: 15-18 years old

Race and Ethnic Background (2006-2007)

Galileo has approximately 2000 students. The underserved student population, as a whole, may be characterized by the percentage of students qualifying for free or reduced price lunch: 41.5% of Galileo students receive free lunch and 12.7% receive reduced lunch (a total of 54.2% of the student body). The ethnic demographics of the Galileo as a whole versus the students that participate in this program look a little different.

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<tr>
<th>Galileo Demographics (%)</th>
<th>WISE Demographics (%) (n=35)</th>
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<tr>
<td>Latino = 12.8</td>
<td>Latino = 26.0</td>
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<tr>
<td>Other white = 5.1</td>
<td>Other white= 14.0</td>
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<td>African American = 9.4</td>
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<td>Chinese = 51.1</td>
<td>Asian = 12.0</td>
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</tr>
<tr>
<td>Filipino = 6.2</td>
<td>(see Asian)</td>
</tr>
<tr>
<td>Other non-white =12.1</td>
<td>Other non-white= 21.0</td>
</tr>
<tr>
<td>Declined to state = .9</td>
<td>Mix race= 7.0</td>
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“Overall, my experience with the Watershed Program was a positive experience and I am glad that I was part of this program it has enlighten me in many ways.”

~ Former Student, Inspiring Young Emerging Leaders (I-YEL), Male
Data Analysis

Mid-Semester Questionnaires

Five open-ended questions were provided to students in February 2007 (see Appendix A). The questionnaire was administered on site at the Crissy Center ensuring all students present completed this and, for anyone absent during those class periods, the Science Teacher administered and collected these at the school. These were brought to the Crissy Center during the next class period.

Data analysis was accomplished using a basic constant comparative technique (Glaser & Strauss, 1967) and analytic induction as tools for analysis. All hand-written responses were typed into a Word document organized by question. After the data were organized and coded, similarities among responses were established (e.g., exploration of common themes). The data were analyzed in two primary ways: Responses were first coded using descriptive classifications derived from the questionnaire. Using the questions as guides, content for each section was coded for relevant themes.

Second, responses were then coded by emerging patterns, categories and themes as part of the movement from data description to conceptual clarification. This involved the research assistant reading and re-reading transcripts numerous times to ensure familiarity with the data.

Based on the simple questionnaire structure for this study, no effort was made to tease out the relative effects of gender, race/ethnicity, or age of the participants at this time.

End of Year Survey

Data were first entered into an Excel spreadsheet then imported into the SPSS ver. 14 (Statistical Package for the Social Sciences). Basic frequencies and descriptives were first organized and reviewed. Second, given the small sample size (n=31 completed surveys) we were limited to what statistical tests we ran and decided to keep this simple. For instance, a series of correlations were computed to measure the degree of the linear relationship between two variables. The resulting correlation coefficient determines the direction (positive or negative) and strength of the relationship between two (or more) variables; this does not explain causation. Furthermore, comparative analyses using crosstabulations were completed to explore relationships between two or more variables. Because with any given crosstab analysis, there might not be enough cases to determine the chi-square tests of statistical significance, some analyses were completed for the interest and descriptive assessment only (i.e., if any cells have expected frequencies less than 5 use of the chi-square statistic is questionable and should not be used for statistical significance yet simple observations are acceptable). Details are provided in the results section.

Note: An attempt was made to include a comparative analysis between the mid-semester questionnaire and the end-of-the-year survey. This was challenging given the distinctly different nature of each instrument. This fact notwithstanding, we focused on those items in common to obtain the greatest opportunity for comparison as possible. That is, was there an apparent increase, decrease or possible ‘stability’ in student experiences based on their responses from the mid-semester through the end of the year (i.e., on related items)?
Video Review

Appendix C provides the detailed criteria for reviewing the video tapes. While eight tapes were selected for review, only four ended up being watched because four of the video tapes selected were completely blank (others were not a back up option because of tape format).

Testimonials

Key categories were developed by the research team that were evident by the type of remarks made by program partners. Content was organized into one of five categories: 1) Crissy Center Characteristics/Benefits; 2) Program (WISE) Characteristics/Benefits; 3) Collaboration Description/Benefits; 4) Skill Development; and 5) Personal Comments based on experience with WISE (see Appendix E).

2005:

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<td>Number of Respondents</td>
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<td>UC Berkeley Leader</td>
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<tr>
<td></td>
<td>University High School Science Dept. Chair</td>
</tr>
<tr>
<td></td>
<td>WISE Alumni Student</td>
</tr>
<tr>
<td></td>
<td>Galileo Environmental Science Teacher</td>
</tr>
</tbody>
</table>

The following categories were created along with the subsequent themes that emerged as part of the data reduction process:

Crissy Field Center (CFC) Benefits

1. Learning/How-to
2. Exceptional facilities
3. Influence on community
4. Destination for locals
5. Opportunities for volunteers
6. Staff: accessible and accommodating

CFC Characteristics

1. Inclusive and welcoming across cultures
   a. Programs/publicity materials presented in several languages
2. Quality of staff

Project WISE Benefits

1. Enjoyment = Return rate back to the Center
2. Commute length impedes enthusiasm
3. Experiential learning positively affects connections with knowledge gained
4. Opportunity for visual observations
**Project WISE Characteristics**

1. Real life opportunities presented to participants
2. Balance of personal development and academics
3. Developed appreciation for nature and connection with outdoors
4. High quality equipment and knowledgeable staff

**Collaboration Description**

1. UC Berkeley partners with Crissy Field Center and Urban Watershed Project in the US Department funded project called City Watershed.
2. For more than six years, UC Berkeley’s Interactive University has worked with Galileo Academy of Science and Technology and other San Francisco high schools, the Crissy Field Center and Golden Gate National Parks Conservancy, the National Park Service, and the Presidio Trust.

**Collaboration Benefits**

1. Rewarding and deeply satisfying
2. Enriches educational opportunities around the Bay Area

**Skill Development**

1. Development of science skills
2. Critical thinking
3. Teamwork
4. Ability to present one’s ideas and thoughts
5. Environmental awareness

**Favorite/Liked Best**

1. Physical activity
2. Water testing at the Tennessee Watershed
3. Scavenger hunt
Results and Findings

This section provides results from each of the six aspects of the data collected throughout the evaluation period. Key procedures employed are the focus of this section while a sample of the other supplemental strategies (e.g., staff interviews, analysis of testimonials) are included to help verify the findings as presented in this report. Students meet three other times in the classroom at Galileo High School with the science teacher. Project WISE is the “lab” portion of this science class; concepts and information may therefore be reinforced or not reinforced from one location to another. One key factor is the program is also working to enhance a greater flow of information between the classroom and the lab work at the national park (i.e., Presidio/Center, Tennesse Hollow).

Mid-Semester Questionnaire

Out of 40 students in the program at the start of the second half of the program, 33 questionnaires were completed and returned. Each of five open-ended questions were analyzed using qualitative procedures and resulted in six major categories: Environmental/Historical Awareness, Environmental Justice, Experiential Learning, Comprehension of Tools and Methods, Behavioral/Lifestyle Changes, and New Life Perspectives. The narrative below provides detail about themes that emerged within these categories and our examination of this data; the table on page 22 offers an at-a-glance descriptive for the meaning as represented within each section. Given several months of involvement up to this point, clear impacts from this course have begun to surface as reflected in the analysis (see Appendix D for sample student quotations).

Environmental/Historical Awareness & Environmental Justice

1. Environmental & Historical Awareness

It is clear from numerous student responses that they acquired a wealth of both environmental and historical awareness through WISE program learning experiences. When asked what they learned during the first part of the program, many students responded by briefly mentioning learning “about the environment [broadly] and what they do at Crissy Field Center” while others chose to give more detailed examples such as “water quality, macro-invertebrates, soil, rocks, plate-tectonics” and “urban watersheds, history of the Presidio and learned about how different factors greatly affect our environment.” Students also indicated they learned about the cycle of plant life in the Presidio and how much life it actually has. Environmental ethics and life in the Monterey Bay also surfaced as topics learned. There were numerous responses regarding history including, “I learned how San Francisco looked like before the humans came and changed it” and “the history of the Presidio”.

Evaluative assessment of findings

Judging from student questionnaire responses it appears that environmental and historical awareness was a primary area of student’s acquisition of knowledge. When asked what they learned during the first part of the program, 21 out of 33 students responded by mentioning they gained general knowledge about both the natural environment and its history. From the depth of student responses, it also appears that environmental and
historical awareness is perhaps the largest area of students learning. Judging by the broadness of students responses regarding their acquisition of environmental and historical knowledge, it seems many of the students had limited knowledge and experience in the field.

2. Environmental Justice (EJ)

EJ, in its simplest form, is a term used to describe injustices in the way natural resources are used. This also relates to inequitable distributions of environmental burdens (pollution, industrial facilities, crime, etc.) and access to environmental commodities. Aside from learning “a lot about the environment”, WISE students also “learned about how our environment is being damaged”, and “also about how to keep the environment safe”. Though many of the responses did not directly mention the language of environmental justice, many responses did relate to “how to work in the environment and how to help it survive”. More of these related responses included “I learned…how to keep the environment healthy”, “we learned about the poachers and how they killed dolphins and how other animals are becoming extinct”, and “environmental ethics”. (Note: Project WISE did not discuss poachers/dolphins; this is a good example of what’s learned in the classroom related to science yet students are not always able to segment where they are learning this material. That is, in some cases to them this is the same class/one in the same).

When asked what more they wanted to learn at WISE, students named “more on global warming”, “how to protect some species that are endangered”, and “how we can reuse things more”. A significant number of students responded to this question by expressing an interest in learning more about animals. Responses that reflect this interest include: “more things about animals”, “especially about the animals that are endangered”, and “to know more about animals”.

Evaluative assessment of findings

As of the mid-semester, the area of environmental justice seems to be a particular interest for a significant amount of students yet warrants further study. If our assertion is correct that students are gaining a fundamental understanding of environmental science through Project WISE is true, then it may also be many students first exposure to environmental justice issues. Even if a number of students did not directly use the term “environmental justice” many of their responses eluded to related issues. Some examples of this can be seen in such responses as “I would like to be more environmentally friendly and know what harm me and my people’s actions do to the environment”. These kinds of statements might suggest that students want to learn practical ways to be more environmentally friendly and realize there are consequences to certain behaviors.

Experiential Learning

The “Experiential Learning” category incorporates student responses that are focused on learning through the means of hands-on lab and field work. Student responses regarding experiential learning were very positive. Their responses generally referenced their field work and field trips. The positive mention of the field trips became a common thread throughout many of the responses. Examples of this can be seen in the following statements: “I always went to the field trips”, “I also come to all the trips”, “I tried to come to all the field trips”, “I would like to participate on a lot more of the trips”, “I joined the class because of the field trips".
Some students offered recommendations to “go to the zoo and the Monterey Bay Aquarium for field trips”, or to “have more all day field trips”. When students were asked if they were personally engaged during the first part of the course, one student’s reply was “yes, I was because I enjoyed the field trips, so I didn’t mind learning”.

Another aspect of experiential learning related to specific and tangible/direct use of research equipment and learning data collection methods. However, while this was mentioned it was evident these two program components (e.g., part of scientific methodology) did not yet seem to have a significant impact on student learning at this time. A positive response to WISE lab work can therefore be noted by seeing the “Tools and Methodology” category.

**Evaluative assessment of findings**

From the significant number of responses that related to experiential learning, it appears that students respond well to hands-on, in the field learning experiences. A number of students mentioned the field trips in particular as their initial source of interest, and even more said they made an effort to attend all of the field trips. The number of these responses indicates that regular field trips enhanced the learning experiences of students. One student went as far to say that they “didn’t mind learning” when in engaged in the field trips.

Although a considerable amount of student responses referenced experiential learning methods as a source of interest, a surprisingly small amount of students directly mentioned the use of scientific methodologies and tools in their responses. A mere four responses out of 33 directly mentioned the use of specific tools such as a compass, the GPS system, and PH meter. An even smaller number of students mentioned the use of science-related methodologies such as water testing, conductivities testing, etc.

Considering that Project WISE emphasizes the application of learned knowledge and skills through conducting a research experiment and presenting their final project, the amount of student responses that indicated the learning and use of scientific methodologies and tools and equipment were quite few.

**Comprehension of Tools and Methods**

This category includes all student responses that encompass their acquisition of new research tools and methodologies from the WISE program. Student responses ranged from broad examples of methods such as “teamwork…and field work”, to more detailed examples including “water testing”, and “how to do the PH levels, conductivities, and AW temps”. Some of the specific tools mentioned include “learning how to use a compass and a GPS system, also Google Earth”. As one student put it, “I learned how to use the tools to see how healthy some areas are”.

With regards to expanding their use and understanding of research tools and methodologies, students mentioned wanting “to learn…how to collect data and experiment better”, and learning how to use all the materials and tools for water monitoring testing”. Another student added they wanted to learn “how to grow stuff”. Students also expressed interest in obtaining more day-to-day practical procedures such as “how we can re-use more things”, and “how to safely dispose stuff without having to pay”.

---

*Project WISE*  
-19-  
*July 2007*
Evaluative assessment of findings

Given that Project WISE emphasizes the application of learned knowledge and skills through conducting research and giving a presentation on their final project, the amount of student responses that indicated the learning and use of specific scientific methodologies and tools and equipment were minimal. Perhaps this is an area for further consideration regarding the program instructors and school science teacher in terms of what students can expect to learn from September through February (i.e., half way through the course).

Personal Enrichment

1. Behavioral / Lifestyle Change

The “Behavioral / Lifestyle Change” category attempts to identify student responses that are concerned with the influence the WISE program has had on their behavioral patterns half-way through the course. While it is difficult to gauge behavioral changes of students from one series of five questions, responses suggest that subsequent knowledge, tools, and research strategies have helped to change some of the student’s behavior towards the natural world. Certainly their desire to change was very strong.

These behavioral changes are evident in such responses as, “I feel that I changed a little through this program. I’m starting to recycle more and started using less light in my apartment”. Another student added, “Every time I see myself thinking of littering, I would think twice about my actions and the actions of others”. Still, other students referred to their personal change by stating “I would like to be more helpful...in the environment”.

Many students expressed an interest in learning more personal behaviors that will help them to better live in harmony with the natural environment. For example, when asked what more they want to learn at WISE, multiple students mentioned wanting to know “how to eat healthy”.

Evaluative assessment of findings

From the significant amount of student responses as indicated in the analysis, it appears that Project WISE has a big influence on the personal lifestyle patterns and behaviors of students. Some students appear to already be actively applying new knowledge to their behaviors and lifestyle, while others seem to be considering new ideas for the first time more frequently as a result to their program participation. A noticeable number mentioned the desire to learn ways to “help the environment”, which is an indicator of the programs ability to reach the students’ conscience.

2. New Life Perspectives

The “New Life Perspectives” theme encompasses student responses that indicate an acknowledgement of the role individuals play in environmental change. A significant amount of responses describe a change in student’s perception of the natural world as a result of WISE-related learning experiences. These responses might also show how their experience in the program contributes to the increased knowledge and confidence in ones ability to help the environment. These responses often show that through the WISE program experience, students’ perceptions of their relationship with the natural environment have changed.
One student summarized their learning experience by stating that “I joined the class because the field trips, but now is more than the field trips, but the difference we make”. Another student honestly admits that “I wasn’t really engaged at first because I thought it was going to be boring…reading about the environment, but it was more interesting”.

**Evaluative assessment of findings**

A considerable number of students noted a distinct increase of their environmental awareness and desire to continue their learning as a result to their program participation. Of all the categories analyzed, the development of a new open-mindedness concerning environmental issues is the most obvious. These changes can be easily seen in specific individuals as well. For example, one student who responded to the question of being **personally engaged** in the program with “no, I thought it was a tree hugging program”, later responded to other questions with more of a sense of interest and concern, even declaring at one point that “we can all help the earth with environmental burdens”. These kinds of responses show both pre-existing views and new perspectives resulting from participation.

“I look at our national parks, such as the Presidio, so much more differently now that I realize how much work actually goes into making them the way they are, and how many people, such as myself help do that”.
### Common Themes Across All Students and Questions (Mid-Semester/Feb. ’07)

<table>
<thead>
<tr>
<th>Category</th>
<th>Themes / Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental/Historical Awareness</td>
<td>Increased consciousness about historical impacts and current issues. New perceptions formed about current issues. Attention paid to specific science topics relating to their studies.</td>
</tr>
<tr>
<td>Environmental Justice</td>
<td>Interest in comprehending effects of human behavior. Exposure and desire to understanding of what it means to be “environmentally friendly”. Growing familiarity with why species are extinct. Increased alertness to related health issues.</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>Field trips were an integral component with desire for more. Positive hands-on practices and approaches during field trips and park-based activities. Use of tools and data collection techniques did not yet seem to have an impact on enhanced learning at this stage.</td>
</tr>
<tr>
<td>Comprehension of Tools and Methods</td>
<td>Use was apparent yet knowledge gained of various tools and application to gathering data and/or learning about environmental science, in general, was minimally stated.</td>
</tr>
<tr>
<td>Behavioral / Lifestyle Changes</td>
<td>Element of personal enrichment. Program reveals growing impact on student actions and seems to create an increased level of consciousness about how their behavior (and that of others) effects the environment. Indicators of potential “change” provided.</td>
</tr>
<tr>
<td>New Life Perspectives</td>
<td>Elevated level of attentiveness. Reality of what is yet to come based on what has been learned to-date. Change of heart regarding what was anticipated versus what was actually occurring. New desire to learn more and gain greater level of knowledge about the environment as well as science.</td>
</tr>
</tbody>
</table>

“It is amazing to watch and work with the students during the initial struggle of developing a protocol for their project, gathering data, writing up results and working with a small team. Then at some point in the process you see it click for them. By the end of their final projects they often talk about how easy the project was. They forget about the struggles of working in a team, gathering data and writing a paper because once it all clicks for them, they have become experts on their topics…”

~ Senior Specialist, Urban Ecology
Crissy Field Center
End of Year Program Survey

Out of 35 youth completing the 2006-2007 program 31 completed the four-page questionnaire representing a response rate of 88%. Furthermore, in completing a reliability analysis of this instrument (i.e., a measure of internal consistency) Cronbach’s Alpha = .87 deeming this an acceptable tool. Note: Usually 0.7 and above is adequate and the closer the Alpha is to 1.0, the more reliable the test is. Apparently the students who did not complete the survey were graduating seniors and, unfortunately, they were difficult to track down. This section provides a few highlights of key results and findings.

### Gender

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Male</td>
<td>17</td>
<td>54.8%</td>
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<tr>
<td>Female</td>
<td>14</td>
<td>45.2%</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Age

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1</td>
<td>3.2%</td>
</tr>
<tr>
<td>16</td>
<td>10</td>
<td>32.3%</td>
</tr>
<tr>
<td>17</td>
<td>13</td>
<td>41.9%</td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td>22.6%</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100%</td>
</tr>
</tbody>
</table>

### How often did you attend WISE classes?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every class</td>
<td>15</td>
</tr>
<tr>
<td>Almost every class</td>
<td>10</td>
</tr>
<tr>
<td>Every other class</td>
<td>3</td>
</tr>
<tr>
<td>Once every few classes</td>
<td>2</td>
</tr>
<tr>
<td>Rarely attended</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
</tr>
</tbody>
</table>

### During WISE classes, I usually am . . .

<table>
<thead>
<tr>
<th>Completely engaged</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partially engaged</td>
<td>14</td>
<td>45.2%</td>
</tr>
<tr>
<td>Not engaged</td>
<td>1</td>
<td>3.2%</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>80.6%</td>
</tr>
<tr>
<td>missing data</td>
<td>6</td>
<td>19.4%</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100%</td>
</tr>
</tbody>
</table>
Change in Students’ Perspectives

Comprehending direct impact of the program on student lives can be very difficult. While this survey represents self-reported measures, the way this question was framed was intended to provide the opportunity to make direct inferences regarding any impact the program may have on perceived changes (on topics posed) over a 10-month period with potential for long-term effects on students’ lives. That is, we wanted to know: Have your perspectives on the following general areas changed because of your participation in the WISE program this year?

Student perspectives changed about the following as a result of their participation in the WISE program

Results show more students perspectives changed regarding the “natural environment, national parks, and science” then the other three areas of interest represented in this question. According to the findings, only 13 students (approximately 1/3) expressed a change in their perspective regarding ‘academics’. This was a dichotomous option where students were given the option to choose “yes” or “no” with space provided and a request to please explain their answer. Though much of the written support was limited to one sentence responses (with the exception of five students who were more thorough), they were generally clear about the actual ways they were changed through their program experience. The most common response of this nature indicated that students have gained more awareness and appreciation for the natural environment. Examples: “All of the information I learned let me feel more aware of nature” ~ “I am so much more aware of my surroundings” ~ “I have learned to appreciate nature” ~ and “I respect my environment more”.

Other students indicated an increase of knowledge and understanding of national parks as a result of their participation in the WISE program. Sample statements: “I look at our national parks such as the Presidio so much more differently now that I realize how much work actually goes into making them the way they are, and how many people, such as myself do that” ~ and, “I respect park property more and I know how actions affect the environment.”
By participating in Project WISE, I was required to ...

All 31 students responded to this section and the top three factors the majority believed they were “required” to do were: 1) Try new things, 2) Work in groups, and 3) Use new technology. Other factors were clearly of importance yet it is interesting to report that fewer believed as strongly in the other program features as being ‘required’.

Working in Groups

Quantitative information from the end of the year survey clearly shows group work is an integral part of student’s learning experiences. 28 out of 30 students who completed this section (93%) agreed they were required to work in groups during participation with Project WISE. Furthermore, 47% (n=14 of 30 students responding) reported experiencing frustration from working in their group. While this may have been the case, an important finding represents 73% (n=22) reporting an improved ability to work in a team resulting from WISE experiences.

Perspectives about National Parks

One of the most valuable facets of student involvement in Project WISE is whether or not their perspectives about National Parks have changed. The answer is clear:
Communication and Public Speaking Skills

For students who completed the course and filled out the end-of-year survey, 80% indicated the program helped them *communicate better*. Slightly more males ($n=14$, 58%) than females ($n=10$, 42%) indicated an increase in this attribute. Findings also show this increase in ‘communication’ factor has a significant positive relationship to the high percent of students, overall, who indicated learning to work better in groups/teams ($p<.01$, $r^2 = .54$). Additionally, students overwhelmingly agreed that their *public speaking skills* improved as a result of their participation. Interesting to note, however, is that when we explore the relationship between females and males, findings show more males ($n=3$) rated themselves as disagreeing in some capacity that their involvement in the program helped improve their public speaking skills. No females disagreed with the fact they improved their public speaking skills. The other aspect worth noting is that improvement in students’ public speaking has a positive and statistically strong relationship with *feeling more confident in my school work and academic engagement as a result of my participation* ($p < .01$, $r^2 = .73$).
This chart represents different areas of student knowledge and skill acquisition relating to scientific methods. Out of 31 completed surveys, this chart shows a nice balance of what the majority of students learned. However, this is limited to the precise question asked on the survey and does not, therefore, tell us about what exactly they learned or understood within each of these categories (e.g., what did they learn/comprehend or did not learn about the language of science, collecting or analyzing data?).

When comparing this series of responses we also see a positive and statistically significant relationship with their ability to develop hypotheses and writing up the results and findings (p < .01, \( r^2 = .63 \)). Regarding students who reported ‘yes’ to the attribute they learned about data collection techniques (94%) and data analysis (89%) there was a positive, yet not significant, relationship with developing a “new interest in science, in general”.

![Knowledge Gained of Scientific Methods](chart.png)
Hypothesis Testing  *Did your results support your hypothesis?*

Choices were a dichotomous “yes” or “no” answer and included an opportunity for open-ended comments (i.e., “please explain”). All 31 students completing the survey responded to this question. 74% (n=23) reported that their research supported their final project hypothesis. When given the chance to briefly explain how their research was used to test their hypothesis, 26 students took advantage of the opportunity. Very few students shared the exact reason why their hypothesis was true or not. Many students redundantly answered the question in short, such as in one sentence answers like “no, hypothesis was wrong”, or “because what we predicted happened”. Other students gave more descriptive answers such as “no, we thought that nitrates in our water would be lower than the data we collected”, and “yes, our hypothesis stated that we would see more birds at the Himalayan blackberry than at Thompson Reach and our data showed that”. Students may have attempted to rush through the survey or perhaps were truly unable to explain how their results supported their hypotheses. Without a verbal exchange with students, it’s difficult to know why they did not actually ‘explain’ their choice versus providing such a terse answer to this question.

### Ability to Learn Science through WISE versus Traditional Classroom

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moderately Disagree</td>
<td>1</td>
<td>3.2%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Disagree</td>
<td>1</td>
<td>3.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Agree</td>
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<td>19.4</td>
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</tr>
<tr>
<td>Moderately Agree</td>
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<td>22.6</td>
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</tr>
<tr>
<td>Strongly Agree</td>
<td>10</td>
<td>32.3</td>
<td>40.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>80.6</strong></td>
<td><strong>100%</strong></td>
</tr>
<tr>
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<td>6</td>
<td>19.4</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Using a 7-point Likert-type scale (including “don’t know”), students were asked whether they agree or disagree with the following statement: “I feel my ability to learn improved through my participation in Project WISE more than I would have in traditional in-school science courses.” What we see here is 23 people agreed in some capacity that their ability to learn improved through their participation in WISE as opposed to traditional in-school science courses. This validates the importance of a program like Project WISE that offers an alternative science education to high school students who may not have had much success or engaging experiences through more traditional in-school classes. While 92% students responding to this question have improved their ability to learn science from their participation (i.e., see ‘valid percent’), what about the other 8 percent who disagreed with this statement? In this case there were only 2 students, yet what does this mean?
Do students get bored during Project WISE?

Students experience boredom for a variety of reasons and what stresses them out is not always clear. Results of this survey showed that while the majority of students were not bored or stressed from their participation, nearly 1/2 (48%) experienced the issue of “boredom” and “being stressed out” based on their involvement in this program. It cannot, however, be assumed what factors may contribute to these feelings. One aspect of interest to the researchers was whether or not this may have related to the ‘jargon’ of science that they may not have fully understood. For example, nearly 1/3 of students who complete this year-end survey reported a disconnection with scientific language (n=10 indicated “yes” as something they experienced).

<table>
<thead>
<tr>
<th>Gender by Boredom by A disconnect with scientific language</th>
<th>Boredom</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>A disconnect with scientific language</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

We first ran a bivariate correlation (using the Phi index for two dichotomous variables) to determine if there is a relationship between “boredom” and “a disconnect with scientific language”. Results show there is a positive correlation between these two variables (p<.01, \( r^2 = .52 \)). This table above looks at ‘boredom’ –across gender–specifically in relation to whether this could pertain to a possible disconnect with comprehending scientific language. These results, while not statistically significant across gender, show that these factors together apply equally to both males and females yet out of 31 students only 8 (n=4 girls and boys), experienced boredom due to a lack of comprehension of scientific language in the course.

It is interesting to note, however, that when kids express boredom this can denote being passive and full of excuses (Louv, 2005). Youth of this generation are so attached to electronic games and gadgets that being removed from these extensions of their lives can sometimes impel them into boredom. On the other hand, boredom can also force creativity hence instructors in future can do what Louv calls “nurture constructive boredom which can often increase children’s openness to nature” (p. 167), or in this case, environmental science.
Miscellaneous researcher's judgments/observations about student survey responses:

A. **Terminology**: Some students may lack a depth of knowledge in terminology associated with research methodology. Many students were seemingly unable to articulate their final project research methods or data collection strategies used as asked on this section of the survey.

What method(s) did you use for your final project? ________________________________
________________________________________________________________________
How did you collect your data? ______________________________________________
________________________________________________________________________

Twenty-seven students responded. One student mentioned they used “seven steps of the scientific method” while others wrote in a very general and even broad way such as “teamwork and data analysis”. Other examples include responses as shallow as “by doing it”, “we went outside” and “by writing it down”. Some students gave slightly detailed examples of the methods they used for completion of their final project such as “power point presentation” and “we collected data and wrote a paper and graphed things.” However, of the 27 students who responded to this question (87%), seven students were more vague and listed “all of the above” (referring to categories presented regarding if they gained a new understanding about conducting scientific experiments and what aspects of science they learned) ~ Two other comments to these questions [above] were: “A lot of stuff” ~ and “data”.

This is being shared as part of this report in attempts to determine if and how to improve student responses in future. Such elusive types of responses may indicate a possible lack of emphasis on formal research vocabulary and terminology or perhaps a simple lack of interest in responding to this question.

C. **Two Students**: It is important to keep in mind this program serves teenagers and it may be unrealistic to reach them all as positively as desired. Even if they are reached or touched (e.g., thru their involvement), they still may not articulate their personal growth or experiences in a way that is very advanced. Consequently, survey completion observations include potential disinterest in completing this evaluation and/or in the WISE program all together: While not a major theme or concern, per se, but worth noting is a seeming disinterest (or perhaps indifference/apathy) in the program of two students. For example, some responses blatantly or more subtly (through the use of sarcasm) criticized the time they spent in WISE classes. Statements written on open-ended sections included: 1) “I’m bored in this class! The regular class knows more! The extra time did nothing but stress me out;” and 2) “The class isn’t too great, I didn’t learn very much. But I have a background in environmental science so maybe that’s why I’m bored.” While potentially isolated from other very positive responses on their surveys, this shows clear disinterest by these two students in particular. One student who may have clearly paid little attention to reading and answering the survey answered the question about whether their perspective has changed as a result of their participation stated “yes, go hippies.” This student did, however, check all boxes/categories in this section (i.e., yes, personal perspective has changed). **Note**: This judgment is merely provided for instructors to realize the added challenges of reaching “all” students while accepting the value that a written survey has in obtaining honest responses.
Comparison from mid-semester to end of the year

Part of our analyses consisted of an attempt to compare the mid-semester questionnaire with results in the year-end survey. The aim was to ascertain if there were increases, decreases or no changes in certain segments of student learning by topic or theme. There are both noticeable similarities and differences between related responses from these two data collection techniques. Important to note is the fact that two instruments were administered in different ways. In February 2007, a one page, open-ended, five item questionnaire was administered to the students. In contrast, the end-of-year survey was four pages of predominantly Likert-type scales and dichotomous “yes/no” statements with supplemental open-ended questions that prompted students to give detailed information about their responses and any additional experiences they might want to share. As the two evaluation instruments were designed completely different, they rendered two sets of contrasting results that may, regarding certain content areas, be difficult to compare. (For more information on evaluation descriptions, please see the methodology section.)

Experiential Learning

One common thread that was apparent in both the mid-semester questionnaire and the end-of-year survey is the importance of experiential learning as a means of comprehending environmental science. In the mid-semester questionnaire the overwhelming majority of students mentioned experiential learning in the context of field trips and a smaller but noticeable number of students’ referenced experiential learning through the use of science-based tools, equipment and methodologies. In the mid-semester questionnaire only four students directly mentioned the use of specific science-based tools. In addition, a small number of students mentioned the use of scientific methodologies in the mid-semester questionnaire.

It is clear from the numerical data provided by the end-of-year survey that the use of science-based tools and methodologies is a significant part of WISE student’s learning experiences. For example, students were given a list of scientific methods and were asked to check those they participated in during the course of the program. Although in the mid-semester questionnaire, most students did not list specific methodologies they were engaged in, when given concrete examples in the end-of-year survey the majority of students agreed they participated in developing a research hypothesis, collecting data, analyzing data, writing up results, and learning presentation strategies at rates that ranged between 77% to 90% as “new understanding and learning of these skills”. This is clearly in contrast to the scarcity of results found in the mid-semester responses potentially showing an increase of these skills from mid-semester to the end of the course.

Likewise, in the mid-semester questionnaire, few students mentioned the use of specific science-based tools and equipment, however when given a specific list of tools on the end-of-year survey to check off, student responses indicate a higher amount of tool and equipment usage. According to survey responses, most of the tools, equipment and materials were used by high percentages of students. For example, 93% of students who completed the survey learned to use Google Earth, while 74% learned to use a dissolved oxygen meter. In contrast, there are a few tools, equipment and materials that were not used by as many students according to survey results. For instance, 61% of students reported not using the
An area of experiential learning that was noticeably of high significance to students in both the mid-semester questionnaire and the end-of-year survey was regular field trips. By far, students mentioned regular field trips more than any other single learning component in the mid-semester questionnaire. In the end-of-year survey, all 31 students (completing this survey) indicated participating on “regular field trips”. This clearly shows the integral part of student’s learning experience that field trips play.

New Behavioral & Lifestyle Changes

In the mid-semester questionnaire a noticeable area of impact Project WISE had on students was their own personal behavioral patterns. Students referred to changes in their personal behaviors as a result of their WISE experiences halfway through the course. Some examples include recycling more and not littering. (For more detailed examples, refer to the Mid-semester Data Analysis section).

In the end-of-year survey, students gave a variety of responses relating to the area of personal behavior. At times, however, it appears there are some inconsistencies in student responses for this item. For example, on the end-of-year survey, 51% agreed that their perspectives regarding their own personal abilities had not been changed through their WISE experiences. Similarly, 52% (n=16) reported that their perspectives on healthy life choices also did not change as a result of their program participation either. On the other hand, in a later section of the same survey, 74% of students agreed, in some capacity, that their participation in WISE has empowered them to make better life decisions impacting the environment. Other student responses potentially inconsistent with the 51% who claimed their perspectives of their own abilities were not changed are the 17 out of 25 students who agreed they experienced noticeable changes in their lifestyle since participating in the program. This topic area warrants further exploration.

Environmental Awareness and Environmental Justice

Student responses from the mid-semester questionnaire clearly show WISE students gain a greater awareness and knowledge of the natural environment as a whole and learn about how the environment is affected by elements such as pollution. (For more examples see the mid-semester data analysis section titled Environmental Awareness and Environmental Justice.) Quantitative data from a variety of sections in the end-of-year survey similarly shows how student acquisition of new environmental knowledge and awareness influences their personal perspectives of the natural environment. For example, when asked if their perspectives have changed in a number of areas due to their program participation, a high percentage of students acknowledged these areas to be true for them. One such topic was student perspectives of the natural environment where 87% (n=27) agreed their perspectives have changed due to their participation. When asked if learning about the watershed process of Tennessee Hollow was part of their learning experience, 88% agreed or strongly agreed. Similarly, 92% of responses to this question (n=25) agreed they gained a greater understanding of the natural history of the Presidio.
Doug Kern, Urban Watershed Project Director and Project WISE Principal Investigator, states he enjoys “seeing students transform from being shy and tentative outdoors, to getting outside and becoming more comfortable and able to articulate their experiences.”

For Charity Maybury, Urban Ecology Specialist, “the most rewarding part of working with the instructor team of Project WISE is having a truly functioning partnership between the classroom teacher, the professional scientist and the Crissy Field Center environmental education team. Each of us has different strengths that we capitalize on and then, in turn, learn and enhance our own skill sets. I think, for each of us, it is a labor of love to put out the energy to take these classes that extra step from the typical jammed packed classroom being lectured at, to utilizing a National Park as the outdoor learning laboratory.”

Lisa Franzen, Science Teacher/Galileo Academy, shares some of the most rewarding aspects about working with Project WISE. Lisa says she enjoys being part of a team of educators that can have a larger impact on student’s science education than most in-school science education models. Lisa’s remarks also include her appreciation of instructing and inspiring students as they learn to believe they have the opportunity of “making science careers a reality.”

Informal phone interview:
Program Observations

Multi-media Lab Work

Students selected themselves for their project groups. Topics were presented to students from a list so, in many cases, groups were determined by area of interest in any given topic. The research team observed students on five independent occasions during the spring semester (2007) as they worked on their final projects in the Crissy Center Media Lab and prepared for their final project presentations. Computers in the lab are all networked so tasks completed are accessible both within and between groups. The particular computer technology these students are learning is valuable and in some cases extraordinary. For example, learning to use and/or perfect Excel, Power Point, MS Word, Adobe Photoshop, and Motion Pro/video software provide students with substantive hands-on computer experience.

Due to researchers’ scheduling constraints all computer lab observations were made during the Wednesday class, rather than both Wednesday and Thursday classes (nor was the chance to observe just Thursday students an option). During the lab observations, it was clear that some students were more engaged than others in their work. For instance, groups of three worked on their individual projects with little interaction between groups that seemed relevant to their activities. In some groups, it appeared that one student took the lead, sitting directly in front of the computer and doing the bulk of the work, while the others sat behind, to the side, or wandered around the room offering less input. On multiple occasions, students were observed spending their class time on the computer engaged in a way that might be determined as inappropriate ‘surfing the Internet’ exploring unrelated topics, while leaving their work for others in the group to complete. Other groups seemed more interactive with their exchange of ideas and sat closer together in front of the computer.

Towards the end of the period on two different days, multiple students seemed to have lost their focus for the day. Though twenty minutes of class time remained, they seemed disengaged and ready to end their work. While others used their class time to type up their findings and convert data into graph form, these students idled the remaining class time away involved in potentially irrelevant matters such as joking around and casually talking. Having a good time during this course is essential for student enjoyment, yet it may be equally valuable to ensure they are productive with their group work and that not any one student dominates.

At times, there was only one instructor present, while at other times there were two or three. It appeared that when there was a single instructor, there was more of the above mentioned detachment from work. Occasionally students would pull out their cell phone and were found text messaging other people (e.g., more than likely their friends).

• When the relevancy of student behavior to coursework was questionable instructors would intervene, making comments such as: “Make sure this is the best use of your time” (keeping them on track).
• Students also helped to keep each other focused by reminding their peers of the importance of being prepared for the final presentation.
As survey results show that 45% (n=14) students were “partially engaged” and 48% (n=15) were “partially interested” for the entire year, versus fully engaged/interested, these observations are therefore not unusual regarding the intermittent behavior displayed by these teenagers based on their honest responses on the survey. Furthermore, their critique of one another regarding their work with peers is compelling regarding what they experience as part of the group. As written by one student on the mid-semester questionnaire: “I would like to stop being in groups with people who don’t do shit.” This is typically one of the greatest challenges for young people!

Student preparation for final presentations, including observation of actual rehearsals and the post-rehearsal process:

- Encouragement among their peers, for one group who emphatically stated to another: “Show some enthusiasm!” In terms of poise and style, they were critiqued by one another to try not to be so mono-tone in their diction.
- Instructors opened up to the students in the audience during rehearsals/practice sessions: “What did they do well, what was good and what can you suggest for them to work on?”
- Written comments were provided by instructors allowing for specific aspects to be discussed with students later on.
- Each group completed a “presentation grading sheet;” these were collected, later compiled and averaged, compared to instructor ratings, then discussed with students.

Practice/rehearsal presentations are an excellent opportunity to keep students moving forward to make progress towards completion as well as for enhanced peer-to-peer relations including an opportunity for feedback by everyone in the lab thereby giving them a chance to improve their work.

Final Presentations

- Personal impact of Project WISE - Many students spoke about the positive ways this program has affected them. One student said she did not like coming to class the first semester, but now enjoys coming to class. Another girl said she was shy before taking the class, but is now not as nervous during presentation.
- Some of the presentations had a clear introduction and conclusion, yet lacked a substantial amount of research method explanation. Considering the depth of some research projects, it also seemed that some groups could have used more time to do a thorough explanation of their project and more in-depth presentation.
- During Q & A: Some of the students spoke on behalf of others in response to questions, while a significant number of students gave the outward impression they did not want to answer questions.

a. “Spider girls” (n=3, females)
   - Power Point was outstanding, substantiated their findings by using self-made graphs and followed with an analysis including personal interpretation about the “facts”.
   - Cue-tape on the floor was effective in keeping the students grounded in one spot and not getting in the way of the visual aides.
   - Results – including diversity of types of spider webs found.
   - Two girls spoke more than the third.
b. “Ivy Girls” (n=3, females) - English and Cape Ivy Removal
   o Intro student speaker seemed much more comfortable with public speaking. Other two spoke in monotone and read directly from their index cards; rarely to never did they ever look up.
   o Talked about their basic scientific procedures for their study, including site comparisons (Area A, Area B).
   o Able to articulate their longitudinal and cross-sectional approach well.
   o Power Point was okay, not great – Re: yellow text on green slides/photos was hard to read (too much contrast).

c. “Wire Weed” (n=3, males)
   o Good job with Power Point – for the most part.
   o Clear level of comfort with their study in terms of knowledge gained, used relevant scientific language.
   o One guy didn’t even use notes; the other two had one-pager with notes.
   o Conclusion of this presentation seemed premature; this leads us [researcher team] to wonder about the time constraints. For example, is there enough time to thoroughly and concisely present student projects and findings?

d. “French Broom” (2 males, and 1 absent)
   o One guy read directly from his cards, other addresses what’s on the computer monitor screen in front of the room.
   o Then the second student also read from his index cards but not as much – seemed to have more knowledge about their study.
   o This group did a lot of note card reading, which resulted in a lack of eye contact with the audience.

e. “Butterflies” (2 females, 1 male)
   o Greater level of comfort with these three in talking about their project.
   o Good job personalizing their research with group experiences.
   o Power Point was very good.
   o This group smiled more often or just more in general.

f. “Himalayan Blackberry Bush” (2 females, 1 male)
   o Each had note cards yet there was clear evidence of knowledge and skills they gained because they rarely referred to their notes.
   o Excellent job with Power Point – similar issues however with other (Wed.) class in that font color used was not always the best selection overlaying photographs.
   o Multifaceted presentation style, which included an interactive group game that engaged the audience.

g. “Raptors group” (3 males)
   o Very enthusiastic, great projection, plenty of energy, and talked well without note cards.
   o 2 of 3 guys were very knowledgeable and seemingly comfortable with their new skills from this project.
o Power Point was outstanding.
o At the end of their presentation they played a Q & A game with the audience including a musical introduction. The game was a humorous touch to the presentation and complete with sound effects and prizes of candy.

h. “What’s in Your Water?” (3 females)
o Well spoken and poised yet read clearly from their index cards (off and on).
o They had visual props to show audience how they conducted their experiment. They included vials, etc. and had a separate video camera on the table that had the materials and supplies so the audience could see the simulation on the big screen.
o Compared and contrasted the findings of three different samples of water and drew conclusions. Lastly, they gave actual recommendations that impact both the Crissy Center (café) and the community at large.

i. “Brush Pile Monitoring” (3 guys)
o Decent job overall, group had plenty of enthusiasm.
o Polished in terms of their knowledge and comfort in front of group.
o Good job at presenting their data in graph form.
o They ended with bird sounds and passed out sheet of paper with color photos and names of 6 birds. The audience had to guess the name of the bird and who’s sound it belonged to.

j. “Geology of the SF Bay Area” (2 females/1 male)
o Video simulation using “Steve-O” taking a stroll and use of play-doh with wood blocks to simulate the Earth’s crust and the mantle.
o Knowledgeable, good job with flow of their presentation, excellent job using photos to substantiate their research.
o They spoke about what they learned from their research, ended with a personalized message that really showed how strongly Project WISE has impacted their educational experience.

**Note:** See recommendations for a series of suggestions regarding student final presentations
Video Reviews

Overture

When students are video-taped at the beginning of the school year and then again during their final presentations, one anticipated outcome would be: “A marked improvement in student attitude, a transformation of student poise, maturation and ability to interact successfully in the world” (From the 2006-2007 WISE project summary document).

Tapes were considered “supplemental” and not a primary segment of the present study. We received a bag of tapes and an excel spreadsheet was obtained by email; both a bit disorganized (and acknowledged as such by the Urban Watershed Project [UWP] director). The Excel spreadsheet had incomplete information providing very little context to the content of any of the tapes. There was no sense of system or order to the tapes at all; following a conversation with the director of the UWP, we modified and updated this list. Several of the tapes received were not labeled. That is, we were also given four tapes and four labels and we agreed the research assistant would view and properly label. It turns out nothing was on any of the tapes—no audio or no video. They were completely blank.

Upon receipt of the bag of tapes, the research team became concerned that we would not be able to view the “MiniDVD’s” because none of us had this type of camcorder or unit that could view these tapes. The research assistant and volunteer consultant proceeded to offer to talk to their friends and family to try to find a camcorder with cords so they could view in their personal TV unit. We were told by the UWP director that if we couldn’t find a system or unit to view the tapes, he would convert them to regular DVD’s.

Both the research assistant and volunteer consultant tried off and on find a unit for viewing the Mini DVD tapes. At the time when we realized if we are going to view the tapes at all, we would, in fact, need the UWP director to convert them. Hence, we figured we’d take him up on his offer to “convert any time”. VHS tapes to be converted were returned to the Center and other tapes in tact were viewed for inclusion as a supplemental part of this study. As of July 1st when no additional video tapes were received for viewing, it was determined that we would no longer be able to view and include.

The following four VHS tapes were ultimately reviewed and highlights of the analyses are reflected in this section (see Appendix C for criteria):

1. 5/22/03: Galileo Final Presentation #1 (wide-shot, back of room)
2. 4/29/02: Tennessee Hollow Field experience with Barbara Corff, NPS Docent
3. 2/27/02: Tennessee Hollow – Macro-invertebrate
4. 5/9/01: Tennessee Hollow with David Lauter class #1, Washington H.S.

Highlights of analysis from tapes reviewed

The research team collectively viewed a total of four video recordings from Project WISE field and class activities and lectures. Video observations offered a close up view of the pre- to post-assignment procedures, involving both students and instructors. From the video observations, it seems that field activities have an obvious impact on students learning ability via hands-on activities.
Three different video recordings contained Washington H.S. students on site at the Tennessee Hollow Watershed, while a fourth documented part of student’s final presentation at the Crissy Center (see 1-4 above).

Video observations provided supplemental in class perspectives on a variety of activities that students participated in. The following list consists of the activities that students were observed taking part in:

- compass orientation (learn how to use a compass)
- soil observation (varying components of soil)
- water testing (data collection)
- visited a waste water treatment plant (learned how bacteria can breakdown human waste)
- model building
- air quality testing
- plant identification (native or non-native)
- macro invertebrate observation
- field trips (visited Lobos Creek)
- removal of non-native plants
- public speaking
- journal writing (activity reflections)
- note taking, data recording
- data synthesis (students converted their findings into graph form and percentages)
- lecture and discussion
- drawing conclusions, creating solutions and forming recommendations (critical thinking)

Additional topics that were covered during in video observations include:

- Coastline and land formation
- Watershed makeup (composites, soils, rocks)
- History of the Watershed (glacier impacts – land)
- History of specific native plants and people
- Tennessee Hollow Watershed name origin

Summary

Video observations by the research team show the important role of “team work” in the field. Students worked together and supported each other’s scientific explorations. This can be clearly seen when students work together to explore a variety of ways to do research and experimentation. The activities showed students how to draw conclusions by using scientific data. Some of the tools observed in use by students were eye droppers, spoons, view finders, collection tubs and trays, collection nets, tweezers, and a water monitor, insect identification manual. Students were seen putting their critical thinking skills to use as they encountered new concepts and field methodologies. Observations included on-camera student interviews, in which students displayed a clear understanding of their research methods and seemed comfortable speaking about their work. Students also demonstrated an extensive knowledge of eco-systems and environmental issues/impacts, as well as the impact humans have on the environment.
Testimonials – “Personal Praise and Tributes” to the Program

The Crissy Field Center, in connection with Project WISE, provides opportunities for students to learn the fundamentals of environmental science and ecology. The students are exposed to an inclusive, cross-cultural and experiential learning environment that not only contributes to their personal skill progression but also potentially the development of the community, as a whole. As a result of the participation in the program, individuals enhance their critical thinking and communication skills, while also learning how to effectively work in teams and increase one’s ability to present ideas and thoughts publicly.

The program also allows participants to utilize modern field techniques and use current technology to gain a better understanding of the interconnections between humans and the environment. A knowledgeable and professional staff, as well as, high quality equipment enhances the participant’s comprehension and allows them to maximize their learning experience.

The following table reflects the convictions of four individual program partners and one alumni (and former I-YEL student) as expressed by their written feedback provided directly to the Urban Ecology Specialist. These categories represent what is believed to be the greatest skills learned by students involved with this program.

<table>
<thead>
<tr>
<th>Science</th>
<th>Personal Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducting water quality testing</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Developing hypotheses</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Making predictions</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Collecting data</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Making observations</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Analyzing data</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Developing and delivering presentations</td>
<td>Project management and public speaking skills, communication and critical thinking.</td>
</tr>
<tr>
<td>Use of technical equipment</td>
<td>Gaining comfort with technology</td>
</tr>
<tr>
<td>Awareness of environment</td>
<td>Gaining appreciation for the environment</td>
</tr>
</tbody>
</table>

From the statements provided by these few individuals (based on experiences from 2004 to 2007), the above table shows not only did students’ gain science-based techniques through their program participation, but also their personal development increased in a number of areas. For example, while the chart shows students learn to conduct water quality testing, it also notes the subsequent growth of their critical thinking skills. Although all science-based emphases reported in the chart show a contribution to the development of students’ critical thinking skills, other personal development such as project management and public speaking (e.g., ability to be organized), communication skills, gaining comfort with science-based technology, and gaining an appreciation for the environment are stated to be effects of the program as perceived by these professional partners. Combined, these skill areas enhance students’ depth of environmental understanding and directly impact their development as potential agents of environmental change.
The understanding of nature that may lead to its protection depends on more than the organizational strength of the Crissy Center, as an educational Stewardship organization. It also depends on the overall quality of the relationship between the kids they serve and their direct exposure to nature. It depends on how, or if, these youth actually establish an attachment to nature. As Richard Louv (2005) contends, “once this attachment is made, it will never be lost.”

Place-based education increases students’ sense of stewardship and environmental consciousness and has added to their sense of attachment to “place” (e.g., Crissy Center, Tennessee Hollow, Presidio).

This evaluation research study employed multiple methods to assess student experiences including the following: Mid-semester questionnaire, end-of-year survey, video viewing of previous years, program and presentation observations, analysis of a sample of prior years testimonials (provided by program partners and one WISE alumni), and informal interviews with instructors. This allowed the research team to obtain as much varied information as possible given the small number of students participating in the 2006-2007 academic program (n=35). This offered a more robust understanding of the value of WISE, broadly, as well as determining student challenges.

These teens seem to create an attachment to these parklands yet, in most cases for those who live in the inner-city, many still are not able to transfer their new connection to the natural environment to their communities. In the question and answer session for the Wednesday class final presentations, when asked about that connection, several students responded with their own dialect by stating: “there ain’t no nature where I live so I don’t connect to nothin’ there.”

The situation is not hopeless. In one way or another, the Environmental Science Pathway (ESP) and the Crissy Center together with high quality staff and teachers have began to awaken these youth toward a new union with nature and science. The ESP and the CFC must ensure greater connection to the students’ home community.

From a holistic viewpoint, two key findings are important to note. First, while 58% of students noted their perspectives about “academics” (generally) have not changed, ¾ reported agreeing to some extent that confidence in their academics at school has increased as a result of participation. Second, while 2/3 expressed a ‘noticeable change in their lifestyle’ as a result of participation, this particular course may or may not offer an opportunity to change their perspective on their personal “healthy” life choices.
This study also reveals a couple of important challenges for the instructors. While the majority of students reported an increase in various facets of their personal and social skills development (such as enhanced communication skills, increased ability to work in groups), results show a clear variation across a large spectrum of students’ ability to learn science. When Project WISE was first developed, the original goal had the intent of reaching academically marginal students.

Apparently, this environmental science “Pathways” program had evolved to where it was later given the title of “Honors” course by Galileo high school. This can be considered misleading because the actual background and prior science knowledge of each student who applies and is accepted ranges from low to high. For instance, results of this study show some student abilities, coupled with their progress made, are very strong while evidence shows a few other students probably did not care very much (and/or were lost during the year) ending the year with a potentially inconsequential or mediocre experience.

When exploring the ‘big picture’ of this continuum, it appears as if Project WISE is serving both lower level skills as well as true honors level students. If the program is trying to meet the needs of both, results of this evaluation show this may not be working. The Project WISE instructor team may need to tighten up the enrollment/application criteria. Determining who the desired or preferred group of youth should be warrants discussion for future success of student learning.

Second, as corroborated in the literature, other challenges include the following: 1) the aims of outdoor learning and environmental science instruction are sometimes but not always realized in practice; 2) the different types of barriers faced by individual students in learning out-of-doors may vary and possibly not be addressed; 3) the relative benefits of novelty and/or familiarity (or lack thereof) with the outdoor learning setting may be unknown; and 4) the benefits of outdoor learning are not always sustained over time.

That is, we know this school-year program has offered an amazing experience with numerous outcomes and impacts as expressed in the results, however, without gathering more data over the long haul (e.g., tracking alumni/former students) there is currently an inability to comprehend whether the effects of this program will truly be long-lasting by students involved. This, by no means, detracts from the recognition that – after nine months of participation – student learning (e.g., science concepts and social skill development) was extraordinary and real in its overall effects. This also does not rule out the findings that the overall education value of the park to these youth was very strong.

Despite the varying levels of information and evidence gathered from this evaluation study, what would be equally valuable to know is the relationship between indoor/classroom learning and outdoor learning in the park setting.
This research, undertaken to explore of impacts of Project WISE and students’ experiences, suggests that there are several factors that can facilitate and/or impede learning in the park/outdoor settings. These can be conceptualized in terms of:

- Program factors – including the structure, duration and pedagogy of this environmental science program and curriculum.
- Participant factors – including the characteristics, interests and preferences of students as learners.
- Place factors – relating to the nature and novelty of the Center, park, or other outdoor learning setting.

Instructors are encouraged to build upon these key features and promote the successes as highly relevant for college preparation and meeting science standards. Additionally, it is essential for instructors to create measures of progress using the findings and recommendations in this report as well as their own ideas.

As noted in Appendix G, thirteen students in the WISE program have also been active with other CFC programs during the last several years ($n=7$ females, 6 males). For instance, six students completed I-YEL, one did a Parks Conservancy Site Stewardship internship, and four participated in the Eco Career Day.

Additionally, twelve students participated in Youth Quest over the last two years. Student’s who are involved in multiple Center programs, and/or other local leadership development opportunities, seem to gain new technical skills as well as enhance their interpersonal skills in a way that potentially surpasses those who do not partake. This facet of cultivating seamless involvement of youth across programs will continue to be an extremely valuable component of the Center.

Finally, results and findings of this study can provide a framework for thinking about how efforts to improve the quality and depth of the environmental science and general outdoor education opportunities might be directed as it relates to student learning across their lives.
RECOMMENDATIONS FOR FUTURE

1. **Orientation/Training for Students Pre-Program:**
   a. Consider use of video-tapes (or edited versions) for engaging student interest and enthusiasm early on *(see # 8 in this section).*
   b. Invite a panel of previous students (including alumni as feasible) to speak in class to prospective new students who have applied or are thinking about it with no final decision.
   c. Having Project WISE graduates/alumni as part of the orientation process may help to ease new students into unfamiliar territory.
   d. For students that drop out either ½ way into the program or at some point prior to the culminating experience in June, it would be beneficial for one of the instructors or the Galileo science teacher to conduct an “exit interview” or some modified title with these students to determine why they are not finishing the course. When families move away, this is clearly a justifiable reason for departure. Understanding why some students depart for other reasons might assist with greater retention in future.

2. **Experience in the Media Lab at the Center:** In groups, for example, one student may seem really involved on the computer, while others were sitting back and watching. Perhaps have a required rotation of who works on the computers at any given time or does any given experiment with the technology. That is, implementing a rotating schedule of student responsibilities in the lab may ensure that everyone’s time is accounted for and used to its fullest potential. Example: One student per project group focuses on the computer while other group members conduct literature reviews or other related tasks. Students can periodically switch responsibilities thereby providing a more well-rounded learning experience and maximizing time spent in the computer lab. Stop motion animation and Excel, for example, were part of the curriculum yet 29% of students indicated they did not learn either of these programs.

3. **Connection of parks and people / Level of “relevance” to students’ community and their personal lives:** Seeming lack of connection/comprehension and values – Consider taking two trips into the students’ neighborhood(s); one in the fall and one in the spring. This can be a one-shot deal (e.g., go into the Mission District and conduct a water testing experiment or explore, air quality, tree assessment, etc). This may also be the place to include concepts/discussion about environmental justice also providing students with context to other interrelated facets of the “environment” (e.g., clean air and water in relation to one’s health).

4. **Final presentations:**
   - The notion of “competition was apparently not an intent of the instructors; this evolved towards the end of the school year. Consider being conscientious about this and strive to have less focus on group competition and more focus on collaborative problem solving regardless of which group students are affiliated with.
   - Provide increased coaching about use of certain colored fonts that overlay color photographs.
   - Consistency in science project recommendations – each group had to address at least two, which is good. Why not focus on: 1) What would you tell/have the “Presidio Managers” do in the future? and, 2) What suggestions would you have for future students who might work on the same or similar project the next year?
• Consider an increased focus/mandatory directive for all students to “dress professionally” for the presentations.

5. Project graduates / alumni:

✓ Teaching assistants: For the second semester (spring ’07), one student (senior) who participated in WISE the previous year returned as a teaching assistant for the science teacher in the classroom and the lab. Continue to recruit WISE alumni to return as class/teacher assistants. Strong connections can be made with students, increasing the potential for longevity in their interest and involvement in environmental science. Benefits can be three-fold: 1) Help track the progression of program graduates and alumni (see also Discussion/Conclusions); 2) Retain student interest and involvement in environmental science with an increase of responsibilities, WISE may help to enhance career development potential in new students as well; and 3) Enhanced opportunity for in-depth cultural connections with students involved.

✓ Long-term: Maintaining relationships with program graduates can potentially aid WISE in following lasting impacts of the program on the lives of students. An annual focus group of selected students (e.g., one year after program completion) may help WISE to better understand how students’ lives have truly changed/been impacted as a result of environmental awareness and science-based skills gained through their participation. Subsequent focus groups may also help track the environmental science college major and career matriculation of former WISE students.

Note: Use of alumni/graduates may be woven throughout other recommendations regarding the potential for engagement (for example, see #1(c), orientation).

6. Career development: The program indisputably exposes students to a selection of environmental science careers. Unfortunately, this study did not flush out the relative effects of the program on student interest in pursuing environmental studies/science or related fields the way we would have liked. A few WISE students (n=4) participated in the Crissy Center Eco-Career day. How can the program get more students to attend? Also, consider being more explicit with opportunities to educate students about careers in environmental studies and related science-based careers (e.g., share announcements about career fairs at local colleges). Future evaluation should definitely include this component regardless of what methodology is used. This element could be included in an alumni mail-back survey in attempts to track program graduates as well.).

Note: Next year (’07-’08) a new component to Project WISE will be an Environmental Science Internship. Current sophomores and juniors (’06-’07) will be eligible to apply. Involvement in Project WISE is a prerequisite for the application. This internship is therefore an indirect relationship to Project WISE so this would be another placement of the Galileo Environmental Science Pathway.

7. Outreach:

✓ Recruitment for new students: Project outreach in the form of student led classroom presentations may help in the WISE recruitment process (as needed). For example, peer-to-peer classroom presentations that are delivered in student-friendly, yet science-based language may attract other high school students that may already have an interest in science, yet feel that an “honors” course is too foreign or
academically rigorous. This could work at Galileo Academy and/or other high schools as indicated as a desire by instructors for program expansion to other schools.

- For community to attend the final presentation: Have more field work that is completed in the students’ communities. This may assist them with making a greater connection with their communities and what is considered a traditional ‘natural environment’ versus urban/built environment. WISE could partner with other community-based organizations and these individuals should then be invited to attend the end-of-the year final presentations. Prospective partners’ and even college recruiting officer’s, could also be invited to learn about what students are accomplishing with the WISE program as well. This will allow for a broader connection across parks, people, and colleges (See Appendix H, 2007 announcement).

8. Managing internal program operations/administration:

- Video library/organization: Create a comprehensive electronic database. For example, this can be done on Excel to include such detail as the date, class/year, topic, # of minutes, location, name of videographer, one line of notes consisting of tape content, etc. (e.g., for ease of at-a-glance identification).

Use of tapes

- What currently happens after students/groups are video-taped?
Instructors should view and determine best use for them as teachers, direction of the program (e.g., content), and for student learning.

Videos - Recommendations

1) Use tapes, or segments of tapes, specifically for classroom instruction as visual aid for either this particular course (current and/or new student review), and/or for other environmental science classes for students who do not have the opportunity to partake in WISE;
2) Use 7-10 minute edited clip of the best video segments for recruitment efforts to champion other student interest in this course;
3) Use either this same tape or create a separate one as a “Promo Video” for fundraising and/or conference/workshop presentations;
4) For incoming students, preparation for field activities and preliminary training for them to gear up for final presentations.
Final Reports (student products): Index/library of hard copies and/or electronic copies of all student final reports as models for next year’s students as well as referencing previous students’ work. Currently a comprehensive list has been developed from the onset of the program in 2002 (see Appendix F, also submitted to the Center staff independently). We suggest an Index (e.g., or Table of Contents) be created and all reports from each year be placed in a physical binder including identification of student names.

Miscellaneous suggestions for consideration:

Portfolios – The program currently includes use of “reflection journals” that are written after each field trip within the Presidio or to Tennessee Hollow. Consider expanding this practice and use “portfolios” – This is a tool that is not new but one that can be developed as an effective means for both gathering information and establishing a sense of pride for these youth. This is a more naturalistic approach and one that is learner or student-based more than it is researcher-based. Portfolios, if the program partners have the time and energy to implement, are definitely different (and sexy for some stakeholders if testimonials and anecdotal information are used, and portfolios can be employed over the long-term). The contents of a portfolio (e.g., case, 3-ring binder and/or digital portfolio that could eventually also provide printed materials) could include students’ creative work, a range of products relating to their project, and their reflection journals would be an integral component. This could potentially provide a contribution to “The Crissy Way” as it could be representative of the I-YEL portfolio in some ways yet with clear unique attributes to match the goals of Project WISE.

Promotion of other Center programs – While there are a few students who are also involved with other Center programs, this could be increased exponentially with the right transition promotion. For example, provide each WISE student with a packet of CFC brochures and future opportunities for them to get involved with. Verbally telling students about what is available is valuable; this should be coupled with a packet of various materials for them to read on their own time as well as encouraging them to share with their parents (or guardians). (See Appendix G).

Academic Achievement – This program evaluation did not measure the actual effects of whether or not student grades at Galileo were affected by their participation in WISE. Those factors were beyond the scope of this study yet future evaluation projects could potentially create a greater connection and deeper relationship with the school teachers (and other personnel where necessary) in order to procure requisite documentation to measure these factors.
Research Results from Student Projects:
- The Center, GGNPC, and Presidio Trust Managers should consider paying attention to the results of the studies that have the most revealing information. For example, water testing found high nitrates (e.g., a 10ml nitrate is normal standard. The Center Café was tested as having the highest levels). Origin of water service is Lobos Creek for everyone in the presidio including businesses and residences thereby having widespread effects.
- During all data collection efforts in the field, 3-4 professionals including the Center staff as well as science teacher from Galileo and the Director of the Urban Watershed Project (UWP) engage in close monitoring of the equipment used as well as oversee actual testing/instructor to validate the results.
- The Director of the UWP is working with the Presidio Trust to follow up with this water issue. The Trust should consider hiring an expert or health professional to test the water themselves.
- Follow up to results that are valid and reliable would authenticate the student experience.

Through an experiential science course, the park becomes the classroom. Through this program, science is taught as a way to understand the intricacies of nature, a way to comprehend and feel how all things are interlaced, and with the potential to increase student confidence in their abilities.
APPENDICES

A: Mid-Semester Questionnaire
B: End-of-year Questionnaire
C: Video Review Criteria
D: Sample Student Quotations
E: Sample Partner Quotations
F: List of all project titles, student authors, and year of program
G: Participation in other CFC programs and Youth Quest involvement
H: 2007 end of year announcement to promote presentations
We hope you have been enjoying your experience with the WISE program so far. This spring we will be working with San Francisco State University to evaluate your involvement in this program. Please take a few minutes to read each question first then think about how you can best respond – Be as honest as possible! Your responses will help us make sure these next few months provide you with the greatest learning experience as well as contribute to the evaluation process overall. (Feel free to use the back).

1. What I learned during the first part of this program:

2. Was I personally engaged during the first part of the course (did I dedicate myself to experience as much as I could)? – If not, why not? If yes, how?

3. What I hope to accomplish this spring as a result of my involvement:

4. How I would like to change as a person during this second half of the program:

5. What I want to know that I haven’t already learned:
APPENDIX B

Watersheds Inspiring Student Education (WISE)
Evaluation of Galileo High School/Academy of Science & Technology
Environmental Science Pathway Program

End of the Year Survey 2007

Thank you for participating in this program. These questions are designed to help Project WISE better understand your learning experiences, to judge the effectiveness of teaching methods, and to better assess what WISE students might like to learn in the future. Your feedback is confidential and will be used strictly for WISE program improvements. For this reason your honesty is most valued! Thanks very much for your time and input!

I. Introduction
   A. From the start of this year’s program to now, how often did you attend WISE classes?
      ❑ Every class
      ❑ Almost every class
      ❑ Every other class
      ❑ Once every few classes
      ❑ Rarely attended

   B. During WISE class sessions I usually am …?
      Please check the ___ that best applies in each column:

      ❑ Completely interested       ❑ Completely engaged
      ❑ Partially interested         ❑ Partially engaged
      ❑ Not interested               ❑ Not engaged

   Male ___ Female ___
   Age: ______

II. Science-Based Enrichment

   A. Please check all the activities you participated in during the course of the year as a WISE participant. (Please check all that apply)

   ❑ Regular field trips          ❑ Computer lab experience
   ❑ Water testing                ❑ Habitat preservation
   ❑ Soil sampling                ❑ Wildlife/Aquatic life data collection
   ❑ Data Analysis                ❑ Graph/Chart Making
   ❑ Public speaking             ❑ Writing a research paper
   ❑ Group-oriented activities    ❑ Developing a research hypothesis
B. I gained new understanding about conducting scientific experiments through learning skills in the following scientific methods: (Check all that apply)

- Developing hypothesis
- Data collection
- Data analysis
- Research strategies
- Writing up the results and findings
- Presentation strategies

What method(s) did you use for your final project? ________________________________________

How did you collect your data? _________________________________________________________

Did your results support your hypothesis? ________

Please explain: ____________________________________________________________

C. I learned how to use the following tools, equipment, and materials through my participation. (Please check all that apply):

<table>
<thead>
<tr>
<th><strong>Electronic Equipment</strong></th>
<th><strong>Science-based tools/Equipment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS system</td>
<td>Compass</td>
</tr>
<tr>
<td>Digital camera</td>
<td>Microscope and Viewfinder</td>
</tr>
<tr>
<td>Video camera</td>
<td>Soil Testing Kit</td>
</tr>
<tr>
<td>Google Earth</td>
<td>Spectrophotometer</td>
</tr>
<tr>
<td>Google Docs</td>
<td>Dissolved oxygen meter</td>
</tr>
<tr>
<td>Stop motion animation</td>
<td>Maps</td>
</tr>
<tr>
<td>Power Point</td>
<td>Transects and Quadrats</td>
</tr>
<tr>
<td>MS Word</td>
<td>Refractometer</td>
</tr>
<tr>
<td>Excel (using graphs)</td>
<td>Fish dichotomous key</td>
</tr>
<tr>
<td>Adobe Photoshop</td>
<td>Conductivity meter</td>
</tr>
<tr>
<td></td>
<td>PH meter</td>
</tr>
</tbody>
</table>

D. I went on the Marine Science Institute Boat Trip:  

- Yes
- No

If yes, I learned to use the following equipment (Please check all that apply):

- Plankton tow
- Dredge
- Fish net
- Fish dichotomous key
III. Personal Enrichment

A. Have your perspectives on the following general areas changed because of your participation in the WISE program this year? (Check all that apply)

- [ ] Science
- [ ] National Parks
- [ ] Natural Environment
- [ ] Healthy Life Choices
- [ ] Academics
- [ ] Personal Abilities

If yes, please give us an example:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

If no on any of the above, please tell us why not?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

B. In this section, please tell us how you feel about each statement in relation to your experience with this program. We want to know how your involvement in this class has impacted your academic life as well as your personal attitudes.

<table>
<thead>
<tr>
<th>Check ONE box next to your answer</th>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Moderately Agree</th>
<th>Strongly Agree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel my ability to learn improved through my participation in Project WISE more than I would have in traditional in-school science courses.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2. My experience with Project WISE has given me a basic understanding of the watershed process (including biodiversity) of the Tennessee Hollow watershed.</td>
<td></td>
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</tr>
<tr>
<td>3. My experience with Project WISE helped me to better understand the natural history of the Presidio.</td>
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<tr>
<td>4. My field experience helped prepare me to develop my own hypothesis and learn how the findings were accepted or rejected.</td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
5. I learned about reviewing and analyzing data before working on my own project.

6. I feel my participation with Project WISE has empowered me to make better life decisions that impact the natural environment.

7. I feel my environmental perspectives have changed over the course of the year as a result to my participation in Project WISE.

8. I have noticed a change in my lifestyle since participating in Project WISE.

9. I feel more confident in my school work and academic engagement as a result of my participation.

10. My public speaking skills have improved as a result of my experience in this program.

C. By participating in Project WISE I was **required** to… (Check all that apply):

| ☐ | Think critically | ☐ | Get dirty |
| ☐ | Try new things | ☐ | Be physically active |
| ☐ | Use new technology and tools in the field | ☐ | Learn about new technology and tools |
| ☐ | Learn how to communicate better | ☐ | Work in groups |

D. As a result of my participation I **also experienced**: (Check all that apply)

| ☐ | Boredom | ☐ | Being overworked |
| ☐ | Being stressed out | ☐ | A disconnect with scientific language |
| ☐ | Frustration with working in my group | ☐ | Challenges with my part of the project |
| ☐ | Curiosity to learn more | ☐ | Enjoyment of being at the Crissy Center |
| ☐ | Increased comfort being in the Presidio | ☐ | A new connection with nature |
| ☐ | Improved my ability to work in a team | ☐ | A new interest in science in general |
Any other comments about your overall experience?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

E. Would you recommend other students to apply to Project WISE next year?

☐ Yes ☐ Maybe ☐ No

If you are not sure (in that you checked “maybe”), what changes are needed for you to recommend the program to others?
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

Thanks for filling out this survey! Have a great summer!
**APPENDIX C**

**Video Viewing Criteria**

1. Program / Field experience
2. Interviews – beginning of the year
3. Final presentation – end of the year

<table>
<thead>
<tr>
<th>Program/Field</th>
<th>Interviews</th>
<th>Final Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) How/what are they learning? Is it effective?</td>
<td>1) Current knowledge (e.g., what do they know before starting the program?)</td>
<td>1) Evidence of learning, knowledge gained?</td>
</tr>
<tr>
<td>2) N/A</td>
<td>2) Public speaking abilities prior to program</td>
<td>2) Public speaking after program</td>
</tr>
<tr>
<td>3) Applied research (are they getting it?)</td>
<td>3) How much have they used the scientific process before the E.S. program and how? (What capacity?)</td>
<td>Evidence of success; other uses?</td>
</tr>
</tbody>
</table>

1) Learning/ Knowledge – use of scientific language or opportunities
2) Public speaking ability –
   - level of confidence
   - poise/comfort
   - what do they share
3) Application of scientific principles
4) Miscellaneous
   - Decision-making process/abilities

Per email communication from Doug Kern on 4/23/07: “I'd have to go back to the tapes to get the questions that I asked. From my memory the questions would have been:”

1) Name
2) What do you enjoy about coming out to the Presidio? (At that point they would have come out once or twice.)
3) Do you notice any wildlife or animals when you're there?
4) Are you interested in going to college?
5) What area of study/what type of job would you like to pursue?
6) Do you think you would be interested in studying science?

It was noted that not every student was asked precisely the same questions.
APPENDIX D
Sample Student Quotations

2007: Mid-Semester Questionnaire

What I learned during the first part of the program:

“I learned different easy to help out the environment and what there is in the environment. Also I learned how to use the tools to see how healthy some areas are.”

“We learned about soil. And erosion and the rocks and things like that. We also learned about the air pollution and how something affects everything. Mostly habitat stuff.”

“I was able to learn that working together in groups makes it better and fun to learn and the difficulty of the environment. Although the year isn’t over I have lots of new things of the environment around me, and life that I didn’t know existed.”

“I learned how San Francisco looked like before the humans came and changed it. I also learned that the watershed is important and I learned what an estuary is.”

Was I personally engaged during the first part of the course (did I dedicate myself to experience as much as I could) – If not, why not? If yes, how?

“Yes. I was very interested, because I had no other class like it. I was very curious & up for new things”.

“I could have dedicated myself a little more.”

“I wasn’t really engaged at first because I thought it was going to be boring and reading about the environments and animals. But it was more interesting learning about Crissy Field and it was fun doing activities.”

“Sometimes, yes but not always because some things Doug says are hard to understand. He’s so smart and he uses big people words.”

“Well I feel that I changed a little through this program. I’m starting to recycle more and started using less light in my apartment.”

“Yes I did, because I have tried my hardest to go to all the classes and trips. At the beginning I joined the class because the field trips but now it was more than the field trips, but the difference we make.”

No, because I was excited about learning and the environment.
What I hope to accomplish this spring as a result of my involvement:

“I want to find a way I can help the community.”

“Now I’ve become a bit more interested & I hope to build a good experience and hypothesis for the final.”

“I want to get a good understanding of animals.”

“To learned how to collect data& experiment better.”

“I hope to get to learn how to use all the materials and tools for water monitoring / testing.”

“I want to learn more about the environment, because I’m such a city person and I want to help the planet”.

How I would like to change as a person during this second half of the program:

“I would like to change into a person that respects the environment and appreciate its greatness.”

“I would like to become a little more disciplined.”

“I would like to feel like I’ve really learned something & that I’m not just doing it for the grade.”

“I would like to be more environmentally friendly & know what harm my & peoples actions do to the environment.”

“I would like to talk more because I rarely talk.”

“I guess I would want to be more attentive and, well, do my written work & be responsible.”

“I would like to stop being in groups with people who don’t do shit.”

“Be a little more involved.”

“I would like to get more into science and into the environment.”

“I would like to become more engaged so that I can get the most out of this program.”

“Become involved with more activities.”

“To be more outgoing and not have stage fright. Also to do something useful I can use in the future.”
What do I want to know that I haven’t already learned?

“I want to know everything possible, especially about the animals that are endangered.”

“Environmental Justice.”

“More things about animals & how we can reuse things more.”

“I already learned what I wanted to know.”

“To know how to eat healthy.” ~ “To eat healthy.” ~ “How to grow stuff.”

“Something about animals - Not birds or bugs or fish or anything smaller than a cat.”

“Well at the moment I am satisfied of what I’ve learned. I am a person that is unsure of what is useful to learn, but anything that is available to me I am happy to take in mind.”

“More than I know now.” ~ “I really don’t know.” ~ “Everything.” ~ “It don’t matter to me what I have to learn.”

“More on global warming.”

Former WISE Student and Past Participant in I-YEL (Inspiring Young Emerging Leaders) –

- “The skills I was able to develop and learn was teamwork, being more vocal, being more aware about my environment (having that mental awareness of how myself can affect the environment by driving or throwing a piece of trash onto the streets and also how I can be part of the change by educating others), being more vocal, able to learn how to perform water quality testing.”

- “I thought the Presidio portion of my environmental science class was very interesting and fun because it gave me a chance learn the issues and topics in class about such things like erosion, pollution, water quality, etc.”

- “By going to the Presidio once a week I had the chance to really connect with what we learned in class by doing hands on activity and group work in the Presidio. I got to learn more about the environmental issues we are facing now-a-days and by going to a natural creek I was able to see what lived in a creek and how human can have a negative and positive impact.

- “Overall, my experience with the Watershed Program was a positive experience and I am glad that I was part of this program it has enlighten me in many ways.”

- “The materials you are able to learn in class can't compare to the up in your face content the program offers to you. You are able to go to many places that people in San Francisco have never seen before.”
APPENDIX E
Sample Partner Quotations from Testimonials

May 2007
Compiled by
Paul O’Connor, Research Consultant

Leader, University of California Berkeley (Male)

- “In only a brief period of time, students and community members can take part in an educational, rewarding, and fun experience; alternatively, the center's multi-visit programs - some a full school-year long - allow the learner to become deeply familiar with the processes shaping the watershed.”

- “For City Watershed, the San Francisco-based portion of the project wouldn't exist if it weren't for the Crissy Center and its watershed program.”

- The Crissy Center's programs and publicity materials, presented in several languages, attract participants from many of San Francisco's different neighborhoods.

Science Department Chair, San Francisco University High School (Female)

- “Gives all of the local residents a place [Crissy Field Center] to go to learn about the area's native habitats and communities as well as experience these habitats firsthand. Also, provides an opportunity for people of all ages, including my students, to get involved in community service volunteer activities like habitat restoration.”

- “Within there own park rules and regulations, the staff is very accommodating, allowing me to tailor the field experiences to my specific class needs and curriculum.”

- “It (Crissy Field Center) allowed my students to explore their own backyard and see areas that have been restored or are in the process of being restores to their natural state.”

Environmental Science Teacher, Galileo High School (male)

- “The program offers unique educational opportunities to a population of students that would under normal circumstance not have them. The curriculum is both rigorous, hands on and project based. Equally important, the staff has a good understanding of the student population they are working with.”

- “The lab portion compliments the classroom curriculum nicely. We cover each topic in the book and lecture and then follow up with the outdoor experience.”

- “The most important skills the program promoted were communication, teamwork and patience.”

# # # # #
# APPENDIX F

**Galileo Academy of Science and Technology, Urban Watershed Project and the Crissy Field Center**

**List of Student Final Projects: Five year period from 2002-2007**

<table>
<thead>
<tr>
<th>I.</th>
<th>2002-2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Geological and Soil History of the Presidio</td>
<td></td>
</tr>
<tr>
<td>✓ Water Resources</td>
<td></td>
</tr>
<tr>
<td>✓ Macro-invertebrates</td>
<td></td>
</tr>
<tr>
<td>✓ Vegetation</td>
<td></td>
</tr>
<tr>
<td>✓ Air Quality</td>
<td></td>
</tr>
<tr>
<td>✓ Cultural History of the Presidio</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II.</th>
<th>2003-2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Climate</td>
<td></td>
</tr>
<tr>
<td>✓ Air Quality</td>
<td></td>
</tr>
<tr>
<td>✓ Geology</td>
<td></td>
</tr>
<tr>
<td>✓ Soil</td>
<td></td>
</tr>
<tr>
<td>✓ Water Quality</td>
<td></td>
</tr>
<tr>
<td>✓ Macroinvertebrates</td>
<td></td>
</tr>
<tr>
<td>✓ Vegetation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III.</th>
<th>2004-2005</th>
</tr>
</thead>
</table>
| Wildflower Guide to Inspiration Point  
By: Benita Ho, Bi Yu Zheng |

Eva and Sharon’s Amazing French Broom Eradication Adventure  
By: Eva Piontkowski, Sharon Lo

Salamanders and their Habitat  
By: Gordon lee, Michael Lee

Garbage Disposal and Recycling on the Presidio  
By: Lansford Lim, Kelvin Seo

Pollution and Macroinvertebrates Between Two Habitats  
By: Emmanuel Maranon, Trang Van, Adam Levitz

The Effects of Plants on the Color and Amount of Total Dissolved Solids (TDS) in Runoff Water and Soil Erosion  
By: Nick Wong, Johnson Zheng
Our Experience on Restoration and the Mission Blue Butterfly  
By: Arnold Perez, Wiana Pleiutu

Dog Walker’s Perception of dogs in the Watershed  
By: Johnny Ray, John Phung

Impact of Dog Waste on an Aquatic Ecosystem  
By: Rocky Chau, David Spencer

IV. 2005-2006  
(A) Wednesday Class:

The Mission Blue Butterfly  
By: Anita, Chester

Air Quality  
By: Joe Wang, Donald Viray

Coyotes in the Presidio  
By: Evelyn [last name unrecorded], Adrian Magadan

Turtles at Mountain Lake  
By: Wilson Wong and Joe Wang

Raptors in the Presidio  
By: Guliano Sarinelli, Nathan Tzeng, Scott Leveau

Cape Ivy Plant Removal Project  
By: Alexandria Daily

What’s With Those Willow Trees?  
By: Nelson Solano, Kevin Miguel

Bye Bye French Broom  
By: Jonathan Ale, Mike Lespina, Jerry Recedoro

Foxes in the Presidio  
By: Vincent Andre, Li Taguel, Carlos Torres

Sustainability in the Presidio  
By: Julien Le Biavant

Landfills and Wastestream of the Presidio  
By: Kevin Guan
(B) **Thursday Class:**

Presidio Self-Sufficiency By 2013  
By: Matthew Manalaysay, Mary Grace Guarin

Gulls  
By: Andrew Liu, Long Cai, Allen Liang

Water Quality  
By: Spencer Snook, Nick Wong

Serpentine Soil  
By: Jonathan Tijerino, Nelson Zheng

Presidio Clarkia  
By Justin Sagun

Red and Gray Foxes in the Presidio  
By: Bobby Clark, Neguse

Poison Oak in Tennessee Hollow  
By: Leonette Padol, Wilness Carlos

Dogs in the Presidio  
By: Jessica Bautista, Mary Tan

Native and Exotic Plant Walk  
By: Kelly Lin, Qian Dong Li

Video Project: How to make the Presidio more Inviting for Youth  
By: Anell Medrano, Jose [last name unrecorded]

What People Think about Crissy Field Interview Project  
By: Michael [last name unrecorded], Andy Tran

V. **2006-2007**  
(A) **Wednesday Class:**

Butterfly Study in Thompson's Reach and Lover's Lane  
By: Dillard Marshay, Ivan Hernandez, Solomon Segen

Cape Ivy Removal Follow-up Study  
By: Anna Cai, Ammonette Molano, Gwen Wong

French Broom Removal Follow-up Study  
By: Arwelie Caballero, Anthony Ruiz, Yoni Tekeste
Spider Study at Inspiration Point in 3 Habitats  
By: Sonia Garcia, Cheri Johnson, Karen Vargas

Mattress Wireweed Removal Techniques  
By: Rathy Ke, Karl Lincoln, Peter Schuttish

(B) Thursday Class

Brush pile Bird monitoring  
By: Uriel Garcia, Daniel Loyola, Nathan Sueste

Composting in the Presidio  
By: Jason Lee Linda Loi Raphael Sousa Henry Tran

Geology of the SF Bay  
By: Julia Gallyot, Ellen Gong, Steven Schwenka

Birds using Himalayan blackberry vs. Native Vegetation  
By: Jade Cooney, Kristen Hirano, Matthew Sickles

Raptor Study- Nest Heights  
By: Julius Ale, Frank Largaespada, Romy Lorete, Seaera Magsino

Water quality - nitrate levels at Crissy Field Center  
By: Bianca Ashley, Jennifer Flores, April Scott

# # # # #
## APPENDIX G

### WISE participation in other Center programs and in Youth Quest

*As of June 2007*

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age</th>
<th>CFC programs</th>
<th>WISE participation year</th>
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<td>LINC (site stewardship internship)</td>
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<td>Nick Wong</td>
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<tr>
<td>Bobby Clark</td>
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Hello everyone!

Please join the extraordinary students of Project WISE- a collaborative program between the Crissy Field Center, Urban Watershed Project, The Presidio Trust and Galileo Academy of Science and Technology- as they present their final projects. Two classes of students have been conducting their lab studies in the Presidio once a week for the entire year. This is your chance to see their final projects, meet some students and get a taste for Project WISE. You even get 2 chances to catch a glimpse so take a break one afternoon and support our youth!

WHERE: Crissy Field Center in the Gathering Room
WHEN: May 30 and May 31; 2:00-3:30pm
WHAT: Presentations on water quality, composting, invasive species, raptors, spiders, bird diversity and geologic forces

ANYTHING ELSE? Light refreshments of course!
QUESTIONS? Contact Charity Maybury @ 415-561-7758

We would like to acknowledge the National Oceanic Atmospheric Administration B-Wet Program, San Francisco Unified School District School to Career Program, City College of San Francisco, and the University of California- Berkeley for their generous support of Project WISE.

Charity Maybury, Senior Specialist, Urban Ecology
415-561-7758 (phone); 415-561-7695 (fax)
Crissy Field Center - 603 Mason @ Halleck, Presidio
San Francisco, CA 94129 ~ www.crissyfield.org

Crissy Field Center programs encourage new generations to become bold leaders for thriving parks, healthy communities and a more environmentally just society.
REFERENCES


