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ABSTRACT
In an effort to increase female student interest in computing we applied and evaluated an interdisciplinary approach at a suburban high school in eastern Los Angeles County, California. Three classes, an IB Environmental Science class, an AP Environmental Science class, and a Computer Science were surveyed to assess attitude changes toward information technology. Results indicated gender differences between the participating classes, and differences before and after the project. Although the project did not uniformly impact the attitude of female high school students, it impacted teachers who are adjusting their teaching methods, an outcome that has a long-term positive influence.

Keywords: Broadening Participation in Computing, Education, Role Models, Mentoring, GIS

INTRODUCTION
We live in an Information Age, which according to Eisenberg (Eisenberg, 2008) indicates that information and technology skills are required for success in personal achievement. Even though access to computers increased, mobile phones became omnipresent with younger people, and social networking gained enormous popularity during the last decade, female students remain underrepresented in computer science and information technology (Anderson et. al., 2008) (Bennett, Maton, and Kervin, 2008). Various researchers have studied gender differences in Science, Technology, Engineering, and Mathematics (STEM) (Cohen et al., 2009), and all indicate that female participation rates continue to be low. Even female high school students, considered "digital natives" according to Bennett et al. (Bennett et al., 2008), show an alarmingly low interest in computer science, for example, a low percentage of female students participated in the 2007 Advanced Placement (AP) Computer Science A and AB Examinations: 17% females compared to 83% males.

Women have traditionally been underrepresented in information technology (Barker et al., 2006). Although they represented 46% of the total workforce in 2000, they constituted only 30% of the IT workforce (Joshi and Kuhn, 2007). A gender gap in computer use persists across all age groups and cultures and is strongest in high school students (Koch, Muller and Sieverding, 2008). A continued gender imbalance in computing is disturbing because technology plays a central role in society, encompassing most aspects of modern life. In order to remain globally competitive, it is important for individuals to develop competency in computing skills (Papastergiou, 2008).

There are many advantages to eliminating gender bias in the sciences, business, and other areas. An absence of this bias allows for new perspectives, new questions, and new technological missions (Schiebinger, 2007). Information science is a problem solving discipline that requires the creativity found in multifarious perspectives. Within diverse groups of people, different, alternative perspectives are more likely to emerge leading to better, applicable solutions to problems (Peckham et. al., 2007). Eliminating gender bias in business, results in better management teams, and in other industries it facilitates better designs and products. Several research projects have identified variables associated with female persistence in STEM areas. According to Mendez, (Mendez et al., 2008), high school GPA and SAT math scores significantly relate to persistence in engineering. Laefer (Laefer, 2009) argues that in spite of remarkable achievements by women in the fields of natural and applied sciences, female enrollment levels in engineering are still a fraction of male enrollment and conclude that accomplishment in physics courses is a critical factor for explaining female engineering enrollment levels.

Research indicates that boys express greater confidence than girls regarding mathematics. Pierce (Pierce et al., 2006) monitored five variables, mathematics confidence (MC), affective engagement (AE), behavioral engagement (BE), confidence in using technology (TC) and attitude toward the use of technology to learn mathematics (MT), and found that boys have significantly higher scores than girls for each variable except BE. Others identified additional factors that may help explain these differences such as the perception that information and communications technology (ICT) subjects are boring to girls and produce a strong aversion to computers (Anderson et al., 2008; Mead et al., 1957). There have been various efforts to eliminate these barriers and to identify solutions to increasing female participation in STEM subjects. Amelink (2009) showed that mentoring, which enhances positive socialization among women, was a critical factor for increasing retention and success of women in STEM subjects. Kahveci, A. et al. (2006) evaluated the effectiveness of a mentoring program in retaining women in STEM fields, finding that more students in their program remained in the STEM fields than non-program students.

Complicating matters is that a one-size-fits-all solution does not uniformly increase female participation in STEM (Murphy et al., 2007). Furthermore, several promising avenues have not yet been explored. As such, we evaluated an interdisciplinary approach to increase interest of female high school students in information technology. We leverage students' interest in environmental science to introduce them to computing with a GIS project. We worked with three different courses for an entire semester: **[[add the three here]]** Class activities included interdisciplinary tasks between the different classes, which have been found to increase interest in computing (Barker et al., 2009)

Previous work to address the gender imbalance in computing technology includes many interventions. Eisenberg advocates increasing information literacy by providing services, resources and facilities through libraries, schools and other organizations.(Eisenberg 2008). Additional research advocates addressing female student persistence in STEM disciplines by identifying faculty practices, teaching methods, and other factors associated with high levels of persistence in degree granting programs (Mendez, et. al., 2008). Other ways to increase persistence include developing methods to increase high school physics enrollments for women students (Laefer, 2009). Methods for addressing gender imbalance in computing technology involve removing gender bias from science disciplines (Schiebinger, 2007). Research demonstrates that developing tools for analyzing the role of gender in the creation of science knowledge can introduce new questions and perspectives. These authors advocate collecting empirical examples of how gender analysis has impacted theories and practices in science fields such as physics and chemistry. Finally, Liston, et al discuss the importance of introducing active learning experiences into technology curriculum (Liston, Peterson, & Ragan, 2006). Active learning experiences take the form of allowing students to select relevant, real-life projects as assignments by surveying students before developing class activities. Additionally, researchers found that allowing time and space for collaboration and teamwork skill building within the project improve the learning experience of all students, particularly female students.

Increasing Interest In Computing Through An Environmental Science Project

In an effort to increase student interest in computing, we implemented an interdisciplinary project at a comprehensive, suburban high school, in eastern Los Angeles County, California. The project was designed to blend together information technology and environmental issues. In contrast to many existing projects, we used an indirect approach to introduce students to computing by leveraging an existing, strong interest in environmental science. We chose this approach because of the advantages it provides compared to other interventions such as workshops or after-school activities: the existing curriculum is not interrupted but enhanced by using state-of-the art software; students continued with their interests, the project spanned an entire semester, and all students participated. Naturally, disadvantages are that because of its indirect approach, the exposure to computing is less focused and not individualized and the project relies on the class teachers, who often need to learn the technology themselves.

Working with mentors from the School of Information Systems and Technology (SISAT), at Claremont Graduate University (CGU), high school students in the environmental and computer science classes worked together to conduct an Urban Ecosystem Analysis (UEA) of their school's campus using Geographic Information Systems (GIS) software and presented the results online. An UEA analyzes tree distributions in urban areas using a combination of spatial data along with GIS technology. This was possible because GIS is one of the focus areas of SISAT and sufficient technical expertise and female role models were available. Furthermore, the City of Claremont and the Claremont Unified School District (CUSD) are interested in their "green" resources and environmental sustainability. In addition to receiving training in GIS software use at the beginning of the semester, the students were given the opportunity to experience the connection between information technology concepts and environmental science principles. At the end of the semester, students presented their findings to the CUSD Board of Education and were able to demonstrate the impact they could make on the environment in their community.

METHODOLOGY

Setting

Claremont High School is comprised of a diverse student population which is 46% White, 29% Hispanic, 13% Asian and Pacific Islander, and 8% African-American. As stated in the Claremont High School Self-Study Report, Claremont High School serves 2,371 students. In the 2009-2010 school year, enrollments for girls are: 325 in 9th grade, 300 in 10th grade, 290 in 11th grade, and 275 in 12th grade. The 2009-2010 enrollments for boys are: 330 in 9th grade, 275 in 10th grade, 300 in 11th grade, and 240 in grade 12. We selected the International Baccalaureate (IB) Environmental Science class, an Advanced Placement (AP) Environmental Science class, and a Computer Science class for this project due to the distribution of gender in these classes: IB Environmental Science (Male: 42%, Female: 58%), AP Environmental Science (Male: 42%, Female: 58%), Computer Science (Male: 85%, Female: 15%). Additionally, we sought an opportunity to provide an interdisciplinary experience to students enrolled in the various science subjects through the project.

Procedure

The two-semester long project started with a project kick-off meeting, during which CGU faculty introduced Information and Computer Science, possible career areas, and demonstrated the misconceptions held by teenagers of those in the field of computing. Following this meeting, teachers led the projects in each class. During the project, students in the environmental science classes learned how to use advanced GIS software in an efficient manner and applied it for their class projects. They learned the GIS software from a user's perspective while also discussing with the computer science students how best to present results online. The project was utilized to teach the use of new software as part of the curriculum and students used ArcGIS to complete a tree survey and conduct their UEA. The project was completed when student participants delivered presentations to teachers and administrators using PowerPoint slides

The computer science students worked in teams and developed websites for each individual environmental science project. They learned about GIS software from a developer's perspective through the development of an online mapping website. The UEA project was used to teach programming concepts and the use of new software in the computer science class where students learned the basic functionality of ArcGIS software. In addition, these students were taught the concepts of website design using Adobe Dreamweaver software and the Perl scripting language. Teams in computer and environmental science communicated with and learned from each other throughout the semester.

Data Collection

We used a survey to measure student attitudes toward computing. The survey instrument was adopted from the "Assessing Women and Men in Engineering" (AWE) Project (http://www.engr.psu.edu/awe/). These surveys have been designed, validated, and made available online for the benefit of educators and researchers to reduce the time spent on putting together new surveys. The survey we chose served as a pre- and post-intervention measure. We customized it by changing the project names and by adding a question at the end requesting keywords describing computing and computing careers. The final version contained both multiple choice and essay questions. There were 18 questions related to coursework, ethnicity, gender, goals, attitude toward science, and attitude toward mathematics. The additional questions consisted of asking students to write down five keywords that best describe computer scientists and five keywords that best describe the jobs of computer scientists.

In this paper we examine the questions related to self-efficacy regarding interest and performance in math and science subjects. Table 1 illustrates the survey questions posed students. The survey was distributed at the beginning and end of the semester to the participating classes.

Question No.	Question	Scale
11c	Work that allows me to use math, computer, engineering or science skills	1= Not important, 2= Somewhat important, 3=Very important

11e	Work that allows me to help solve problems and create solutions	1= Not important, 2= Somewhat important, 3=Very important
14a	I can solve this problem now	1= No, 2= Yes
14b	I can teach myself to solve this problem	1= No, 2= Yes
14f	I am not interested in learning to solve this type of math problem	1= No, 2= Yes
16a	I look forward to science class in school	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree
16b	I look forward to math class in school	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree
16j	Science is a difficult subject	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree
16l	I feel comfortable with using a computer to make graphs and tables	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree
16m	I am interested in learning more about how computers work	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree
16n	I like to learn to use new computer software	1= Strongly disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Strongly agree

Table 1. Self-efficacy Questions

RESULTS

Demographics

The pre-intervention survey was conducted in fall 2009 and administered to students in the three participating classes (N=111): Computer Science (N=28), AP Environmental Science (N=33), and IB Environmental Science (N=50). There were almost an equal number of male (N=52) and female (N=59) students in this group. However, female students were underrepresented in the computer science class (4 out of 28 students) and overrepresented in the environmental science classes (48 out of 83 students). These demographics mirror those found in literature describing participation rates of females in education pathways leading to IT professions (Anderson, 2008). Student ethnicities by class were recorded as well; however, we limit our results to gender comparisons. White and Asian & Pacific American students were well represented in the participating science classes (48.6 % and 23.4% respectively). Students identified as African American and Hispanic are traditionally underrepresented in science and math fields (Goode, 2008). The percentage of African American students participating in the project was (9.9 %).The percentage of Hispanic students participating in the project was (19.8%). Table 2 illustrates student participation rates; however, some students declined to state or selected dual ethnicities.

The post- intervention survey was conducted in the spring 2010 and administered to students in three high school classes (N=92): Computer Science (N=24), AP Environmental Science (N=31), and IB Environmental Science (N=37). There were an equal numbers of male (N=46) and female (N=46) students in this group. However, female students were underrepresented in the computer science class (4 out of 24 students) and overrepresented in the environmental science classes (42 out of 68 students). The reason why we see different number of students for post-intervention survey is that we distributed questionnaire for pre-intervention survey to student in fall 2009, but post-intervention survey was administered in spring 2010. That means we conducted two surveys in different semesters. However 92% of students for post-intervention survey are the students who took the pre-intervention survey in fall 2009.

The percentages of ethnicities participating in both surveys are listed in Table 2. These results indicate that almost half of the participating students are White American, Asian & Pacific American, and Latina/Latino/Hispanic.

Ethnicity	Pre-Intervention %	Post-Intervention %
African/Black American	9.9%	9.8%
American Indian/Alaskan Native	4.5%	5.4%
Asian & Pacific American	23.4%	29.3%
Latina/Latino/Hispanic American	19.8%	21.7%
White American	48.6%	42.4%
Others	8.1%	10.9%

Table 2. Student Responses to Ethnicity (The total percentage is not 100 % since some students chose more than one ethnicity)

Table 3 displays percentages of male and female students in each class taking pre and post-intervention surveys. This table illustrates that female students are under-represented in the computer science class and overrepresented in the environmental science classes.

Classes	Pre-Intervention			Post-Intervention		
	Male (%)	Female (%)	N	Male (%)	Female (%)	N
Computer Science	85	15	28	83	17	24
IB Environmental Science	42	58	50	40	60	37
AP Environmental Science	42	58	33	35	65	31
Total	53	47	111	46	46	92

Table 3. Student Enrollment In Classes Participating in the Project

Gender Based Differences

To find differences between genders, we applied the t-test for the pre-intervention and post-intervention survey. No significant differences were found in the pre-survey data. In Table 4, we illustrate the four questions with a significant difference for gender. Male students are more confident regarding future jobs related to science than female students and have more interest in computer work than female students.

Question No.	Questions	Gender	N	Mean	Sig.
11e	Work that allows me to use math, computer, engineering or science skills	Female	42	1.69	0.016
		Male	42	2.09	
14f	I am not interested in learning to solve this type of math problem.	Female	42	1.16	0.027
		Male	42	1.02	
16m	I am interested in learning more about how computers work.	Female	41	2.29	0.002
		Male	41	2.95	
16n	I like to learn to use new computer software.	Female	41	2.31	0.012
		Male	41	2.92	

Table 4. Post-Intervention Gender Differences

Attitude changes over time for both male and female students are presented in Table 5. Female students' attitudes toward work involving math and science changed negatively after the intervention. Female students' attitudes regarding using computers and learning about computer software changed negatively as well. Table 5 further illustrates that the attitude of male students changed positively regarding the difficulty of science and their confidence to solve problems.

Question No.	Question	Gender	Pre-Intervention			Post-Intervention		
			N	Mean	Sig.	N	Mean	Sig.
11c	Work that allows me to use math, computer, engineering or science skills	Female	52	1.80	.24	42	1.69	.01
		Male	59	1.96		42	2.09	
11e	Work that allows me to help solve problems and create solutions	Female	52	2.57	.07	42	2.33	.91
		Male	58	2.34		43	2.34	
14a	I can solve this problem now.	Female	52	1.13	.59	42	1.21	.32
		Male	59	1.10		42	1.30	
14b	I can teach myself to solve this problem.	Female	52	1.13	.34	42	1.11	.75
		Male	59	1.20		42	1.14	
14f	I am not interested in learning to solve this type of math problem.	Female	52	1.07	.65	42	1.16	.02
		Male	59	1.10		42	1.02	
16a	I look forward to science class in school.	Female	50	3.14	.23	41	2.73	.19
		Male	59	2.91		42	3.02	
16b	I look forward to math class in school.	Female	52	2.71	.79	41	2.41	.08
		Male	58	2.75		42	2.78	
16j	Science is a difficult subject.	Female	51	2.29	.38	41	2.31	.58
		Male	59	2.13		41	2.43	
16l	I feel comfortable with using a computer to make graphs and tables.	Female	51	2.92	.87	41	2.90	.72
		Male	59	2.94		41	2.97	
16m	I am interested in learning more about how computers work.	Female	52	2.65	.11	41	2.29	.00
		Male	59	2.94		41	2.95	
16n	I like to learn to use new computer software.	Female	52	2.76	.08	41	2.31	.01
		Male	59	3.08		41	2.92	

Table 5. Pre-Intervention and Post-Intervention Gender Differences

Ethnicity Based Differences

We conducted a t-test for each ethnicity for pre-intervention and post-intervention survey, listing the significant results in Table 6. African American students are most comfortable with using computers to make graphs and tables. Asian & Pacific American students have more confidence for solving a problem than others who are not Asian & Pacific American. White American students show less confidence in science and computers than other students.

Ethnicity	Intervention	I can solve this problem now.	I can teach myself to solve this problem.	I look forward to science class in school.	I look forward to math class in school.	Science is a difficult subject.	I feel comfortable with using a computer to make graphs and tables.	I am interested in learning more about how computers work.	I like to learn to use new computer software.
African American	Pre	-	-	-	-	-	3.45	-	-
	Post	-	-	-	-	-	-	-	-

Asian & Pacific American	Pre	1.26	-	-	-	-	-	-	-
	Post	1.40	-	-	-	-	-	-	-
Latina/Latino/Hispanic American	Pre	1.10	-	-	-	-	-	-	-
	Post	-	-	-	2.2	2.9	-	-	-
White American	Pre	1.00	-	-	-	-	-	-	2.7
	Post	-	-	-	-	2.08	-	-	2.2

Table 6. Ethnicity Differences for Pre-Intervention and Post-Intervention

Attitude Difference Between Classes

A one way - ANOVA was applied to identify attitude difference between classes. Table 7 illustrates the mean value for each question with a significant difference.

For the Pre-Intervention Survey, there were significant differences in the responses between the three classes for questions 11e (Work that allows me to help solve problems and create solutions), 16j (Science is difficult subject), 16m (I am interested in learning more about how computers work), and 16n (I like to learn to use new computer software). While computer science students somewhat disagree with question 16j, AP and IB environmental science students somewhat agree on question 16j. Computer Science students strongly agree on questions 16m and 16n, but AP and IB Environment science students somewhat agree on these questions. Responses to question 11e illustrate CS and IB environmental science students are more confident about pursuing a future job in the science field than AP environmental science students.

The Post-Intervention Survey revealed two significant differences in the responses between classes regarding questions 11e and 16n. This result reveals that the intervention affected an attitude change for classes regarding the difficulty of science and students' interest about how computers work.

Question No.	Questions	Pre-Survey (Mean)				Post-Survey (Mean)			
		CS	IB ES	AP ES	Sig.	CS	IB ES	AP ES	Sig.
11c	Work that allows me to use math, computer, engineering or science skills	2.07	1.8	1.87	.27	2.00	1.91	1.77	.60
11e	Work that allows me to help solve problems and create solutions	2.40	2.62	2.24	.03	2.36	2.52	2.07	.02
14a	I can solve this problem now	1.10	1.1	1.15	.76	1.09	1.33	1.29	.13
14b	I can teach myself to solve this problem	1.14	1.2	1.15	.76	1.19	1.13	1.07	.49
14f	I am not interested in learning to solve this type of math problem	1.07	1.06	1.15	.34	1.04	1.11	1.11	.70
16a	I look forward to science class in school	3.00	2.95	3.12	.75	2.95	2.61	3.19	.08
16b	I look forward to math class in school	3.07	2.62	2.62	.09	2.71	2.58	2.53	.82
16j	Science is a difficult subject	1.82	2.4	2.25	.03	2.45	2.44	2.23	.66
16l	I feel comfortable with using a computer to make graphs and tables	3.42	2.88	2.90	.65	2.80	2.97	3.00	.75

16m	I am interested in learning more about how computers work	3.07	2.6	2.60	.00	3.00	2.47	2.53	.14
16n	I like to learn to use new computer software	3.46	2.76	2.75	.00	3.30	2.36	2.46	.00

Table 7. Attitude Differences between Classes

DISCUSSION AND CONCLUSION

Previous work to address the gender imbalance in computing technology involves many interventions. Eisenberg advocates increasing information literacy by providing services, resources and facilities through libraries, schools and other organizations (Eisenberg 2008). Additional research advocates addressing female student persistence in Science, Technology, Engineering, and Math (STEM) disciplines by identifying faculty practices, teaching methods, and other factors associated with high levels of persistence in degree granting programs (Mendez, et. al., 2008). Other ways to increase persistence include developing methods to increase high school physics enrollments for women students (Laefer, 2009). Methods for addressing gender imbalances in computing technology involve removing gender bias from science disciplines (Schiebinger, 2007). Research illustrates that developing tools for analyzing the role of gender in the creation of science knowledge can introduce new questions and perspectives. These authors advocate collecting empirical examples of how gender analysis has impacted theories and practices in science fields such as physics and chemistry. Finally, Liston, et al, discuss the importance of introducing active learning experiences into technology curriculum (Liston, Peterson, & Ragan, 2006). Active learning experiences take the form of allowing students to select relevant, real-life projects as assignments by surveying students before developing class activities. Additionally, researchers found that allowing time and space for collaboration and teamwork skill building within the project improve the learning experience of all students, particularly female students.

This paper presents our efforts to encourage and involve female high school students in information technology. We discovered positive changes between genders and between classes. Regarding gender differences, the attitude of female students toward pursuing jobs involving science, toward attending science and math classes, and their interest in computers and computer software decreased. However, female students' attitude toward solving the math problem became more positive. In contrast, male students' attitudes toward pursuing jobs in science, toward attending science and math classes, and their interest in computers and computer software did not change. Male students' confidence in their ability to solve math problems increased, similar to that of female students. Additionally, both male and female students expressed that science is a difficult subject. There were some significant differences in responses between classes for both the pre-intervention and post-intervention. We identified four significant differences during the pre-intervention survey. These differences involved the challenge of problem solving, perceptions about the difficulty of science, interest in working with computers, and comfort with computer software. IB Environmental Science students had the most challenges using computers and learning computer software, whereas Computer Science students were more likely to learn new computer skills and use new computer software.

Two significant differences were identified during the post-intervention survey regarding pursuing a job in information technology and the intention to use computer software. Here we recognize the value of using an interdisciplinary approach with the different classes.

Limitations of this project were the need to work with high school teachers who are often learning the materials, in our case the GIS software, as they go along. Different teachers may have a different experience with learning new software, which may have increased the variability of the results. More training of the teachers will also improve the results of intervention projects.

Impact

The project impacted teachers as they adjusted their teaching methods to include more technology, and impacted students by introducing them to computing even though they were not taking the computer science course. Additionally, teachers were interviewed from both the environmental science and computer science classes at CHS to solicit feedback on the program's effectiveness and to identify best practices for implementation in future projects. Finally, we believe that our efforts made a long-term impact by exposing high school teachers to the new technology, providing them with state-of-the art software and training them in its use. We hope that an introduction to relevant software will be included in science teacher certification programs.

Observations and Lessons Learned

Although this intervention utilized many of the techniques recommended for engaging students in computer science and information systems subjects (Liston et. al., 2006), there were circumstances that impacted students' attitudes between the pre- and post-intervention surveys. One factor is that students participated in the intervention over a period of two semesters, a possible explanation for the expressed attitudes on the post-intervention survey. By spanning two semesters, students received first semester grades during the intervention, and could have received a lower grade than expected in the class. This experience could impact their answers on the post intervention survey. Another circumstance that could have impact on student responses is the limited time that teachers were given to prepare for the intervention. Research indicates that teachers with strong content-area knowledge are most successful, and that most computer science teachers at the high school level did not major in computer science (Goode, 2008). Although we implemented many techniques to enhance the learning environment, such as forming teams and working on a "real world" problem, students' attitudes could have been impacted by having same-gendered mentors. A limitation we faced was the inability to track from the pre-intervention to the post-intervention; a result of not being able to link the surveys to students directly (due to confidentiality requirements) we did not perform a paired t-test. The ability to fully implement the project was limited due to constraints on curriculum for AP and IB courses.

Three problematic areas surfaced during the project. There was an inadequate level of technology knowledge; the teachers were not familiar with GIS software prior to this project, and were give a short amount of time to learn it. There was a limitation on the amount of time students were permitted to use the computers (during school hours), and they would have benefited from increase availability of these resources. Next, there was an inadequate amount of professional development provided for the teachers participating in this project. A low level of knowledge about GIS software on the part of teachers, and limited opportunities for teachers' professional development could impact the attitudes of students negatively. Lastly, there was a lack of instructional resources available to teachers involved in the project. The teachers would have benefited from structured lesson plans and presentation materials. We anticipated that teachers would prepare their own lesson plans and presentation materials, but realize that expectation was too great considering all of the duties required of teachers.

Next Steps

We propose to leverage the lessons learned from this project by offering semester-long instructional activities rather than daylong activities. We will involve the instructors in the instructional activities, thus facilitating the emergence of a knowledge community that should have effects beyond the duration of this project. At CGU, doctoral students are required to fulfill a portfolio that encompasses a diversity of activities, ranging from work on grant proposal to teaching experience. We propose using this project as a pilot study to evaluate mentoring as a required portfolio item for doctoral students. Graduate students will receive training in mentoring, will interact and mentor younger students, and will report on their activities in their e-portfolio.

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