

External Evaluation Report

EXECUTIVE SUMMARY

The Eastern Washington TechREACH program, funded through the National Science Foundation, the Washington State University Center to Bridge the Digital Divide, and Microsoft is an extension and enhancement of an existing Western Washington program through the Puget Sound Center for Teaching, Learning, and Technology (PSCTLT). It is designed to serve low-income and at-risk middle school students through after school programs that focus on science, technology, engineering, and mathematics (STEM) activities. Over the second program year, TechREACH has served 198 students in twelve clubs (six girls clubs and six boys clubs) from six middle schools located in the communities of Granger, Pasco, and Sunnyside.

The external evaluation team have employed assessment instruments including participant surveys, stakeholder interviews, and student focus groups, and have analyzed associated program data to measure the program's goals of 1) increasing student interest, confidence, and achievement in STEM, 2) increasing school and community support for STEM learning and interest, and 3) increasing the number of students pursuing STEM classes, degrees, and careers.

The TechREACH program consists of six components: 1) after-school clubs led by certified teachers providing hands-on technology-integrated curriculum and associated STEM field trips; 2) a two-week summer technology workshops focusing on animation and programming; 3) electronic and personal mentoring by STEM professionals via e-mail, through club visits, and at field trip venues; 4) teacher professional development in STEM curriculum and hands-on applications; 5) parent workshops providing information and training in STEM disciplines; and 6) college preparatory support in the form of college visits and workshops on scholarship and financial aid assistance.

Curriculum

There were two primary units covered during the second academic year. The Investigating STEM Careers curriculum focused upon Science, Technology, Engineering, Math and related fields of study. Students research two to three careers and/or interviewed a club mentor to learn more about their profession. Following the completion of their research, students wrote a brief description of the career and constructed career trading cards to share amongst themselves and other clubs.

The 3-Dimension Building Design curriculum provided students the opportunity to design their own homes, shopping centers, and other structures. Students were encouraged to design buildings for their own communities and their unique needs. They

first utilized provided materials to create their project by hand and to calculate the amount of materials needed and the associated costs. Once the preliminary design was constructed, the students used “Anim8or” software – a free 3-Dimensional modeling and animation software – to create an electronic version of their building with multi-perspective and drill-down viewing.

Field trips

A highlight of the TechREACH clubs for a majority of students and club leaders was the field trips. During the focus group sessions, the students unanimously said that they loved the trips, particularly those to the Laser Interferometer Gravitational Observatory (LIGO) for the mentor/student kick-off and MESA conferences. Club leaders also felt that students greatly benefited by these trips, as many do not have opportunities to even leave their neighborhoods. Additional field trips were offered to places such as WSU Tri-Cities for the MESA Middle School Conference, Family Fun Day, and Expanding Your Horizons, providing opportunities for families to spend a day on a college campus with faculty and staff to learn about college admissions, financial aid, science, and explore STEM careers by meeting and learning from local professionals.

Summer technology workshops

Following the completion of the second academic year of the program, TR students were again provided the opportunity to participate in a two-week summer technology workshop. This year TR staff created the animation curriculum, because their partner, DigiPen Institute of Technology’s curriculum utilized 3-D Studio Max software, which was too hardware-intensive for the schools’ computers to run.

Each hands-on workshop was offered to TR club members for six hours each day for a two-week period. In the 2007 program, students learned the basics of video game programming by using a game construction software package to animate their own computer-generated artwork. The 2008 workshops built upon those skills and provided students the opportunity to use Adobe Flash, Moviemaker, and Pivot animation software to create short animated films which incorporated their own artwork and storylines.

Six TechREACH workshops were offered in summer 2008 – three for boys and three for girls. Thirty-eight middle school girls and 40 middle school boys from middle schools in Pasco, Sunnyside and Granger attended. Student survey results show that almost 70% of students agreed or strongly agreed that the workshop increased their interest in technology. Over 73% agreed or strongly agreed that it made them want to take more technology classes in high school, 62.2% said it increased their interest in a career in technology, and 48.9% said it increased their interest in a career as a computer scientist. In addition, 48.9% said it made them want to take more math classes in high school.

Mentoring

The mentoring component of the TechREACH program has continued to be an important part of club activities. For this program year, there were 41 scientists and other professionals serving as mentors. A majority of the mentors were scientists from the Pacific Northwest National Laboratory (PNNL) and the LIGO Hanford Observatory – both world-class research facilities located in Richland, WA. Faculty from Washington State University, Heritage University, and Perry Technical Institute also served as mentors.

Throughout the academic year, students exchanged e-mails with their mentors and in a number of cases, were paid a visit on one or more occasions by their mentor at the after school club or at a field trip. Based upon mentor surveys and feedback received from student focus groups and club leader and staff interviews, the mentoring component of the TechREACH program again met with mixed success due to mentor recruitment challenges and limited communication between the mentor and their student's club leader.

Due to the continued challenges of the mentor program, TR staff are currently adapting this component to best fit the needs of students, club leaders, and mentors while maintaining a high standard for student interaction with STEM professionals. A select group of mentors will be trained to become “guest speakers,” delivering STEM career talks at clubs to serve as role models for students. In addition to guest speakers, each TechREACH club will have a Champion Mentor who will e-mail clubs monthly, visit the clubs at least three times per academic year, and help organize field trips and additional guest speakers for the clubs.

Teacher professional development

Twelve TechREACH club leaders received three full days of professional development training as described in the TR program proposal. Trainings were in general well-received by the club leaders and rated 4.6 and 4.5 on a 5 point scale, with 5 being the highest rating. Participants were appreciative of the quality of support provided by TR staff, and the opportunities for sharing experiences among their fellow club leaders. Most written feedback reflected a sentiment that these trainings were time well-spent.

Parent workshops

TechREACH worked in partnership with MESA to offer a number of educational workshops and events for TR parents and their students.

During the academic year five parent events provided including 1) a MESA Middle school conference in November 2007 with 11 parents attending; 2) a Family Fun Day at Washington State University Tri-Cities in November 2007 serving 28 parents; and 3) a field trip to LIGO in December 2007 with 17 parents attending; 4) the Mentor/Student Kickoff event at LIGO in January 2008 with over 150 students and their parents

attending; and 5) a Family Science Training workshop in March 2008 that served 20 parents.

These events have been highly successful and have provided an extensive set of opportunities for parents to learn about to visit world-class research facilities, post-secondary educational institutions, learn about college academic requirements, and receive computers and computer training. In most cases, without TechREACH, these parents would not have had the opportunity to receive information and training in STEM disciplines and college preparation.

College preparatory support

College preparatory activities have been successfully implemented this school year. Activities including work with the MESA High School Program, college workshops and visits, scholarship and financial aid assistance, and other forms of college preparatory support have occurred over the past academic year. As described above, students and parents have participated in a number of workshops designed to prepare students and their families for college. The LIGO Kick-Off event provided training to 30 parents that focused on supporting their children during middle school, the transition from middle school to high school, and information about preparing for college. The Family Fun Day at Washington State University was another opportunity for students and their parents to learn about college, tour a university campus, and receive information on financial aid and other college requirements.

The strong partnership between TechREACH and MESA has continued to provide information and services to students and their families over this second program year. As TR students enter the eighth grade this coming program year, TR and MESA expect to offer additional services focused on the transition from middle school to high school and high school science and mathematics coursework.

The following are the major findings of the program's second year activities.

- All student program components have been fully operational during the second academic year. The parent component was also implemented this program year.
- The program has again served more students than proposed in the original grant proposal for the second school year. There were a total of 198 TR students enrolled in twelve clubs at six school sites for the 2007 – 2008 academic year with 124 students attending at least half of the club meetings. This exceeds the anticipated number of students to be served (originally 120) by 65%.
- Almost 95% percent of TR girls and 74.1% of TR boys want to participate in TR club next year.
- TechREACH student interest in mathematics, science, and technology increased by 9.8%, 7.0%, and 13.7% respectively.
- TechREACH student confidence in mathematics and science decreased by 3.0%, and 0.3% respectively.

- Over 86% of students surveyed reported that they liked the activities in which they participated.
- All TR parents and their teachers surveyed have continued to report an increase in student interest, confidence, and grades for STEM coursework for the second program year.
- Over 76% of students surveyed indicated that they planned to take more science, technology, and math classes in high school because of TechREACH– an increase of 4.1% over the previous year.
- Six TechREACH summer workshops were offered in 2008. Almost 70% of students indicated that the workshop increased their interest in technology, over 73% felt that it made them want to take more technology classes in high school, and 62.2% said it increased their interest in a career in technology.
- A number of college preparatory activities for students and their families were implemented this year. TechREACH student interest in attending college has increased by 8.3% over the academic year with 88.9% reporting in the post-survey that they planned to attend college.
- TechREACH students had the opportunity to attend six educational field-trips including those to world-class facilities such as LIGO and a U.S. Department of Agriculture research laboratory.
- The three club leader professional development trainings were highly rated by participants. The quality and delivery of content as well as the workshops’ organization continued to be praised by club leaders.
- The Mentor/Student Kick-off event held at LIGO was very successful and attended by over 150 TR mentors, students, parents, and program staff. Attendance increased by 50% over last year’s event.
- During the first program year, TR girls’ interest in STEM-related careers actually declined. In response, STEM careers were strongly emphasized through club curriculum and in club leader trainings for year two. Consequently, there have been dramatic increases in these areas for girls club students. For example, over the second program year girls’ interest in a career as a scientist, mathematician, or engineer has increased by 12.1%, while interest in a career utilizing a high degree of technology increased by 14.8%.
- The mentoring component of the TechREACH program again met challenges during the second year. In response, TR staff are adapting this component for the third year to give clubs two format options to best fit the needs of their students while maintaining a high standard for student interaction with STEM professionals.

Based upon the analysis of two years of data obtained from student pre- and post-surveys, participant interviews and focus groups, a number of preliminary conclusions can be made concerning the positive impacts of TechREACH on program schools and club students. There is a **high level of student interest in the program** with almost all girls club students (95%, both years) and roughly three-quarters of boys (75% year 1, 74.1%

year 2) wanting to participate in TechREACH the following academic year. There is also ***significant interest in program curriculum*** with almost all students reporting that they liked the activities in which they participated (90% year 1, 86% year 2). TechREACH students have also demonstrated ***increased interest in taking STEM courses in high school***, with 72% of first year and 76.1% of second year students reporting that because of TechREACH, they planned to take more science, technology, and math classes in high school. TechREACH students have shown an ***increased interest in attending college*** during the second program year with over 88.9% reporting in the 2008 post-survey that they planned to pursue post-secondary education. Over the first program year, there have been demonstrated ***increases in boys' interest in STEM careers*** (+16%) and ***boys' interest in a career utilizing a high degree of technology*** (+10%). Similarly, during the second program year there have also been ***significant increases in girls' interest in STEM careers*** (+12.1%) and ***girls' interest in a career utilizing a high degree of technology*** (+14.8%).