

## Examples of Tensor Projects

Project: **AWE+SUM: Attend Westminster, Explore Science, Use Math Summer Camps for Entering 8th grade Girls**  
Director: **Carolyn Connell, Westminster College**

The AWE+SUM program began at Westminster College in the summer of 2005, with funding from the MAA/Tensor Foundation and other sources. In the summer of 2006, it expanded to two camps with additional funding from the State of Utah, part of a first-ever program in the state called ASTEC: Applied Science, Technology, and Engineering Camps. This summer (2011) was the 7<sup>th</sup> year Westminster College hosted the AWE+SUM camp. Forty-eight girls attended the 3-day camp, June 27 - 29. Each year, the directors targeted girls entering the 8<sup>th</sup> grade in the fall, and in particular, they try to recruit girls who are interested in math and science, but who may not be performing at their true ability level. They also made every effort to recruit girls from all ethnicities. Not all girls listed their ethnicity, but of the ones who did, 29% this year were non-Caucasian: 5 Asian, 3 Hispanic, 4 Native American, and 1 Pacific Islander. All except 7 attendees were from a radius of 30 miles of Salt Lake City; three of the native American girls were Mountain Utes from southeastern Utah. In addition to full scholarships for these girls, we pay travel expenses for them to get to Salt Lake City.

The primary goal of the program is to show girls that math and science can be fun through applied, hands-on workshops. The workshops are led by female math, science, aviation and finance faculty members. The hands-on workshops include the following:

- How to choose lengths for pipes to create wind chimes for certain musical chords
- How to program with 'Alice,' a programming language designed specifically for middle-school girls
- How to analyze water samples
- What makes airplanes fly (and they actually get to fly simulators in our aviation lab).
- What credit cards are, what is financial literacy: besides the math connection, it's an important topic for girls to understand

One of the most popular events each year is a dinner where we invite professional women to share their stories about what made them choose a math/science related career, and what they love about their careers.

In most years, we invite the campers back to campus the following January for an "AWE+SUM Reunion" where they are re-acquainted with girls from the past summer. The event also includes meeting women role models from the community, similar to the 'professional women's dinner' at the camp.

Summary of the AWE+SUM program: [www.maa.org/wam/AWESUM\\_summary.pdf](http://www.maa.org/wam/AWESUM_summary.pdf)

The 2011 information about the AWE+SUM can be found at <http://www.westminstercollege.edu/camps/index.cfm?parent=1425&detail=4568>

Project: **Preparing Women for Mathematical Modeling (PWMM); An Academy for High School Girls**  
Directors: **Viji Sundar and Marie Vanisko, California State University Stanislaus**

For the second year, the Department of Mathematics at California State University Stanislaus conducted a specialized summer math Academy for high school girls "Preparing Women for Mathematical Modeling (*PWMM*).\" The Academy was funded by a grant from the MAA/Tensor Foundation with additional support in 2007 from the Lawrence Livermore National Laboratory's National Girls Collaborative Project. Twenty-six 3rd and 4th year high school girls from the surrounding area completed the summer portion of the Academy in 2006. Since many young women make career choices early in their lives, frequently in high school, that lead them towards non-technical career paths, the *PWMM* program is designed to development self-confidence in the girls' own skill levels and plant the seeds that can steer them down a career path that involves mathematics and science. During the summer program, they learned how to model real life problems with difference equations and spreadsheets and how to do simulations with Excel. They form teams to practice solving problems from previous HiMCM contests and learn to do "magic" with math. They had a VIP tour of the National Ignition Facility and lunch with scientists at the Lawrence Livermore National Laboratory.

The culminating activity is working in teams for a 36-hour marathon in November to participate in the High School Mathematics Contest in Modeling (HiMCM), sponsored by COMAP (Consortium of Mathematics and Its Applications).

An update on work at CSU Stanislaus can be found at <http://www.csustan.edu/math/documents/SundarMathPrograms/2009/HiMAP-FlyerF09.pdf>

Project: **GEMS (Girls Experiencing Mathematics in the Summer)**  
Director: **Lisa Rezac with students Jena Greig and Amanda Thompson, University of St. Thomas**

In 2007, the University of St. Thomas, St. Paul, Minnesota hosted its 6th annual summer math camp for high school girls. GEMS camp is an opportunity for mathematically talented high school girls to explore interesting math topics not typically covered in high school math courses. The goal is to motivate high school girls.

In 2005, GEMS campers participated in two mini-courses led by teams of St. Thomas faculty and undergraduate math majors: Going 'Round in Circles and Iterations and Fractals. In 2006, the courses were: Symmetry and Graph Theory and Matrices. Participants chose a project for presentation after research that required self-motivation and creativity. Activities included a mathematical trip to the Science Museum of Minnesota and a career panel with women who use mathematics on the job.

Future information about this project can be found at <http://www.stthomas.edu/mathematics/gemscamp>

Project: **Fractal Geometry and its Applications: A College/ Middle School Collaboration**

Director: **Ann Robertson, Connecticut College**

College and middle school teachers, working collaboratively, present a series of after-school workshops for small groups of middle-school girls in Bridgeport and New London, Connecticut.

Goals are:

- To increase “at risk” middle-school girls’ academic self-esteem and mathematical confidence,
- To foster positive attitudes toward mathematics using instruction in fractal geometry, and
- To encourage interest in post-secondary education.

Project outcomes include: a collection of workshop presentations on “Fractal Geometry and its Applications;” a compilation of program activities; an outline/instructional guide for the college visit; assessment measures; a summative report and the creation of a website with workshop materials.

Outcomes of this project funded over three years can be found at <http://www.fractalmath.conncoll.edu/>

Project: **MPower: Empowering Urban Girls through Mathematics**

Directors: **Cynthia Kaus and Rikki Wagstrom, Metropolitan State University**

MPower: Empowering Urban Girls through Mathematics is a mathematics engagement and mentoring program for middle-school girls offered at Metropolitan State University (St. Paul, MN) with support from a 2006 MAA/Tensor Foundation grant. The girls targeted for this program are:

- 1) from the Minneapolis-Saint Paul metropolitan community, but particularly from the urban core areas,
- 2) entering grades seven, eight, and nine,
- 3) from diverse cultural backgrounds, but particularly from certain underrepresented communities such as Latino, African-American, and Hmong, and
- 4) open to exploring the field of mathematics.

The goal is to promote sustained interest among this group of girls in furthering their mathematics education and pursuing careers which utilize mathematics. During the summer the program offers a five-day nonresidential summer camp to 15 girls on the Metropolitan State University campus. They returned for a follow-up Math Day at the university in the fall.

A recent article in the local press gives praise for this project:

<http://www.tcdailyplanet.net/article/2009/01/05/mpower-camp-math-science-tons-girl-fun.html?print=1>

Project: **Math Days in Alaska**  
Directors: **Mark Fitch, Larry Foster, and Debbie Narang, University of Alaska Anchorage**

Mathematical Sciences faculty at the University of Alaska Anchorage designed and hosted numerous Math Days over the past three years to motivate high school girls and minority students to study mathematics and related fields. These events have been delivered to girls in urban Anchorage as well as to Alaska native students living in remote villages of Alaska accessible only by air.

Funding has come from various sources, including the MAA/Tensor Foundation, to host many Math Days and the faculty is now able to host further events with minimal funding.

Project: **The SEARCH Program at Mount Holyoke College**  
Directors: **James Morrow and Charlene Morrow, Mount Holyoke College**

SEARCH at Mount Holyoke College is a four-week program designed for young women who have done very well in high school mathematics, who have a sense of adventure, and who would like to experience a research-like atmosphere in mathematics. At SEARCH 2006, students worked in several research areas:

- Graph Coloring,
- Finite Geometries,
- Polyhedra, Modular
- Arithmetic, and
- Groups.

They also received instruction in the use Excel, went on a field trip, did an investigation of moon rock mineral composition, and – most of all – worked on lots of interesting problems! A unique feature of the program is that students have ample time to formulate their own questions, problems, and conjectures – and, they receive support in refining and answering such questions.

SEARCH students form a close-knit community within the group of students and with their two residential/teaching assistants who themselves show great enthusiasm for sustained problem solving. Students at SEARCH have the unique opportunity to live on a college campus, meet a diverse group of students from across the country, and find out some surprising things about mathematics.

The SEARCH program is currently on hiatus – more information about the program can be found at <http://www.mtholyoke.edu/proj/summermath/>

**Project: SummerMath Program at Mount Holyoke College**  
**Directors: James Morrow and Charlene Morrow, Mount Holyoke College**

SummerMath is a mathematics learning community designed to address the ways in which women are underserved in mathematics-based fields, and built on the twin pillars of innovative mathematics teaching and research on women's education and development. It is an intensive, four-week program serving 40-60 young women in high school. The student body is diverse, academically, geographically, and racially, with over 50 percent minority students each year. Some students have achieved good grades in math, some have not, but almost all feel the downward spiraling of self-esteem and confidence in math that is so characteristic of high school women. We emphasize greater conceptual understanding, affirmation of young women as capable members of a learning community, and the importance of constructing one's own understanding of complex ideas.

SummerMath helps students replace unproductive approaches to learning with more flexible problem-solving skills. The atmosphere of the program is one of challenge and support: the challenge of rigorous study and difficult problems and the support of a community of teachers, residential staff, and peers. Our goal is to help students acquire greater confidence in their ability to excel, greater persistence in problem-solving environments, and greater conceptual understanding of mathematics.

Students at SummerMath participate each day in three classes, all characterized by student activity, questioning, discussion, and discovery. In all their classes students begin by solving problems or posing their own problems to solve. They experience a new vision of mathematics through three classes:

- Fundamental Mathematical Concepts (FMC),
- Computer Programming (Logo), and
- Workshops (e.g., Robotics, Architecture, Statistics, Origami and Mathematics).

The residential program is critical to creating a strong, close-knit community at SummerMath. The residential staff consists of a coordinator, an assistant, and several undergraduate residential /teaching assistants who offer SummerMath students support and friendship as those students face the challenges of learning and explaining ideas in depth.

Outcomes show increased confidence and willingness to take risks ranging from simply asking the kinds of questions that will move learning ahead to having the courage to take honors and advanced level classes. Anecdotal data suggest higher grades, test scores, and college aspirations.

The SummerMath program is currently on hiatus – more information about the program can be found at <http://www.mtholyoke.edu/proj/summermath/>