

## **Math, Engineering, Science Achievement (MESA) Program**

### **Background**

Co-curricular programs complement the formal curriculum and often have sessions outside of the regular school day. A review of evaluation reports from afterschool Science, Technology, Engineering, and Mathematics (STEM) programs, both co-curricular and extra-curricular, by the Afterschool Alliance found that students attending these programs had improved attitudes toward STEM fields and careers; increased STEM knowledge and skills; and had a higher likelihood of graduating and pursuing a STEM career.<sup>1</sup> Afterschool programs can provide a safe place for students to explore a STEM field, which contributes to student gains in intellectual skills and temperament to become a scientist.<sup>2</sup>

The Math, Engineering, Science Achievement (MESA) program utilizes a co-curricular program that supports educationally disadvantaged students by providing pathways for minority students to succeed in science, mathematics, and engineering disciplines.<sup>3</sup> MESA was started in 1970 as an inter-segmental program, administered through the California Public School System, Community College System, and California College System. Because of the success of MESA in California, the program has expanded to seven other states. MESA USA is a partnership of MESA programs in nine states: Arizona, California, Colorado, Maryland, New Mexico, Oregon, Pennsylvania, Utah, and Washington. MESA USA programs are based on the academic enrichment model originating in California. They include many of the following elements: SAT/ACT preparation, study skills training, hands-on activities, competitions, career and college exploration through field trips and guest speakers, parent leadership development, individual academic plans, and teacher training opportunities. Annually, students in MESA USA programs participate in a national engineering design competition.<sup>4</sup>

An exploratory study funded by the National Science Foundation examines the influences MESA activities have on students' perception of engineering and their self-efficacy and interest in engineering and their subsequent decisions to pursue careers in engineering. The MESA activities included in the study are field trips, guest lecturers, design competitions, hands-on activities, and student career and academic advisement. Focus group interviews were conducted in the 2010–2011 school year to better develop a survey instrument. The survey instrument, Engineering Self-Efficacy, Interest and Perception Survey (ESIPS), was developed and piloted with 166 students from MESA programs in Utah, Washington, and California.

### **Documented Results**

The results of the grounded theory approach to analyzing the focus group responses produced eight disparate themes including (a) informal mentoring, (b) makes learning fun (c) time management (d) application of math and science, (e) feelings of accomplishment, (f) builds confidence, (g) camaraderie, and (h) exposure to new opportunities. We are in the process of conducting a factor analysis from the pilot study, which was conducted last fall and spring.

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<sup>1</sup> Afterschool Alliance. (2011, September). *STEM learning in afterschool: An analysis of impact and outcomes*.

<sup>2</sup> Crane, R., Thiry, H., & Laursen, S. (2011). *Broadening the view: First steps toward mapping the national landscape of out-of-school-time science education*. Presented at Inciting the Social Imagination: Education Research for the Public Good, Annual Meeting of the American Educational Research Association, New Orleans, LA, April 8–12.

<sup>3</sup> Kane, M. A., Beals, C., Valeau, E. J., and Johnson, M. J. (2004). Fostering success among traditionally underrepresented student groups: Hartnell College's approach to implementation of the Math, Engineering, and Science Achievement (MESA) Program." *Community College Journal of Research and Practice*, 28(1), pp. 17–26.

<sup>4</sup> MESA USA. Retrieved from <http://mesa.ucop.edu/about/mesausa.html> on February 17, 2012.

### **Potential Applications**

As formal and informal learning environments are modified to appeal to a more diverse array of students, it is important to understand which instructional strategies appeal to diverse students and how the activities impact their self-efficacy, interest, and perceptions. The survey instrument was developed specifically to investigate MESA's effectiveness in recruiting and retaining underrepresented populations to degree programs within the STEM field. The results of the quantitative analysis produced eight themes that are being incorporated in the development of a survey instrument to support focused work with MESA. The approach used in this developmental effort may be applicable to investigations of the impact of other informal education efforts that have similar goals in serving students from groups that are underrepresented in engineering and interested in increasing participation of underrepresented students.

### **For More Information**

Denson, C., Austin, C., and & Hailey, C. (2012, June). *Investigating unique aspects of the MESA program for underrepresented students*. Proceedings of the 2012 American Society for Engineering Education Annual Conference, San Antonio, Texas, June 2012.

Hailey, C., Austin, C., Denson, D., and & Householder, D. (2012, June). *Investigating influences of the MESA program upon underrepresented students*. Proceedings of the 2011 American Society for Engineering Education Annual Conference, Vancouver, Canada, June 2011.

MESA USA. <http://mesa.ucop.edu/about/mesausa.html> .