The Five Year Evolution of a MESA Program

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Abstract

The first MESA Center in Texas opened in 2007 and after five years there is a story to be told. MESA, which stands for Mathematics, Engineering, and Science Achievement, is a national program that originated in California in 1970. Its purpose is to support educationally disadvantaged students throughout the education pipeline to excel in math and science and go on to attain degrees in the fields of engineering, science and mathematics.

In 2005 a grant program was funded by Hewlett-Packard to expand MESA from California to other states and our college presented a strong proposal. However, at that time the college was unable to provide a dedicated space for a Center in which students could congregate and we were not funded. Over the next two years we continued to pursue the required space, and after finally procuring an underutilized classroom we became one of the few community colleges invited to join MESA as a non-funded affiliate of the program. Since its inception in the spring of 2007, the MESA Program has made a substantial contribution to the success of our engineering program.

Once our MESA Center was established, it soon became apparent why this space was a critical component of the MESA Program. It has served as a focal point for student study groups and a central location for promoting student scholarships, engineering design competitions, internships, and summer undergraduate research opportunities. The Center has been host to tutoring sessions for difficult courses, student success seminars, resume writing and job search workshops, as well as meetings of several science and engineering oriented student organizations on our campus.

The Center has also served as a forum for presentations by faculty and student researchers, university recruiters, and practicing professionals from our area.

This paper will present an analysis of our experience with the challenges encountered and the encouraging results of the first five years of the MESA Program at our community college, as well as offer recommendations and outline future plans.

Brief History

Since its inception in 1970 the MESA Program has been the subject of numerous papers and articles documenting its success in helping students excel in math and science and go on to attain degrees in the fields of engineering, science and mathematics [(1), (2), (3), (4), (5)]. This one will add another perspective to this body of knowledge, showing how this extraordinary program has been implemented at the first and only current site in Texas.

The MESA program was initiated at Oakland Technical High School in California with 25 students [(6)]. Its goal was to support students from historically underrepresented groups in engineering, physical science, and other mathematics-based fields in order to help them graduate from a four-year university with a STEM degree. Since its beginning, the MESA program has demonstrated its effectiveness so well that numerous companies and organizations, including state and federal agencies, have joined forces to support the program. A formal MESA Community College Program (MCCP) was established in 1993, and following several years of growth, the MESA USA program was established to export the MESA Program model to other states in 1997. Initially, only Arizona, Colorado, Maryland, New Mexico, Oregon, Utah and Washington were invited to participate. Then in 2004 MESA partnered with Hewlett-Packard to launch a Diversity in Engineering Initiative for community colleges, and institutions in the states of Florida, Georgia, Illinois, New Jersey and New York adopted the program in 2005. Our college had submitted an adoption proposal in 2004 and was visited by MESA personnel to assess our ability to sustain to the program model. At that time we were able to provide all of the program components with the exception of the dedicated space for students.

The MESA program has traditionally maintained a "by invitation only" admission policy with strict acceptance conditions, and our site met all of them but one. Since our proposal and site visit had generated favorable reviews in other respects, the authors continued pursuit of a designated student space that would complete the missing piece of the program.

Our efforts eventually paid off: early in 2007 we secured a classroom and continued to negotiate with MESA officials to begin the program. Since the opportunity for external funding had passed, this would be unendowed Center with no initial budget appropriation. This required the authors to become very resourceful in securing furnishings and technical support for the new space. The site was accepted as an unfunded member of the MESA Community College

Diversity in Engineering Program in August 2007, and formally dedicated as the first MESA Center in Texas in November.

Almost from its beginning the program produced significant results. Within a year, the number of students becoming MESA Members grew to over 100, our science and engineering related student organizations began entering more and placing well in team competitions, and several students received summer internship or research positions. The critical nature of the designated student space was clearly apparent, and the limited space we had carved out soon became crowded. Recognizing its value, our college partnered with a nearby University in submitting a Title V proposal which included funding for an expansion of the existing Center, new furniture and equipment, and a full-time coordinator. In 2008 the proposal was awarded and planning for the new site commenced at the beginning of 2009. The new site opened in January 2010 and was re-dedicated in February accompanied by much fanfare, including a note of congratulation from our State Senator.

Although the expansion and remodeling project met with typical setbacks, these were minor compared to the challenges encountered in our efforts to hire the now much-needed full-time Coordinator for the MESA Center. We had to initiate the hiring process more than once due to strict requirements for the position, a slow moving screening committee, and a volatile local job market. The third time our efforts were rewarded and we were able to better manage Center activities such as tutoring and study activities, community connections, communications with STEM students, and promote utilization of the Center by STEM students across the campus.

Over the five year effort to implement the MESA Program on our campus the number of STEM majors increased from 2,913 in the 2006-07 academic year to 4,473 in 2009-2010. During the same period, the number of STEM graduation awards (Associate of Science degrees and Technical Certificates) went from 80 to 185 and 65% of the 2009-2010 graduates were members of underrepresented groups. In addition, because of the programs and projects that we have initiated in association with the MESA program, the Engineering program at our college has become the lead program in our Community College District.

The foregoing success was not achieved without surmounting continuing challenges. Our first MESA Coordinator left the program before the grant period expired for an institutionally funded position at a local university and we had to initiate the hiring process again. It took nearly

another year before we had a new coordinator in place, and this one lasted just a semester and a half; she was recruited by a visiting Dean of Engineering who made a presentation of their program at an event hosted by the MESA Center. Although the lure of hard money was beginning to look like a significant problem for establishing long term continuity, we had no choice but to initiate the hiring process once more under grant funding. This time a larger and more diverse applicant pool emerged, perhaps a consequence of timing or a declining economy, and we had become more proficient in the screening process. With several good candidates in the queue, we were able look beyond the basic knowledge and skills needed to also consider ideas they might have to grow and strengthen the program. In a record time of two months we were able to make a selection and we have not been disappointed. We now look forward to new accomplishments and new programs to develop [(7)].

From its inception, all personnel dedicated full-time to the MESA Center at our college have been supported by grants from the National Science Foundation or Department of Education, and this support has been essential to implement the full spectrum of program components. The MESA model includes learning community clusters of linked math, science and engineering classes, academic enrichment workshops to supplement student learning, tutoring and mentoring assistance, participation in national science and engineering related organizations, opportunities for NSF S-STEM and other scholarships, and an Industry Advisory Board.

MESA Center activities include**:**

1) Development of individual student academic plans for MESA students;
2) Assistance in applying for S-STEM or other science and engineering scholarships;
3) Assistance in applying for internship and research opportunities;
4) Assistance in applying for Community College Transfer Scholarships offered through MESA‟s national office;
5) Referral for MESA students needing support services to institutional resources such as the Women's Center, Student Learning Assistance Center, the Career Center, the Internet Skills Center, Multimedia lab, and Strategies for Success, an academic intervention/counseling program; and
6) Facilitating the organization of student study groups.

Upon their acceptance as a MESA member students are expected to receive intensive academic advising, attend a group orientation for MESA members, and are encouraged (but not required) to join one of SAC's STEM student organizations: MAES (Mexican American Engineers and Scientists), SACNAS (Society for the Advancement of Chicanos and Native Americans in Science), SWE (Society for Women Engineers), SPS (Society of Physics Students) and others. Meetings of these organizations are held in the MESA Center, and students are encouraged to study in the MESA Center where they can work with other students is the same classes. Grant funds have also been allocated to provide tutors for Engineering and Physics courses.

The MESA Center is open to all STEM students during the day, but is only accessible to members after hours. All students are expected to sign in and out to provide a record of Center usage. Membership in MESA also offers additional privileges such as computer access to special software programs and priority in selection for participation in undergraduate research projects.

Some STEM faculty visit the Center frequently, and our designated STEM Counselor plays a supervisory role. Faculty-student interaction, especially interaction outside of class such as with the Faculty Advisors to the student organizations, has been shown to improve persistence and academic achievement [(8)].

The MESA Center serves as a hub of information for scholarships, internships, and part time employment with local companies. In addition to STEM student organization activities, which include travel and attendance at national conferences, MESA students have participated in field trips to STEM related workplaces and/or special events at NASA's Johnson Space Center. If a MESA member is interested in research experience opportunities for undergraduates or part-time work in a STEM field, they receive assistance from our STEM Counselor or the MESA Center Coordinator to help them with the application. MESA members have also had the opportunity to participate in student-led, faculty- guided (and grant funded) undergraduate research projects on our (community college) campus.

When MESA members have completed the required coursework for their certificate, associate degree, or transfer program, our designated Counselor assists them in transferring to four-year STEM programs at a university.

Accomplishments

The number of MESA memberships has continued to grow and the student organizations based in the Center (MAES, SACNAS, SWE and SPS) have helped students create extended social support networks. The growing popularity of the MESA Center is demonstrated by the increasing number of students using the center. In the academic year 2009/2010, 368 students made 3563 visits to the center, while in 2010/2011, 454 students made 4525 visits to the center, increases of 23% and 27% respectively.

Study groups have spontaneously formed for Engineering classes that meet two evenings a week to prepare for class. One faculty member has been collecting small appliances that need repair and conducts Friday "fun with physics" sessions that show students how they work. MESA related activities like this are considered in other grant proposals, and a dedicated "Project Room" is in the planning stage.

MESA students have transferred into university programs in engineering, physics, mathematics, environmental science, geosciences, and computer science or computer related majors. They are attending or have graduated from: the University of Texas at San Antonio (UTSA); the University of Texas at Austin; Texas A & M universities at College Station, Kingsville, and Corpus Christi; and the University of Houston. MESA students who have obtained their Bachelor's degrees are working in STEM jobs at Baker Hughes, Toyota Gosei, Standard Aero, General Dynamics, Exxon-Mobil, and Carestream. One of the first MESA students, now at Exxon-Mobil, said "I credit San Antonio College and the MESA Center in great part for my success. Being a nontraditional student had its challenges… it had been a while since I had been in school. SAC provided a great environment in which I learned to be a student again….also ample opportunities for scholarships and tutoring. The faculty and staff truly showed they cared."

Visits to STEM workplaces organized through the MESA Center include the San Antonio Water System Purification Plant, Kelly/Lockheed Aviation, Southwest Research Institute, Toyota Tundra Plant, City Public Service for civil engineering, Precision Molding and Tools Co., Kinetic Concepts Inc., the City of San Antonio's Recycling Plant, and the Scobee Planetarium. MESA members have attended national meetings of MAES and SACNAS; three former MESA members (two now at the University of Houston and the one working for Exxon-Mobil) were recognized at a National Leadership conference in San Antonio. Three former SAC MESA

members have served on the MAES national Board of Directors. A former SAC MESA student, now at Texas State University, claimed his co-MESA members were his "closest friends….we have the same mindset; we're always building stuff together."

The MESA Center has served as a recruiting ground for a variety of programs such as NASA's Community College Aerospace Scholars and CIPAIR, the NSF LS-AMP Program, and the San Antonio College Summer Undergraduate Research Program[(9)]. As a result, in 2010, two MESA students participated in summer internships at UTSA doing research for the LS-AMP Program. In the same year four students were accepted by NASA for a ten week internship period at the Johnson Space Center, and ten students were accepted to do undergraduate research at San Antonio College under the supervision of two faculty members. Each of the students selected as interns at Johnson Space Center was assigned to a different team to do research in a different field and the students conducting research on our campus selected to perform research in hydroponics, photovoltaics, and biometrics. In the fall of 2010 a two day public event was held at the San Antonio College MESA Center during which the students presented the results of their research experiences to fellow students, faculty, and attending NASA officials. Local press and radio stations also reported on the event in the local media.

Our relationship with NASA continued in 2011, when two students were accepted for ten week summer internships at Johnson Space Center and four participated in solar panels research at our college. In 2012 the success of our summer undergraduate research program prompted us to expand the activities to include the spring semester. There were three faculty involved in three projects during spring 2012 advising 12 students, and in three projects during summer 2012 advising ten students. Four MESA students were selected to participate in research projects at NASA as well. All participating students made public presentations of their research in the fall 2012 semester during the two days "MESA Open House" activities.

Another function of the MESA Center is that it serves as a venue to recruit volunteers for STEM related outreach activities. Be it high school job fairs, parents' nights, STEM expos and conferences, or engineering and robotics club activities at schools in our area, there have been students willing and able to accompany our faculty and talk to students about their passion for their chosen STEM area.

Future Plans

Since the student membership is planned to increase beyond 200 members there is already planning underway for another expansion and an additional Project Room. For the Project Room to be developed in the expanded MESA Center, materials for projects will be collected by faculty, students and "friends" of the MESA Center college-wide, and tools or equipment needed for project construction (such as vises and hand tools, soldering irons) will be procured through solicitation of in-kind donations from the SAC community. We expect at least 10 additional science and engineering faculty to become involved in MESA Center activities, through professional development, academic enrichment, and mentoring. In this way, the MESA Center will also be able to serve as an incubator for best teaching practices. Previous attempts to recruit STEM faculty to hold regular office hours in the Center have met with limited success, but an expanded space may encourage more participation.

Conclusions

What a large, urban commuter college like ours lacks for its students, especially its minority, low-income students, are nurturing spaces where like-minded students can work and interact with their peers and faculty. Several researchers have found that minority students perform better in college when they are *integrated* into a community where they feel as though they *belong* [(10), (11), (12)]. By creating a science and engineering "home" in the MESA Center, students are brought into a learning community with like-minded peers who are enthusiastic about learning and working together toward science and engineering career goals.

The MESA Program, together with other STEM initiatives, has clearly increased student participation in STEM disciplines, especially among underrepresented minorities. There is still room to grow, and by expanding our recruiting and student research activities we hope to help meet our community's need for a STEM literate workforce by increasing the numbers of science and engineering students who obtain Associates Degrees or transfer to four-year programs.

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