



## Advisor's Handbook

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## Background Information

### Introduction

Thank you for agreeing to serve as a Pennsylvania MESA advisor. Your role is to help students navigate the many opportunities available to them through our hands-on after-school science, technology, engineering, and math based MESA program.

PA MESA understands the importance of our advisors and values your impact on students and the success of our program. Thank you for your continued dedication and support is the foundation of the MESA program.

### The MESA Mission

The mission of Temple University College of Engineering's PA MESA program is to empower and increase the number of historically underrepresented and economically disadvantaged students throughout Pennsylvania to graduate from college and successfully pursue careers in Science, Technology, Engineering, and Mathematics (STEM).

### History

The PA MESA program is based on a model that originated in 1970 at the University of California, Berkley. Established in 2011, PA MESA is fast becoming a statewide partnership of school systems, colleges and universities, industry and business, government, community organizations, and families. Statewide programs provide thousands of elementary, middle, and high school students with STEM enrichment programs and activities throughout the year.

The PA MESA Program is a co-curricular program that aligns with the PA State Department of Education curriculum and the "Achievement Matters Most" plans for K-12 student learning.

### MESA USA

MD MESA is a member of the MESA USA, a partnership of MESA programs from eight states. Members include MESA programs in Arizona, California, Colorado, Maryland, New Mexico, Pennsylvania, Oregon, Utah, and Washington.

The programs are based on a common co-curricular academic enrichment model that includes academic planning, community service, family involvement, academic enrichment, hands-on engineering activities, career advising, field trips, competitions, and workshops.

MESA USA provides an opportunity for its members to share and expand strategies that work. It also allows the MESA programs to share resources and provide industry sponsors with the highest return on their investment.

## **Goals**

The PA MESA Program is a structured, multi-year, precollege program dedicated to supporting and developing the interests, skills, and abilities of K-12 students in STEM. The program aims to increase the number of engineers, scientists, mathematicians, and related professionals at technical and management levels in the workforce. Additionally, it serves to encourage and increase the number of historically underrepresented and economically disadvantaged students in achieving academic and professional success in STEM fields. Through PA MESA's efforts, participating students receive the educational enrichment experiences and support needed to achieve academic success and prepare for college STEM majors.

## **Educational Outreach and Activities**

To achieve its goals, the PA MESA program offers the following educational outreach components:

- Tutoring/study skills
- College and career counseling
- Advisor (teacher) Professional Development Training
- Field trips and academic competitions
- Parental/Guardian Support
- Summer enrichment programs
- Scholarships/Incentives
- Science, Technology, Engineering, and Math (STEM) Based Activities
- Industry Involvement/Guest Speakers & Presenters
- Business Collaboration/Outreach

## Contact Information

### **Pennsylvania MESA Central Office**

#### **Temple University College of Engineering**

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#### **Program Coordinator: John Leigh**

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## Advisor Role and Responsibilities

The MESA advisor plays a crucial role in administering the PA MESA program at the school. The advisor is the day-to-day in-school contact for the MESA program and is responsible for administering the program on a regular basis. If possible, we encourage advisors to find at least one other co -advisor to assist in implementing the MESA program. A co-advisor alleviates the sole responsibility of one person to administer the program

### Administrative

- Select students on the based on PA MESA program requirements
- Recruit a minimum of 20 students
- Provides on-site supervision of the PA MESA program
- Reviews student academic performance to ensure compliance with the PA state academic standards

### MESA requirements

- Nominate students for the “Outstanding MESA Student Award”
- Provide on-going recommendations for improvements and needs for the MESA program to the statewide office
- Ensure all student information (registration information, grades, senior summaries, ...etc.) had been documented in the PA MESA database

### Coordination

- Coordinate guest speakers, STEM-based hands-on activities and events
- Provide student with information about STEM-based career field
- Host guest speakers on-site
- Encourage and active parent involvement
- Present information on scholarships, mentoring programs, summer enrichment camps and other related activities to the students and parents
- Promote and encourage students to apply for the MESA annual scholarships
- Maintain an open dialog with your school principal on the MESA program Including updates and success stories
- Attend the statewide advisor meetings and regional advisor meetings (if applicable)
- Communicate and coordinator with regional coordinator for field trips, planned activities, and progress of your MESA program

### Code of Conduct

- Advisors and chaperones should remember that they represent PA MESA, Temple University College of Engineering and their school district during all school and MESA activities

- Advisors and chaperones shall serve as positive role models for students and set good examples in conduct, manners, dress, and grooming
- Advisors and chaperones shall maintain the highest standards of conduct and act in a mature and responsible manner at all times when engaged in MESA activities or in the presence of MESA students
- Advisors and chaperones must not engage in activities which violate federal, state, or local laws or which, in any way, diminish or compromise the integrity, efficiency, or discipline of the PA MESA program
- Advisors and chaperones will maintain appropriate professional behavior while working with students and refrain from harassment, malicious or prejudicial treatment, and abridgement of student rights

## **Student Recruitment and Selection**

### **Recruitment**

Recruitment and retention of students is crucial to the success of the PA MESA program. It is important for PA MESA advisors to understand that many ethnic minority students respond differently to outreach and recruitment. Simply announcing the PA MESA meeting time and location is not a sufficient recruitment effort. Successful minority recruitment means that additional forms of outreach must be undertaken.

Below are a few recommended strategies for recruiting and selecting new students to your MESA program.

- Ask math and science teachers or school counselors for recommendations of students who meet the PA MESA guidelines
- Allow members to invite interested friends
- Send invitations to identified students in all science and math classes
- Place recruitment flyers/information in the school newspaper, announcements, hallway bulletin boards, and math and science classrooms
- Create an activity that will get students excited about math, science, and engineering

### **Eligibility Requirements**

- Complete student registration in the database
- Attend MESA meetings, minimum of 10 per year
- Demonstrate a high standard of behavior while participating in PA MESA events
- Earn B's or better in math, science and English classes, and maintain an overall GPA of 3.0 (applies to middle and high school levels). Elementary level - the only criterion for selection is a potential interest in a STEM careers or activities
- Students with less than 3.0 GPA should show a genuine interest in STEM and the MESA program and activities

## MESA Program

### Components

The Pennsylvania MESA Program is comprised of the following components:

1. Mentoring – The Pennsylvania MESA Program provides mentoring opportunities for students through our partnerships with colleges and universities, industry and business, government, community organizations. MESA students establish mentoring relationships with local STEM professionals through MESA initiatives including the College Prep Program and local high school mentoring programs.
2. Weekly MESA Meetings – Pennsylvania MESA students attend meetings before or after school. MESA meetings are used for any of the following purposes: (a) career development sessions, (b) college or financial aid workshops, (c) team building activities, (d) goal setting and problem solving activities, (e) tutoring, (f) STEM related projects or seminars, (g) technical writing seminars, and (h) guest speakers or mentoring.
3. Career Development - Pennsylvania MESA advisors help students select appropriate high school courses in preparation for engineering, mathematics, and science courses in college. They also help students identify, evaluate, and choose the post-high school program that suits them best. Students are introduced to a variety of colleges and universities through online resources, meetings with visiting college and university admissions representatives, and field trips to local colleges and universities. Pennsylvania MESA students also meet formally and informally with college students from minority backgrounds.
4. STEM Projects, Fairs, & Competitions – MESA students are engaged in project-based learning where technology and engineering design principles are used to bridge science, math and other subjects. By taking a hands-on approach to learning, students learn STEM disciplines by doing rather than through lectures and memorization. Pennsylvania MESA students are encouraged to develop STEM projects for entry into their school, as well as local and state Intel International Science and Engineering Fair (ISEF) affiliated fairs. MESA students compete in regional MESA competitions and the winners go on to compete in the state and national MESA competitions.
5. Academic tutorials – Many Pennsylvania MESA students do not have the background and experience to readily manage advanced mathematics and science courses. Academic tutorials are designed to assist students with new academic material, instruct them in areas in which they are academically weak, and instill good study habits. MESA advisors, professional engineers, college students, and other qualified volunteers with backgrounds in STEM disciplines provide their services as tutors.

6. Field trips - In an effort to make careers in the STEM more real to MESA participants, the program sponsors a number of field trips to allow students to interact with engineers, mathematicians, and scientists in their professional environments. Field trips are planned around students' interests and research projects. Students participate in related educational activities or information sessions before and after the field trip to maximize the educational value of the experience.
7. Guest Speakers – Scientists, engineers, and other STEM professionals & leaders attend MESA meetings and events to share experiences, skills, and career choices with MESA students.
8. Scholarships & Incentives - Each year PA MESA awards exemplary MESA highschool seniors who plan to attend college and major in a STEM discipline with a scholarship. Students who maintain at least a 3.0 GPA in college preparatory Mathematics, Science, and English courses are eligible for incentive awards. However, all students receive certificates or other tangible acknowledgements for participating in Pennsylvania MESA.
9. Student Database – The MESA Information Management System tracks the demographic, contact information, grade reporting, and number of advanced mathematics and science courses completed for each participating student. The MESA database also documents students' plans for college attendance and field of study as well as long term outcomes including college matriculation, major, and grade point average.
10. Professional Development for Teachers – Pennsylvania MESA Central Office provides several professional development opportunities to regional coordinators and school coordinators throughout the academic school year. Examples of professional development for teachers include trainings for MESA STEM projects/competitions and other various mathematics and science programs.
11. Parent Outreach – PA MESA understands that no organization, person, activity or project can motivate and support students more than a child's parent or guardian. Parents/Guardians are the backbone of our most successful PA MESA programs. MESA encourages parent support by involving parents in MESA activities/workshops/competitions. Parent workshops are also planned to assist them in information gathering concerning STEM careers, college survival skills, and financial aid.

### **Educational Programs and Activities**

The PA MESA Program provides the following educational programs and activities throughout the academic school year:

1. TU/COE Tours – Each year, the MESA program sponsors field trips to the Temple University College of Engineering (TU/COE) to allow students to

interact with engineers, mathematicians, and scientists in their professional environments. The STEM professionals at TU/COE provide tours, workshops, and presentations for MESA high school students to highlight careers in areas such as homeland security, biomedicine, air and surface warfare, virtual learning centers, and cyber-security.

2. College Prep Program (CPP) - The program is a 14-week summer program offered through PA MESA to help high school sophomore and juniors prepare for college. The program encompasses a variety of activities, including SAT preparation, mock college admission interviews, college application guidance, financial aid, college visits, and inspirational speakers. The goal of the program is to prepare the students for success in high school, college, and beyond.
3. National Society of Black Engineers (NSBE) Conference – Each year PA MESA sends high school seniors to the NSBE Conference. The number of students sent depends on the location of the conference and the cost. This Precollege initiative provides activities to help students discover firsthand how engineering and technology relate to the world around them and to experience the excitement of academic excellence, leadership, technical development and teamwork.
4. Summer Enrichment Programs (3 components to program)
  - a. *Rocketry*- The rocketry program offers elementary students an opportunity to explore scientific, mathematical, and engineering concepts to construct and launch various types of paper airplanes, hot air balloons, and solid fuel rockets.
  - b. *LEGO Robotics* – This hands-on collaborative camp immerses students in the exciting and popular world of robotics. Students work in small teams to learn about topics such as gear ratios, locomotion, and energy as they construct robots with the LEGO Mindstorm NXT Robotics kit.
  - c. *Botball Robotics*-The Botball Robotics program immerses middle and high school students in science and technology through team-oriented robotics competitions. By designing, building, programming, and documenting robots, students enhance STEM problem solving and writing skills in a fun and engaging way.
5. Saturday Scholars Academy – This 3-6 week Saturday program for elementary and/or middle school students assists in improving and developing academic abilities and problem-solving skills in math, engineering, and science. MD MESA partners with universities and colleges, such as Temple University, to sponsor Saturday Academies. These programs consist of academic tutorials and hands-on projects that assist students in developing their knowledge of scientific concepts and applications.
6. Calculator Robot-The Calculator Robot activities are designed to engage students in hands-on inquiry-based missions. These activities address national science and technology standards, as well as specifically

focusing on mathematics content and process standards. These activities are geared towards using a graphing calculator with a Norland Research calculator robot. Students create programs in TI-BASIC to run their robots and use and apply math and science concepts to direct their robots through a variety of challenges.

7. SeaPerch– In collaboration with the Naval Surface Warfare Center, Carderock Division, MESA provides a SeaPerch program and competition. The SeaPerch teaches students how to work as a team to build a propulsion system, develop a controller and investigate weight, buoyancy and other naval engineering principles. The Office of Naval Research as a part of the National Naval Responsibility Initiative supports the program for Naval Engineering. This initiative aims to encourage students to pursue rewarding careers in naval architecture, marine engineering, naval engineering, and advanced marine design.
8. Biomedical Program - Collaboration between the Office of Recruitment and Diversity at Uniformed Services University and Pennsylvania MESA provides high school students with a medical immersion experience. The two week summer program is taught by creator Captain (Dr.) Cynthia Macri, who serves as Vice President for Recruitment and Diversity at Uniformed Services University of the Health Sciences and Special Assistant to the Chief of Naval Operations for Diversity. Students participate in hands-on workshops addressing a range of medical specialties including simulated obstetrical delivery (obstetrics/ gynecology), identification of disease in plasticized human organs (pathology), brain anatomy (neuroscience), risk factors for cardiovascular disease with dissection (cardiology), and suture or surgical knot tying (surgery). When students are not engaged in workshops, they take field trips to the National Institute of Health (NIH) Clinical Center and the National Museum of Health and Medicine. At the end of the program, the students host a community health fair where they presented research based on the medical concerns or health disparities relevant to their community.
9. Cyber Security Program - Provided through MESA's partnership with Capitol College and funding provided by the BRAC Higher Education Investment Fund, this career awareness outreach program is designed to encourage high school and middle school students to consider college studies and careers in Information Assurance and other science, technology, engineering and math (STEM) fields.
10. ThinkQuest- Pennsylvania MESA coordinators and students now have access to an online learning platform that focuses on collaboration and project learning thanks to a partnership with ThinkQuest and the Oracle Education Foundation (OEF).
  - a. ThinkQuest is a protected, online learning platform that enables teachers to integrate learning projects into their classroom curriculum and students to develop 21st century skills. It includes the following: a project environment where teachers and students engage in collaborative

learning; a competition space where students participate in technology contests; the award-winning ThinkQuest Library, a learning resource visited by millions; and a professional development program for educators.

11. OEF and MESA will train teachers on how to integrate 21<sup>st</sup> century skills instruction and project learning into their curricula using ThinkQuest. In addition, MESA students will test their skills by participating in the ThinkQuest International Competition 2012, which challenges teams to solve real-world problems by creating web-based projects, digital media, or web-based applications. MESA students, coached by MESA advisors, will create entries for the competition and utilize research and technical skills they have developed through MESA.
12. MESA Days Competitions- MESA coordinates six regional PA MESA DayCompetitions to serve the thousands of MESA students that participate each year. MESA Days are the result of months of preparation and activities. During this event, MESA students are able to demonstrate and highlight the skills, abilities, and interests they developed over the year in math, science, engineering, and technology. Students design, build, and test projects demonstrating their learning in math, science and engineering concepts. MESA competitions include the following: effective communications, Scratch banner design, bridge-building, electric-powered cargo plane, and the wind energy challenge. Winners from each regional competition participate in the statewide MESA competition. MESA state winners compete in the MESA National Engineering Design Competition.

**Recommended Timeline***(Revise to reflect program implementation date)*

August

- Enlist the assistance of the “veteran” PA MESA students and the math and science faculty to identify potential MESA students that meet the general requirements

September

- Organize the first PA MESA student meeting and select the meeting times and places for the remainder of the semester
- Describe MESA program so all members will remember the goals are college preparation and fun with math and science
- Discuss Science, Technology, Engineering, and Mathematics (STEM) as career options
- Introduce Engineering Design Process
- Ensure all students register in the MESA database
- Begin to identify tutors, speakers for meetings, and local engineers to support competitions

- Schedule tutorial and competition planning sessions for the first quarter as necessary
- Plan your PA MESA semester parent meeting

### October

- Introduce concepts that students will need as they begin preparing for competition
- Show students how to critically and comprehensively read the specifications
- Continue to discuss Science, Technology, Engineering, and Mathematics (STEM) as career options
- Continue to discuss the Engineering Design Process
- Select peer tutors and form study groups where necessary

### November

- Continue introduction of important concepts
- Have students identify competition interests and build their teams
- Have students begin researching and brainstorming designs
- Submit first-quarter grades to PA MESA Database

### December

- Have students develop a plan of action for design development
- Have students organize all notes, research, drawings

### January

- Teams re-visit plan of action and set calendar to be prepared for Regional MESA Day Competitions
- Teams build projects based on designs, test, analyze, and generate improvements
- Submit second-quarter grades to Pennsylvania MESA Database

### February

- Teams continue improving designs
- Encourage seniors to apply for MESA scholarship

### March

- Identify outstanding PA MESA students in your program and nominate them for the annual Outstanding MESA Student Award.
- Finalize teams and submit registration for MESA Day

## April

- Teams finalize designs
- Teams participate in Regional MESA Days
- Identify and notify MESA Central Office of students who are eligible to receive incentives
- Submit third-quarter grades to Pennsylvania MESA Database

## May

- Statewide MESA Day
- Complete senior summary reports in MESA Database
- Ensure all 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> quarter grades are in the database
- Eligible students receive incentives
- End of Year Recognition

## **Program Requirements**

- Regularly scheduled weekly MESA meetings
- Host at least one (1) parent orientation/activity meeting per semester (Recommended)
- Student Tutoring Program (Recommended)
- Host a minimum of three (3) guest speakers per semester from University, Business, or Industry with a focus on career exploration
- One “New MESA Member” recruiting activity per semester
- One individual student/advisor counseling session per semester
- Students must have a 3.0 (B) minimum GPA in the combined Math, Science, and English curriculum
  
- A minimum C grade in all other individual courses
- All high school seniors and juniors enroll and complete the A.C.T/S.A.T standardized tests

## **MESA Meetings**

### **Student MESA Meetings**

Determine the weekly meeting time and location for students. A typical meeting may include the following agenda items:

1. Introduction of Guest Speaker (if applicable)
2. Team Building Activity
3. Attendance and Announcements
4. Administrative Business (forms due, academic status reports, ...etc.)
5. Activity (guest speaker, STEM projects, tutoring, career development sessions, college or financial aid workshops, goal setting and problem solving activities, tutoring, and/or guest speakers)

6. Activity Summary and Evaluation
7. Next Meeting/Activity (time/date/location)

### **Parent Meetings**

At least one (1) parent orientation/activity meeting per semester is **recommended**. The parent meeting will familiarize parents with the goals and objectives of the PA MESA program. A typical parent meeting may include the following agenda items:

1. Overview of PA MESA program goals and objectives
2. Membership Requirements
3. MESA Program Year Planned Activities
4. Parent Involvement Methods
5. Activity (guest speaker on financial aid, college admissions, hands on activity, career exploration, Industry Guest Speaker, ...etc.)
6. Financial Aid Workshops
7. Ways parents can help their students excel in school
8. Organize a parent support group
9. Parent Networking Opportunities

### **Statewide and Regional Advisor Meetings**

MESA Advisors are required to attend (or be represented at) the Statewide Advisor's Workshop and Regional Advisor Meetings.

### **Planning a Field Trip**

PA MESA has limited money to pay for field trips. However, we do realize that they are an essential part of the program and provide enrichment opportunities that augment student learning. Each year, PA MESA Central office will email MESA coordinators of potential field trip opportunities. To attend a field trip:

- Consult with administrators at your school concerning all regulations and procedures for taking students on field trips
- Contact your regional coordinator for planning the field trip and setting up bus transportation. Your regional coordinator will notify the PA Central Office.
- Make sure all MESA students in your program have been registered in the database. PA Central office will not reimburse your bus bill until all students have been registered.

### **Media Policy**

If members of your local newspaper or other media contact you or your school for press coverage of a PA MESA related activity, refer them to the Regional Coordinator/PA MESA Central Office. Coverage received by individual programs is a reflection of the overall MESA image.

When an article does appear in your local newspaper, please forward a copy to the Regional Coordinator and the PA MESA Central Office. Copies of media coverage are often included in proposals to funding sources and the Annual Report.

If you wish to include information in PA MESA's newsletter, *MESA Matters*, contact your Regional Coordinator/PA MESA Central Office.