Research Academy

A train-the-trainer academy for understanding “what is research”


Funding By NASA California Space Grant Consortium
A. Proposal Abstract

This proposal addresses an ongoing, collaborative initiative between the San Diego MESA (Mathematics, Engineering, Science Achievement) Alliance (SDMA) and the Department of Aerospace Engineering at San Diego State University (SDSU).

B. Nature and Design of the Project

Objectives: The objective of this proposal is to develop STEM outreach activities that enhance the focus on recruitment and motivation of students in Aerospace Engineering by the San Diego MESA Alliance.

We aim to:

- Train undergraduate students in research
  ▪ Training by graduate students who work in research.
  ▪ Break down the idea of research.
  ▪ Develop the concepts of research.
  ▪ Train undergraduates in research presentations.

- Immerse the undergraduates in 3 days of ongoing research
  ▪ Develop literature survey skills with hands on library component.
  ▪ Explore concepts of theoretical and experimental methods.
  ▪ Gain hands on experience in experimental methods.

- Presentation and broader impact
  ▪ Develop team working skills, time management, and presentation skills.
  ▪ 40 min presentation with 20 min Q & A.
  ▪ 10 project presentations to MESA Schools Program (MSP) schools.

C. Outcome

The proposal engages the faculty, staff, and students in a project centered on the research process. To keep the groups engaged, the SDSU sample itinerary has been attached. At minimum, the participants should complete the objectives stated above and the sample itinerary should be used as a guide to develop a schedule at the participating university.

After completion of the Research Academy, there will be an outreach component where participants will present their experiences at MSP schools.

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Monday @ SDSU
9:00 a.m. – 3:00 p.m
Introductions
Overview & Goals
Training: The Research Process
Research Opportunities
- SDSU
- UCSD
- USD
Training: How to prepare a research presentation

Tuesday – SDSU sample itinerary begins here
9:00 a.m. – Lab Tours
- Tour labs and facilities associated with projects:
  - Fluids Lab
  - Wind Tunnels
  - Sensorimotor Neural Engineering Lab

10:00 a.m. – Project Overview and Experiment Demonstration
- Discuss project, goals and expected outcomes
- Demonstrate experiment

10:30 a.m. – Group Meeting: Abstract and Objectives
- Group members work together to develop a project abstract
- Draw from information learned in the Project Overview provided by researchers
- Determine research objectives

11:00 a.m. – Library Research: Literature Survey
- May begin with a presentation by Wil Weston or other library staff
- Students will conduct independent library research for approximately 1-1.5 hours on subject matter to obtain a minimum of 3 academic references
- Explore other possible library/literature resources

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12:30 p.m. – Break

1:00 p.m. – Theory and Methods Workshop
- Students will learn about the theory involved in the experiment including:
  - Governing equations
  - Theoretical assumptions (The physics behind theory)
  - Any approximations to the GE’s (Ideology Process)

2:30 p.m. – Group Meeting: Recap and Daily Summary

Wednesday
9:00 a.m. – Experimental Methods Workshop
- Researchers will assist students in obtaining information for the topics below through engaging demonstrations and hands-on activities
- Students will learn about experimental methods, including:
  - Setup
  - Data acquisition
  - Manufacturing
  - Materials
- Students will also learn about project costs, budgets, and funding

10:30 a.m. – Experimental Investigation
- Group members will conduct an actual experiment or test and collect data on that experiment
- Students will engage in hands-on investigation and apply their newly acquired knowledge directly

12:30 p.m. – Break

1:00 p.m. – Data Analysis and Interpretation
- Students will learn about data analysis and how to interpret data obtained during the experiment
- Students will learn about data analysis tools and software
- Students will analyze the data they gathered during their investigation and generate appropriate graphs or charts summarizing this data
- Students will compare their results with the theory they learned the day before

2:30 p.m. – Group Meeting: Recap and Daily Summary

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Thursday
9:00 a.m. – Final Project Prep
  • This time allows for any final prep needed before the presentations are prepared, including:
    o Any extra literature survey
    o Extra experimentation or tests
    o Final data analysis
  • Students will have time to explore and learn about other research opportunities at SDSU
  • Students may participate in a Q&A session with a faculty member to learn more about research, what it is to be a researcher, how to become a researcher, or any other questions they may have about the research process

10:30 a.m. – Group Meeting: Prepare Final Presentations
  • Students will spend this time preparing their final presentations

12:30 p.m. – Break

1:00 p.m. – Presentation Rehearsal
  • Students will spend this time rehearsing their presentations in their groups and making any final changes or adjustments
  • Presentation should be timed so that it will be 40 min

Friday @ SDSU
9:00 a.m. – 3:00 p.m. Presentations