

Awareness of MSE discipline and messaging to attract a diverse student body: a potential model for recruiting high school students into MSE and STEM fields

Young Women in Science and Engineering (WISE) Investigators Program



Mission & Overview of the program

*“To inspire and encourage **high school girls from low socioeconomic groups to pursue careers in science, technology, engineering and mathematics (STEM) where they are under-represented.**”*

- To promote science research in a team environment and provide real world research and design experience over **a full academic year** to increase interest in science, technology, engineering, and math (STEM).
- To provide extensive **mentoring** (4 different mentors) for each group of three junior and senior-level high school students who engage in a team approach to research, design, and conduct a project over different areas of Science & Engineering.
- To expose the students to **novel technologies** (e.g. 3-D printing, drones)
- To develop a **knowledge and appreciation of scientific research** and to gain experience with college-level instruction and research platforms.

Program Concept

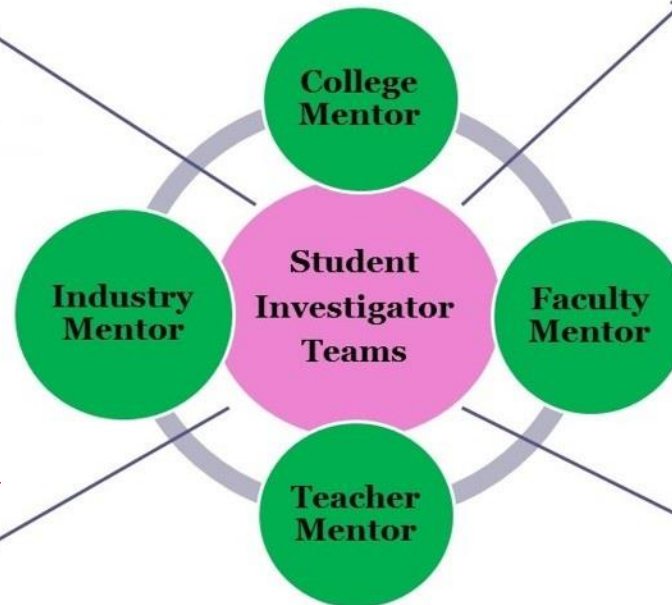
Collaboration and Team Work



A Culture of Innovation



Circle Of Mentoring



Mentoring



College Graduates




One-Year Research Project

- Drone Surveillance
- Molecular Gastronomy
- Underwater Robots
- Understanding Fluid Flow During Various Vascular Abnormalities
- AP stands for action potential in Neuroscience
- Development of Nutrient Sensor
- Stimulus Response Polymers for drug delivery
- Developing Computerized Cognitive Games
- Light Photonics System
- Recreating the Rainbow

Roles of Mentors

Ericsson, AT&T, TI,
Raytheon, Cisco



College Mentors

- Communicate with the team **weekly**
- Act as a resource person to the team by sharing knowledge, skills, and experiences
- Provide each student information about college and professional experiences
- Work hands- on with the team through all stages of the project to meet the milestones

Teacher Mentors

- Offer the team guidance, support, alternatives and feedback
- Meet with the team on a **weekly** basis
- Monitor progress and communicate with industry and college mentors
- Review team reports and provide constructive feedback
- Act as a resource & supervisory role to the team during their experiments
- Enhance the team's awareness of and belief in their own potential

Industry Mentors

- Serve as a role model
- Act as a resource person to the team by sharing knowledge, skills, and experiences
- Provide each student with a vision and understanding of what industry professional women do
- Help students with equipment / opportunities

Faculty Mentors

- Facilitator
- Serve as a role model
- Act as a resource person to the team by sharing knowledge, skills, and experiences
- Share personal stories as to why they chose Engineering and Science professions
- Share details about the faculty role in colleges

Best UG recruiters

Initial HS recruiting
and grading

Long term vision &
potential employers

Humanizers of higher
education/validators

Research Process

- **Problem definition** and literature search
- **Design of experiment**, materials list and first report on topic and needs
- **Start experiments**
- Second report on progress in the experiments
- **Complete experiments**
- **Data Analysis, interpretation** of experimental results, impact of work
- Learn about **communicating research** results to prepare poster
- Final report
- Final **presentation** to compete for prize

and logistics

- May-Aug: Student recruitment/selection
- July-Aug: mentor recruitment/topics
- Aug: topic selection by student
- Sept. 1-8: mentor orientation/technology training
- Sept 15: kick off meeting
- Oct. 15: materials list/first report experiments
- Jan. 15: industry visit
- Jan 28: second report
- March 5: poster design training
- March 15: poster preparation
- March 25: Final report
- March 27: submit poster
- April 15: Final presentation

Trips to Industry - AT&T and Ericsson on February 20, 2017



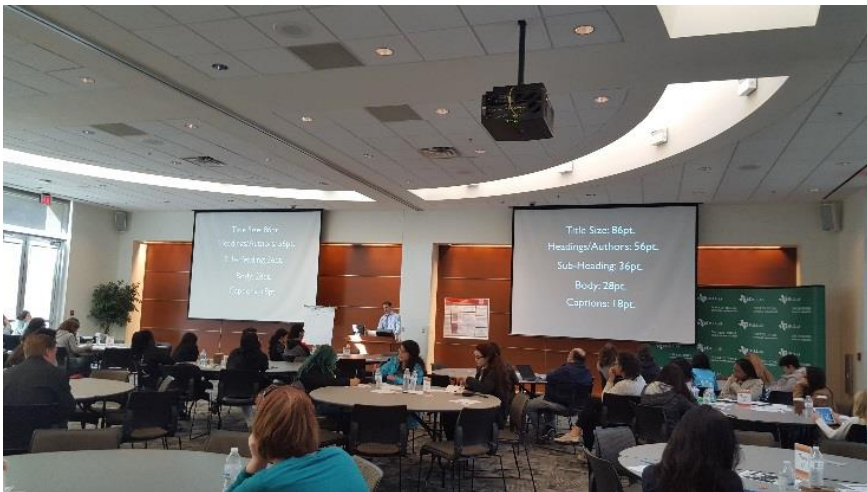
Poster Designing Session

Students receive training to develop **communication & professional presentation skills.**

- communication of scientific and technical ideas.
- Poster presentation skills
- Public speaking and effective communication

Speaker – Tim Miller

A communications expert and lead facilitator of all of our workshops and seminars. After receiving his M.S. in engineering from Dartmouth College, Tim was a Research Associate at Harvard University, and worked for the Museum of Science, Boston. He has spoken at universities, museums, and technical conferences from coast to coast, and has appeared on television and radio.



Poster Presentation

- Final event of the YWISE Investigators Program
- Each team presents its project detailing the different aspects of the experiments



Five-judge panel composed of industry and faculty



Prizes & Recognition

- **Students earn:**
 - **First Prize – \$2,000 Scholarship to UT Dallas**
 - **Second Prize – \$1,500 Scholarship to UT Dallas**
 - **Third Prize – \$1,000 Scholarship to UT Dallas**
- **Outstanding mentor awards for college, industry and faculty mentors
(who work with passion and dedication and whose teams meet all the deadlines on time)**
- **All mentors receive a certificate of participation**

Winners 2016-17



Components for success

- Teacher Engagement
- Faculty / Graduate Student Leadership
- Industry participation: Technology/Donors
- Active mentoring both academic/role model
- Active engagement of UTD MRS student chapter
- Hands on, application of Science Concepts
- Information, engagement with the university
- One-Year length project
- For credit research project High School

Impact

95% Female
34% Black
56.5% Hispanic
6.5% Asian
3% White

Total participants (2012-2017):

- Student investigators: 232 (11 community college students)
- 90% are now attending a college or university (vs 57% state-wide)
- 18 at UT Dallas (17 majoring in science or engineering)
- High school teachers: 56
- UT Dallas graduate students: 120 graduate students
- UT Dallas faculty members: 60
- Industry professionals: 80
- More than \$300,000 donation (Industry/NSF/individuals)

+ Benefit to all the participants:

- Graduate student mentors (experience, exposure to local industries, job connections)
- Industry mentors (recruitment, knowledge of local population)
- Faculty mentors (Broader impact, recruitment, personal satisfaction)
- Teachers (Validation and encouragement for the outstanding work they do)

The **Tech Titan of the Future University Level award** recognizes an accredited institution in the DFW Metroplex that encourages and supports students to choose engineering and technology-related disciplines as a preferred career path



Tech Titans:

Technology leaders (start-ups to fortune 500 companies) from North Texas who collaborate, share and inspire creative thinking that fuels tomorrow's innovations.

Largest technology trade association in TX (>300 member companies, >250 million employees).

Dr Magaly Spector, Program creator/leader

- Bell Labs Fellow, the highest technical recognition at Bell Labs (2004)
- MRS Board of Directors (2016-2018)
- Vice President of Diversity and Community Engagement (UT Dallas, 2008-2014)
- Doctor of Science Honorary Degree from Bloomfield College (2001)
- Hispanic Engineer National Achievement Award , category of Professional Achievement (2000)
- MRS “Woody” Award for the creation of a national program supported by NSF with 14 Minority Serving Institutions to broaden participation and enhance diversity in graduate education (2013)
- Outstanding Scientist Women to participate in the Project “Lecture Series on Women in Science and Engineering”, for the American Association for the advancement of Science (2002-2003)
- Cuban Chess Champion (1979)

Team Challenges

1. Communication between the mentors and the high school students
2. Communication between mentors
3. Do you need any additional materials to further conduct your experiments?
4. Is the experiment being setup at school?
5. How many times has the **team** met with the faculty face to face ?
6. How many times has the team met with the industry mentor face to face?
7. What is the status of the project?
8. Is the team using the lab book to note the experimental results?
9. Is the team analyzing the data to decide if any additional experiments are needed?
10. Is the team taking photos of the experiments to include in the final poster?

Responsibilities of a College Mentor

- **Connect** with the student (Get to know your team)
 - Develop a relationship with the students
 - Be a friend more than a academic mentor
- **Serve as a Role Model**
- Share personal experiences
 - As a **female in STEM**
 - Childhood experience / college / job
- Work with the **TEAM** to meet deadlines –



Responsibilities of a College Mentor (cont.)

- Get the students interested in STEM
- Promote **the university**
 - Students are mostly seniors from high school applying to colleges .
 - Make them aware of the facilities at UTD, opportunities for them.
- Engage with the industry mentors as they offer exciting opportunities (**Internships / jobs**)



Responsibilities of a College Mentor (cont.)

- **One hour per week** (skype / phone) with the students teams
- **Once a month** face to face visit with the team (either at the school or someplace else)
- **Status report** – After a meeting with your team you will need to send the project progress report to Divya Sudhakar(Program manager of YWISE)
- Participate in Kickoff, training sessions, Final Presentation, and tours to Industry.
- In addition, you will have to send **2 status reports**, 1 final report (Students will do the final report and poster) and one material supply list .

You will be paid \$250 at the end of fall semester and another \$250 at the end of spring semester.

Mentor Allocation

- **Program participants** must consult with their “circle of mentors” :
 - School Teacher on a weekly basis
 - College Student on a weekly basis
 - Industry professionals on a monthly basis
 - UTD College Faculty as needed



Milestones (cont.)

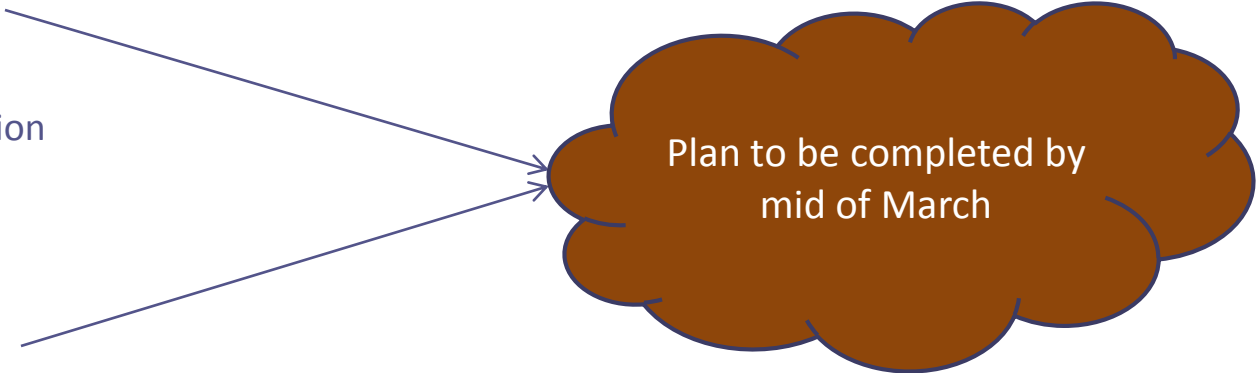


- Along the course of project, students have to **complete milestones**.
- Work with the students to submit their reports in time.
- The milestones can be found at

<http://ecs.utdallas.edu/ywisei/Milestones.html>

Milestones (cont.)

- Literature Search
- Identify Problem Definition
- Plan the Experiment
- Conduct the Experiment
- Analyze Data
- Draw Conclusions
- Presentation



Plan to be completed by
mid of March

Reports



Reports

❖ First Report –

❖ Due by October 15, 2017

- ❖ This report mainly focuses on the problem statement, literature review and the initial tasks given to the participants and the material supply list

❖ Second Report –

❖ Due by January 28, 2018

- ❖ This report mainly focuses on the list of experiments to be conducted

❖ Third and Final Report –

❖ Due by March 24, 2018

- ❖ This report mainly focuses on the experimental procedure, results and the number of experiments completed. In addition, it focuses on data results and poster preparation

Winners 2016-17



First Prize



Second Prize



Third Prize



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16

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16

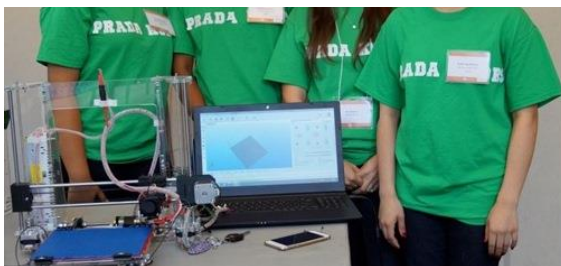
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Second Position

Team Prada Kors

L. V. Berkner High School

Cartesian Robot
3-D Clothing Printer



YWISEI Program
2015-2016

WINNERS

Third Position

Team Positively Charged

Hillcrest High School

Solar Powered
Phone Charger



Winners 2016-17

