The 2017 Women in Science, Technology, Engineering, and Mathematics (WiSTEM) Institute was held Monday, June 19, 2017 through Friday, June 23, 2017. Thirty three students registered for the week long Institute that is open to high school girls.

WiSTEM is a week of interactive, “hands-on” lab activities relating to the fields of science, technology, engineering, and mathematics (STEM). Students participated in two interactive lab sessions each day and explored the STEM labs found at Sinclair. This year the students explored The Science of Defense.

The labs were led by Sinclair faculty from the following SME Departments: Automotive Technology, Aviation Technology, Biology, Computer Aided Manufacturing, Electronics Engineering Technology, Engineering Technology, Geology, Mathematics, and Physics.

**Highlights from participants’ pre- and post-assessments**

The goals of the WiSTEM Institute are to “fuel” student interest and understanding of STEM fields. Results from pre and post program questionnaires indicated that 97% of the students found sessions to be both informative and fun.

85% considered WiSTEM a valuable experience and would recommend the program to friends or family members.

While only 56% of students reported being aware of Sinclair’s STEM programs before participating in WiSTEM, 90% reported an awareness of Sinclair’s programs at the completion of the program.

Prior to WiSTEM, 93% of the girls said they were confident they could handle college and 85% expressed confidence in their ability to navigate the process of applying for financial aid. After the program, 100% felt confident.

Students were enthusiastic about their experience at Sinclair and the Institute! Overall, 96% of the students expressed that attending WiSTEM increased their interest in STEM!
Introduction/Program Summary

The grant funded program was first established in 1994 as the Women in Engineering Technology (WIET) Institute. Originally, the program was designed to introduce female high school students to the different areas of engineering technology. In 2008, the Institute was renamed WiSTEM and the focus was shifted to include all areas of STEM represented within the SME division. With this shift, the Institute also enhanced the assessment of the program to gauge its effectiveness.

Each year students explore STEM careers and programs of study through nine different blocks of labs and activities that relate to a central theme. This year’s theme was “The Science of Defense.” Students were introduced to the many ways that we defend ourselves as a country, a community and as individuals from harmful threats. The lab topics included:

- Automotive Technology - Military Maintenance & Repair
- Aviation Technology - Defense & UAS
- Biology - Biology’s Best Invisible Defense
- Computer Aided Manufacturing - Over the Top!
- Electronics Engineering Technology - Don’t Bug Me!
- Engineering Technology Design - Solar Cell Phone Chargers
- Geology - Strategic Mineral Resources
- Mathematics - Mathematical Ciphers: The Secret to Secrets
- Physics - You Can’t See Me & Impenetrable Barriers

The students also had the opportunity to meet several guest speakers throughout the week. Speakers from the following organizations participated:

- Kettering Health Network, Information Systems (IS) Operations
- National Air and Space Intelligence Center (NASIC)
- Sinclair Community College, Enrollment Services

The Institute concluded with a lunch banquet with parents and families. Students gave presentations about each session and shared highlights of the Institute.

Funding

Funding for the WiSTEM Institute was provided by the Sinclair Board of Trustees and the Science, Mathematics, and Engineering (SME) division.

An $18,000 budget allowed Sinclair to offer the one-week program to a diverse group of high school students recruited from local area schools with only a nominal cost to students’ families (a $10.00 application fee to cover the cost of t-shirts). Students spent 6 hours a day (including lunch) on campus for 5 days participating in the interactive exploration of the STEM fields.

The budget covered lab and classroom supplies, lunches, and marketing. Compensation for faculty and student group leaders/counselors was also covered by these funds.

“My favorite part was making something that worked by myself and being able to show people”

2017 WiSTEM student

Students work with Automotive Technology faculty to learn about the importance of proper and timely military and civilian vehicle maintenance.

Students get hands-on experience in the Electronics Engineering Technology lab learning the principles of soldering and how electrical circuits function.
Planning, Marketing, and Recruiting

The WiSTEM Committee met throughout the year to determine the central theme and to plan the summer Institute. The committee consists of male and female faculty and staff from the nine departments within the SME division. The departments design their WiSTEM lab activity and relate it to the chosen theme. Each department representative is tasked with recruiting fellow faculty to help develop and facilitate their department’s activity. Faculty must also develop an assessment to determine the effectiveness of the session. WiSTEM committee members assist with the marketing and recruitment of high school students. The target student population is young women entering the 10th, 11th, and 12th grades.

Application forms were available online and they were also distributed at numerous Sinclair college fairs in the months leading up to the program. The event was highlighted on Sinclair’s website and social media.

Meet the Group Leaders

Biotechnology students Delaina Mattaliano, Roberta Osborne, and Shelby Sizemore, as well as MVCTC teacher, Markeata Lee enthusiastically served as group leaders for the WiSTEM students this year. The group leaders led students to lab sessions around the campus and assisted faculty with activities. Thank you to the outstanding Group Leaders for helping to make this a successful WiSTEM Institute! Their interaction with students helped ensure a positive experience for all participants.

Program Opening - Icebreaker!

Students and their parents were welcomed by WiSTEM faculty at the check-in table in Building 3 on Monday morning. Students were given pre-program questionnaires to complete regarding their general attitudes toward college and knowledge of STEM fields. Students were divided into two groups and the students met their group leaders. The Institute began with a visit to Building 8 where students were put into groups of two for an “icebreaker” activity. Students interviewed each other to find out what school they attend and their career plans. In addition, they asked “Name something unique about you.” Students enthusiastically introduced their partner to the entire group.
Automotive - Military Maintenance & Repair

Instructor: Ralph Miller

In the Automotive Technology lab, students learned a brief history of military vehicles and the procedures and importance of proper and timely maintenance. Students completed vehicle inspections similar to the military checklists, compared and contrasted heavy duty versus passenger car vehicles, and manually changed a wheel and tire assembly with tools that the military would use in the field. 85% of the students found the left headlight was not working on the Jeep and 100% of students successfully completed the tire.

Aviation Technology - Defense and UAS

Instructor: Benjamin Sears

In the Aviation Technology lab, the students learned the science behind Unmanned Aerial Systems (UAS) and how they are used in the military in the defense of our country and non-military uses. After learning the basics of using RealFlight Simulator, the students were asked to complete 10 challenges in which they needed to maneuver a quadcopter in order to photograph objects. These 10 challenges became progressively more difficult in terms of the number of objects, size, and location. The average success rates for both morning and afternoon groups was approximately 49%, which highlighted the need for additional training and practice needed to master operations of a UAS.

Biology - Biology’s Best Invisible Defense

Instructors: Sarah Finch, Shiloh Graham, Jason Hayes and Erica Mersfelder

In the Biology lab session, students learned about the immune and lymphatic system which jointly work together to defend the body against foreign microorganisms which can cause disease. Students learned proper use of micropipettors, a precision measuring instrument they utilized to perform an indirect Enzyme Linked Immunosorbant Assays, a test used to detect foreign microbes in patient serum. Students scored an average of 73% overall on a concepts assessment game over material discussed in the lab. Students enjoyed the challenge of learning about practical applications of biotechnological techniques.
Computer Aided Manufacturing - Over the Top!

Instructors: Keith Bernheisel and David Griffith

In the Computer Aided Manufacturing lab, the students were taught about how computers are used to direct machining equipment to cut specific patterns in metal. Students helped to create necklaces and/or key chains with “WiSTEM 2017” etched into the metal using the Computer Numerical Control (CNC) automated equipment. Students were thrilled to be able to take home the necklace or key chain as a souvenir of their session in the CAM lab!

Electronics Engineering Technology - Don’t Bug Me!

Instructors: Kenzie Grogean, Fathi Mohamed and Tillie Watts-Brown

In the Electronics Engineering Technology lab the students learned about career opportunities in this field. They built Electronic Mosquito Repellents from kits that, once completed, emitted a high pitched sound that would repel mosquitos. Students worked with kits and learned the principles of soldering and how electrical circuits function. All of the students received fully functional electronic repellant to take home.

Engineering Technology Design - Solar Cell Phone Chargers

Instructor: Robert Gilbert

WiSTEM students learned about the career opportunities in the Engineering Technology lab. Students worked in groups to assemble solar cell phone chargers. This required assembly of the electronic components and its enclosure as well as installing the components in the enclosure and mounting it to the solar collector. Students assembled six cell phone chargers. A drawing was held during the parent banquet to determine which students got to take them home.

“The soldering was the most exciting and interesting thing that we did all week”

2017 WiSTEM Student

“Making something we can use in our everyday life - Getting the chance to keep it after we made it was cool!”

2017 WiSTEM Student
Geology - Strategic Mineral Resources

Instructors: Anne Henry and Cheryl Thompson

WiSTEM students learned about the importance and distribution of strategic mineral resources in personal, state and national defense. Students were asked to build a simple structure but were not given all of the materials needed. This activity demonstrated that no country has all of the resources it needs to defend itself from numerous hazards. This highlighted the importance of strategic mineral resources and the vital role that geologists play in finding and acquiring them. 62% of students indicated that the workshop changed their understanding of what the field of geology is all about and its importance in daily life.

Mathematics—Mathematical Ciphers

Instructors: Najat Baji, Valerie Cope and Kay Cornelius

WiSTEM students learned about three types of cryptography - Caesar, substitution and modern ciphers, which are a set of rules used to convert plain text to unreadable text often used by the military. Ciphers have been used for hundreds of years by military leaders; however, machines to decipher the messages were also created. The students then learned about modern day ciphers and the "exclusive" operator used in computer science. e.g., Diffie-Hellman Key exchange, in which the cipher's key is found by using modulo arithmetic and the cryptographic key can be securely exchanged over a public channel. Over 70% were successful in creating and using the Caesar Cipher to encrypt a message. 88% were able to performing the modulo arithmetic needed for the Diffie-Hellman Key exchange.

Physics-You Can’t See Me & Impenetrable Barriers

Instructors: Lori Cutright, Jessica Hendricks and Shan Huang

In the Physics lab, students learned how metals can be used to block the passage of electromagnetic waves such as those produced by cell phone signals. Participants experimented with various configurations of aluminum foil “wraps” for their cell phones, with the aim of determining which configurations blocked incoming signals.

Students also performed a number of optics experiments dealing with the relationship between the angular size and/or separation of objects and distance. Students also explored the design of telescopes by experimenting with lenses of varying focal lengths. Activities illustrated how “detection” can be thwarted and/or enhanced through physical means. The students scored 90% or higher on an assessment given at the end of the session.
Guest Speakers

Learning continued during lunch as guest speakers spoke each day while the students dined. On Monday, the girls met Robin Rucker, Enrollment Coordinator for Sinclair. Ms. Rucker discussed what students should do to prepare for college while they are still in high school (e.g., ACT and SAT), and she supplied the students with a timeline to use as a guide. Ms. Rucker also presented estimated costs for the different types of colleges (private, public 2– and 4-year and for-profit institutions) that showed the students the dramatic cost savings by choosing to start their college career at Sinclair. She also discussed opportunities available for scholarships and financial aid. The session was highly interactive with students asking Ms. Rucker specific questions about their own college plans. Students also had many questions about the financial aid process and how to pay for college. Ms. Rucker provided resources to help students find scholarships for which they could apply.

On Tuesday, Beth Search, MBA, PMP, CPEL Executive Director, IS Operations, Kettering Health Network and Stacie Carnes, IS Security Analyst, gave students a fascinating and interactive presentation on the importance of Cybersecurity in personal as well as national defense. They used live polling software to engage students in their discussion about the need for understanding and vigilance against threats in this new age of advanced technology.

Wednesday’s guest speaker, Ms. Carmen Dyer, Intelligence Analysis Engineer at the National Air and Space Intelligence Center (NASIC), brought a panel of speakers from NASIC and Air Force Research Labs. Speakers ranged from active duty Air Force to civilian Physicists and Biostaticians. Students were captivated by the discussions of their path to success as well as their experiences working in STEM fields in both civilian and military capacities.

“Real-world connection between what we were learning and what we were making”
WiSTEM Student

“The people were so welcoming and helpful”
WiSTEM Student
Closing Program

On Friday, parents, faculty, staff, and Sinclair administrators were invited to an end-of-program banquet. A closing ceremony was held in the Student Activities Center. Approximately 80 family members were welcomed by opening remarks from Eric Dunn, Assistant Dean of the Science Math and Engineering (SME) division. Students gave presentations on individual lab session and highlighted program and career opportunities, as well as the income potential for each field of study. Families enjoyed the buffet lunch and later had the opportunity to ask questions and meet with faculty. Each student received a certificate of completion and a copy of the group photo. An information table was available for students that were interested in specific SME programs of study.

Thank You!

The WiSTEM Institute was a success due to the efforts of a dedicated WiSTEM Planning Committee: Sandy Specht (Chair), Susan Luken (Chair elect), Doug Bradley-Hutchison, Valerie Cope, Eric Dunn, Sarah Finch, Robert Gilbert, David Griffith, Monica Martin-Frayne, Ralph Miller, Ben Sears, Cheryl Thompson and Tillie Watts-Brown. There was also support from the faculty in each department that developed the lab activities, department chairs, Sinclair staff and administrators.

Special thanks to both the SME Dean, Tony Ponder, and the SME Assistant Dean, Eric Dunn, for their support and guidance, and to the Sinclair Board of Trustees for their financial support. Without their help, we would not have been able to offer such a positive educational experience for the students!

Future Plans

One of our WiSTEM program goals is to begin marketing the program earlier to reach more students. We plan to put the 2018 WiSTEM Institute application online by early Fall Semester. Throughout the upcoming academic year, we plan to send emails to past participants and create flyers to distribute to local school counselors and teaching staff. SME will also advertise the event by handing out flyers at college fairs during fall term.

It remains a central goal to recruit students whose schools do not have extensive lab facilities so these students may be exposed to STEM fields and possible career opportunities in STEM. The committee will continue to reach out to local schools in underserved areas.