This Year’s Theme: Can you keep a Secret?

The 2015 Women in Science, Technology, Engineering, and Mathematics (WiSTEM) Institute was successfully held from Monday, June 22, 2015 to Friday, June 26, 2015.

The Institute is open to any high school girl who is entering grades 9-12.

It is a week of fun, hands-on activities relating to the areas of science, technology, engineering, and mathematics (STEM). Each day students participate in lab sessions that cover a wide variety of skills and knowledge. This year the students explored the science and technologies used in security systems worldwide.

The labs this year included the areas of Automotive Technology, Aviation Technology, Biology, Chemistry, Computer Aided Manufacturing, Electronics Engineering Technology, Engineering Technology Design, Fire Science Technology, Mathematics and Physics.

The WiSTEM Institute helped feed the interest the students had in pursuing a career in STEM. 100% of the students said they are planning on attending college and 95% said they were planning to major in a STEM field.

At the beginning of the week, only 60% of the girls said they knew what STEM programs were offered by Sinclair. By the end of the week, 100% answered that they knew what STEM programs Sinclair had to offer.

All the students participating said that WiSTEM increased their interest in STEM careers and they thought the activities were fun and informative. 100% also said that they thought WiSTEM was a valuable experience and would attend (or suggest a friend or sister attend) next year if eligible.

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Inside this report:
Introduction; Funding
Program; Planning, Marketing, and Recruiting
Program Opening: A Puzzled Scavenger Hunt; Focus on STEM majors; College Life; Puzzled?
Chemistry; Automotive; Electronics
Biology; Mathematics; Physics
Computer Aided Manufacturing; Fire Science Technology
Aviation Technology; Engineering; Closing Program
Guest Speakers; Thank You; Future Recommendations

26 female students from 11 area high schools participated in this year’s WiSTEM summer institute. (See school list below).

- Carroll HS
- Chaminade Julienne HS
- Dayton Regional STEM School
- Homeschool
- Northmont HS
- The Miami Valley School
- Springboro HS
- Stivers HS
- Thurgood Marshall HS
- Troy HS
- Wayne HS

Highlights from participants’ pre- and post-assessments

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Introduction

The Women in Engineering Technology (WIE) Institute was established in 1994 when a grant was acquired to enable females in grades 10-12 to explore the different areas of engineering technologies. In 2008, the Institute was renamed WiSTEM and focused on being more academically oriented and assessment driven, while the topics were expanded to include all areas of STEM that are represented at Sinclair.

Since the grant’s inception, the summer institute has been directed by the following SME faculty and Staff:

- 1994: Harmit Kaur, Retired Professor, Electronics Engineering Technology
- 1995-2007: Natalie Royer, Adjunct Faculty & CNC Machine Lab Technician, Computer Aided Manufacturing
- 2008 & 2009: Larraine Kapka, Chairperson, Engineering Technology Design
- 2010: Kay Cornelius, Professor, Mathematics
- 2011: Deborah Shuler, Adjunct Faculty
- 2012 & 2013: Shan Huang, Associate Professor, Physics and Astronomy
- 2014 & 2015: Susan Luken, Associate Professor, Biology and Biotechnology

Each year students explore STEM careers and curriculum through 10 different blocks of labs under a selected theme. This year’s theme was “Can you Keep a Secret?” The topics included: “Invisible Ink” in Chemistry; “Locks and Latches” in Automotive Technology; “Soldering...Safe Keeping” in Electronics Engineering Technology; “The link between Genes and Biometrics” in Biology; “Mathematical Ciphers” in Mathematics; “Keeping things Locked” in Physics; “UAS...Been there, done that, and took a picture!” in Aviation Technology....and more.

The girls were delighted to have several guest speakers throughout the week who highlighted the topic of secret keeping in their expert areas. Their favorite was the Thursday lunch speakers, two Air Force special agents in counterintelligence.

Funding

The WiSTEM Institute’s $25,000 budget has been provided by the Sinclair Board of Trustees since the inception of the institute. As a result of this generous contribution, each participating student only needed to pay a nominal $10.00 application fee to enjoy a full week of fun and hands-on exploration of STEM careers and curriculum.

The budget covered lab materials, lunches, classroom supplies, parking passes, duplication, mailing and marketing. Compensation for faculty, staff, and student counselors also came from this budget.

Did you know?

Sinclair’s Montgomery County annual tuition rate is the lowest in Ohio.
Program

The Institute started on Monday morning with brief opening remarks for the girls and their parents after which they were split into small teams of 3-4 to work on a campus-wide, code-breaking scavenger hunt which finally brought them to the lobby of building 20 and their first labs.

For the 2015 program, 10 different labs explored the science and technologies that help us keep secrets safe and secure. The curriculum and lab activities were designed, prepared, and facilitated by Sinclair’s Science, Mathematics, and Engineering faculty and staff.

The students were divided into two groups. Each group was assigned a counselor to guide them to the lab rooms according to their schedule. The counselors stayed with the students throughout the institute to supervise and mentor them.

This year’s counselors were Sara Freeland (WiSTEM program graduate and Freshman at Cedarville University) and Sara Specht (Sophomore at Ohio University). Thanks also to Cheryl Thompson (Geology faculty) who helped to plan the scavenger hunt and Molly Rice (Biology adjunct faculty) who helped relieve counselors for breaks.

During Tuesday and Thursday lunches, the girls had guest speakers from the Air Force talk about cyber security and counterintelligence. They also had the opportunity to discuss careers in STEM with the guests. Friday’s closing ceremony gave the parents a chance to see the daily activities and hear a keynote speaker, an expert and author on the Dayton Codebreakers.

Planning, Marketing, and Recruiting

The WiSTEM Committee consists of faculty and staff drawn from all areas of the SME division.

Committee members determine the Institute’s theme and structure, help with marketing and recruitment, develop the Institute activities, and implement the program.

Individual faculty and staff members were paid for specific hours of teaching at the Institute, but not for planning or lesson plan development prior to the event.

For 2015, the committee focused on recruiting students from Dayton Public Schools to participate in the Institute. The committee reached out to science teachers, counselors and administrators to identify potential students. A number of the non-STEM oriented schools had never heard of the program and were extremely interested in exposing young women to this kind of program.

Application forms were also distributed in many of Sinclair’s outreach programs and college fairs in the months leading up to the program. The event was marketed on Sinclair’s website and several participants were identified as a result.

Did you know?

Founded in 1887, Sinclair is America’s oldest continuously operating community college!
Program Opening— A puzzled scavenger hunt

Cheryl Thompson, Shiloh Graham, Molly Rice, Sandy Specht, Sara Freeland & Kelly Specht

The girls and their families signed in early Monday morning and received program materials and their t-shirts. The girls were then split into groups of 3-4 students with a Sinclair Faculty/Staff guide. Each group was given a different type of puzzle that would tell them the location of their next clue. They used a campus map (and their guide) to find the next location where they solved another puzzle leading them to their final location. The puzzles took them each to different locations around the campus and finally into the lobby of building 20 where they were awarded a prize and met their first set of guest speakers; faculty from the Automotive Technology and Fire Science Technology departments.

The girls did a great job solving a variety of combination puzzles ranging from word cyphers, Morse code, number codes and cryptographs.

Focus on STEM majors and going to college

New Student Enrollment

Kylie Dorsten from New Student Enrollment gave a special talk about planning for college. Many of the girls were surprised to see the total cost of college tuition! Kylie gave a breakdown of cost for different types of colleges (private, state, community, for-profit) which showed the students how they could save money by coming to Sinclair. Many students had questions about the financial aid process and how transfer credits worked.

College Life

Our team leaders this year were current college students. On Wednesday, they sat on a panel talking to the girls about what it was really like in college and what they wished they had known on their first day. The girls opened up and asked the leaders questions about fears and expectations they had about college. One of the team leaders was a WiSTEM program graduate! She shared how she knew she liked science but was not sure what field to enter. Because of the WiSTEM program, she was able to find out which she liked the best and choose her college major (electrical engineering).

Puzzled?

The girls tested their skills at breaking codes and ciphers on breaks between labs and with extra time at lunch with various written codes and games. The girls made wheel ciphers (shown in the picture) to solve riddles as well as solving numerical puzzles and testing their skills against each other with games like Mastermind.
Chemistry—Invisible Ink

Instructors: Jane Myong & Lonnie Dorgan

In the Chemistry lab students worked with five different types of invisible inks. Faculty explained the chemical reactions behind the changing of the ink from clear to visible. Afterwards, they split into teams for a friendly competition. One team member would write a message about a chemical element in one of the types of invisible ink. The other girl would try various means to make the ink visible again and afterwards would answer the question about the element. The first team to get the correct answer won!

The girls enjoyed this hands on experience, several mentioned they enjoyed sending messages like a “spy.”

Automotive—Locks and Latches

Instructors: Ralph Miller & Kevin Smith

In the Automotive lab students learned about the different types of door locking mechanisms found in various cars and how door locks have changed throughout the years.

They then got a chance to try out different types of unlocking tools on a variety of cars found in the automotive lab. They found that older models of cars are much less secure than the newer models!

Many students who initially said they were not interested in learning about this industry at all changed their minds after this lab and remarked how much fun they had.

Electronics—Soldering...Safe Keeping

Instructors: Kenzie Grogean, Abdullah Johnson & Tillie Watts-Brown

In the Electronics Engineering Technology lab the girls learned the basics of soldering and how an electrical circuit works.

They created an alarm that could be mounted to a drawer that would sound off when the drawer was opened! The girls commented how much they enjoyed this hands-on lab! Several mentioned in the post-evaluation this was an area they did not previously have much exposure to and how they were excited to create something that they can take home and use.
In the Biology department the students learned about biometric locks that use retinal scanning as well as facial recognition software. They started by learning the parts of an eye and got to dissect a cow eye to match the parts to the model. They looked at a variety of skulls to see differences between people based on facial features and talked about the genes responsible for facial differences. They then performed a DNA fingerprint analysis to show the differences between different types of DNA. Students remarked how much fun they had doing something totally new!

In the Physics lab students learned about the mechanical inner-workings of locks and locking mechanisms. They classified types of keys and locks and described what was happening inside the lock when a key was turned. In another station the girls tried their hand at breaking open combination locks using code methods. The girls found which locks were the best at keeping their belongings safe and secure... and which were the worst!
Computer Aided Manufacturing—Additive and Subtractive Manufacturing

Instructors: Kevin McNeeley & Keith Bernheisel

In this lab the students learned about 3D printing and how computers can design and build security devices. After looking at the programming aspect, the girls watched a demonstration of the 3-D printer at work.

The faculty pre-printed puzzles that said WiSTEM (due to the time it would take to print them out in front of the group) that the girls worked on as a team and later took home.

Fire Science—Fire Science, Unlocking Your Potential

Instructor: Laura Walker

In the Fire Science lab, the students first learned about what a fire needs to grow and what we use in alarm systems and fire suppression systems to keep buildings safe. The girls designed an experiment to create the biggest fire and saw exactly what it took to set off a ceiling sprinkler.

Afterwards, the girls took a trip outside where they suited up in gear and got the opportunity to climb the ladder on the fire truck.

The post-survey showed this to be one of the labs the students knew very little about, but found to be very fun!

Students measure tensile strength in different metals.

Did you know?
The SME division offers 68 different degree and certificate programs!
In the Aviation Technology workshop the students learned about Unmanned Aerial Vehicles and how they can be used to photograph, find missing people in dangerous areas, survey and look for missing equipment, and much, much more! After learning the controls of the machine, the girls competed with each other to master the flight simulator and complete missions.

The girls really showed their competitive side trying to get the highest flight mission ranking, and even finishing their favorite ‘zombie’ mission!

Students competed on flight simulations to complete the most missions.

Girls learn how UAVs can help respond to natural disasters.

Engineering — Barriers, Bollards and Building Security

In this lab the students learned about the practical aspects of many decorative features in high security buildings. Things as innocent as flower pots, standing modern art and stairways can be used as security features. They then used engineering software to design their own US embassy with security features included in case of attack or threat.

Working on their embassy building.

Students design their own secure features.

Closing Program

Parents, faculty, staff, and Sinclair administrators were invited to a luncheon on the last day of the Institute in building 8.

Susan Luken, this year’s WiSTEM Director, gave a presentation showing the parents what the girls had been learning in each lab during the week.

Keynote speaker Debbie Anderson, Historian, spoke about her research into the Top-Secret Dayton Codebreakers and the WAVES program that helped to break the Nazi code generating Enigma machine during World War II. Her own father was a research director for the program and took his secrets to the grave. Debbie put together family stories with de-classified documents to find this amazing story of smart Dayton women who helped win the war!

Afterwards the counselors handed out certificates and group pictures to all participants.
Guest Speakers

On Monday, the girls had lunch with Kylie Dorsten from New Student Enrollment to talk about college admission and financial aide.

On Tuesday, they got a special visit from Sarah Vaughn, a Cyber Security Technician at Wright Patterson Air Force Base. She talked about the importance of keeping online information secure and about her job as a cyber security expert.

On Thursday, the girls heard from Special Agents Heather Glasgo and Lisa Patton who talked to the girls about their jobs in Military Counterintelligence. The girls were surprised to find out that even in a STEM career how easily intellectual property can become compromised. The agents provided advice on how to identify those who are trying to get information from you.

Thank You!

The dedication of many people is required in order to make the WiSTEM Institute happen. Department chairs, deans, faculty, staff, administrators, Sinclair students, parents, and the participants themselves all strive to make the program an enjoyable and rewarding event. Thanks to the Sinclair Board of Trustees, SME Division Dean, Tony Ponder, and Assistant Dean, Larraine Kapka, for their support and guidance.

Special thanks to Monica Martin-Frayne for her administrative assistance. Without her help, we would not have been able to have such an amazing experience for the girls.

Future Recommendations

The WiSTEM Institute has reached many female high school students over the years. From last year’s initiative, we reached out to Dayton City schools and got excellent feedback from teachers and counselors. While we sent applications and visited Dayton STEM schools and Tech Prep schools, our largest efforts should continue to be reaching female students who currently have not experienced much in the STEM fields. We will continue to develop relationships with schools and utilize their current marketing (social media, parent newsletters, student handouts) to publicize in those areas.

Did you know?
The SME division has graduated 2,100+ students in the past five years!