2019 WiSTEM Annual Report

Sinclair Community College
Science, Mathematics, and Engineering (SME) Division

2019 Theme: CSI Forensics

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The 2019 Women in Science, Technology, Engineering, and Mathematics (WiSTEM) Institute was held Monday, June 17 through Friday, June 21, 2019. The Institute is open to young women entering or just completing grades 10, 11, or 12. The Institute was a week of interactive, “hands-on” laboratory 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 College. This year, the students studied the science and technologies that forensic scientists use to solve crimes. A crime scene was staged for the students to investigate using multiple clues they discovered through laboratory exercises.

Highlights from participants’ pre- and post-assessments

The goal of the WiSTEM Institute is to “fuel” student interest and understanding of STEM fields.

Results from pre and post program questionnaires indicated that 92% of the students believed the WiSTEM Institute increased their interest in a STEM career field.

27 female students from 18 area high schools, as well as some homeschooled students, participated in the 2019 WiSTEM Summer Institute

High Schools included:
- Alter
- Bishop Hartley
- Centerville
- Chaminade Julienne
- Colerain
- Covington
- Dayton Christian
- Fairfield
- Hudson
- Jersey City
- Lakota West
- Mason
- Miami East
- Miami Valley
- Miamisburg
- Oakwood
- OHVA
- Stebbins

90% considered WiSTEM a valuable experience and would recommend the program to friends or family members.

While only 80% of students reported being aware of Sinclair’s STEM programs before participating in WiSTEM, 100% reported an awareness of Sinclair’s programs at the completion of the program.

At the completion of the WiSTEM event, participants were positive in their praise of the program: 100% thought the activities were fun; 96% thought the program sessions were informative; and 100% felt they learned a lot from the programs.

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Introduction/Program Summary

The grant funded program was first established in 1994 as the Women in Engineering Technology (WIET) Institute. 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 Sinclair’s Science, Mathematics and Engineering division. The assessment of the program was also enhanced 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 “CSI Forensics” where students were introduced to crime scene investigating.

Laboratory topics included:
- Automotive Investigation - Automotive Technology
- UAS 3D Reconstruction of a Crime Scene - Aviation Technology
- Forensic Biology - Biology
- WCSI - Women CAM Scene Investigation - Computer Aided Manufacturing
- The Siren - Electronics Engineering Technology
- Designing Dining in Dayton - Engineering Technology Design
- CSI with Chromatography and Spectrometry - Chemistry
- Exponential Mystery - Mathematics
- Analyzing Tire Tracks to Determine Speed - Physics

The students also had the opportunity to meet several guest speakers throughout the week. Speakers from the following organizations participated:
- Air Force Institute of Technology, Wright Patterson Air Force Base (WPAFB)
- Dayton Region Manufacturers Association (DRMA)
- Kettering Health Network, Information Systems (IS) Operations
- Sinclair Community College, Enrollment Services

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

Funding

Funding for the WiSTEM Institute is 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 ($10.00 application fee to cover the cost of t-shirts).

Students spent six hours a day (including lunch) on campus for five days participating in the interactive exploration of STEM fields.

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

“This week exceeded my expectations and made me realize that forensics is the career for me”

2019 WiSTEM Student
Planning, Marketing, and Recruiting

The WiSTEM Committee met throughout the year to determine the central theme and to plan the summer Institute. Committee members consisted of male and female faculty and staff from the nine academic departments within the SME division.

Departments designed their WiSTEM lab activity and related it to the theme. Each department representative recruited fellow faculty to help develop and facilitate their department’s activity. Faculty also developed an assessment to determine the effectiveness of the session.

WiSTEM committee members assisted with the marketing and recruitment of high school students. The target student population was young women entering 10th, 11th, or 12th grades.

WiSTEM flyers were distributed at Sinclair college fairs in the months leading up to the program and were emailed to high schools in the area.

Application forms were also available online, and the event was highlighted at www.sinclair.edu/wistem.

Meet the Group Leaders

Thank you to the outstanding Group Leaders for helping make this a successful WiSTEM Institute! Their interaction with students helped ensure a positive experience for all participants.

Group Leaders escorted the two groups of students to lab sessions around campus and assisted faculty with activities.

Emma Osborne
West Virginia Chemistry Student
Soumia Boussaha
Sinclair Mathematics Student
Grace Cope
OSU Political Science Student
Hannah Petersen
Sinclair Bio-Tech Student

Program Opening - Icebreaker!

Students and their parents were welcomed by WiSTEM faculty and volunteers at the check-in table in Building 3 on Monday morning. Students received pre-program questionnaires to complete regarding their general attitudes toward college and knowledge of STEM fields. Background introductions framed the focus of this year’s Institute and built excitement for the week of investigations and crime solving. Students were divided into two groups and walked with their group leaders to Building 20 to investigate the staged crime scene (fatal car crash). A car was positioned as if it had collided with a tree, complete with front end damage and simulated blood. Five students from the theater department performed as the victim and friends of the victim (all of which became suspects in the investigation). Student were encouraged to ask questions of the actors regarding the accident, their relationship with the victim, and where they were/what they were doing at the time of the accident.
Automotive Technology – *Automotive Investigation*

**Instructor:** Ralph Miller and Hanna Weaver

In this lab, students focused on vehicle inspections and how they relate to crash avoidance. Participants investigated the vehicle involved in the staged incident as well as other cars. The students followed inspection sheets and were able to check the brakes, tires, steering, and suspension systems and how each relates to crash avoidance.

Once complete, 88% of the students indicated at least one issue with the car that they inspected, such as headlight condition, windshield washer operation, or a low fluid level. 42% of the students found issues with a steering or braking component on the crash car, but differentiated it from an accident causing issue. As a result of the inspection, 92% of the students concluded that a mechanical failure was not likely the cause of the accident.

Aviation Technology – *UAS 3D Reconstruction of a Crime Scene*

**Instructor:** Benjamin Sears

Emergency First Responders (EFR) do their best to provide aid, determine what happened, and clean up the roadway as quickly as possible at an accident scene, but they can’t always remember every detail of the accident. However, Unmanned Aerial Systems (UAS) can assist EFR’s in documenting and recreating the accident scene. In this lab, students used data derived from a real UAS flight over the simulated accident scene with photogrammetry and advanced software, *Pix4D*, to convert two-dimensional images into a three-dimensional model. These models assisted the students in their investigations.

As a result of this lab, students learned about UAS terms and definitions, laws, and Sinclair’s Aviation Technology program.

Biology – *Forensics Biology*

**Instructors:** Marita Abram, Amanda Duselis, Sarah Finch and Erica Mersfelder

After a brief discussion regarding human blood types and the procedure for determining blood type, students were asked to check the blood type samples from the crime scene. After finding two individuals with the same blood type, students learned about DNA fingerprinting and ran a gel to determine whose DNA matched the crime scene. Students were also able to extract their own DNA from saliva using household ingredients. Assessment of their understanding of blood typing and DNA fingerprinting yielded an average 82.1% score.
Instructors: Keith Bernheisel and David Griffith

Professors Bernheisel and Griffith showed the WiSTEM students a video in which women employed in manufacturing discussed new opportunities for women in this rewarding and “in-demand” career field. Students also interacted with three female speakers from Dayton Region Manufacturers Association as they shared their experiences in manufacturing.

After interacting with speakers, students toured the manufacturing lab and learned about several machines. Additionally, students compared cell phone cases found at the crime scene using a comparator machine. From this analysis, they were able to determine that the case at the crime scene indeed belonged to the victim.

Electronics Engineering Technology – The Siren

Instructors: Kenzie Grogean, Morgan Highlander, and Tillie Watts-Brown

In the Electronics Engineering Technology lab, WiSTEM students learned soldering skills and built a police siren with a flashing light. The students enjoyed working with the kits, learning soldering principles and how electrical circuits function. Upon completion, all the students were able to take their fully functioning police sirens with them.

Electronics Engineering Technology and Biology were voted the 2019 Favorite Sessions by WiSTEM students!

Engineering Technology Design – Designing Dining in Dayton

Instructor: Alexandra Bohler

In the “Architecture” portion of the WiSTEM camp, students designed the eatery where the group of teenagers allegedly were hanging out before the accident. To start things off, the students introduced themselves by selecting one of six architectural projects shown on the screen. The instructor then gave a background overview of the Gem City Market project as a jumping off point. A physical model and two computer models were shared with the students (in both SketchUp and Revit).

Students took this information about the grocery store design to start their own eatery design, to be placed immediately adjacent to Gem City Market. First, they individually sketched a potential floor plan using templates drawn to scale to match the physical model of the market. Next, they worked in pairs to translate their sketches into a physical 3D model. At the end of the session, they brought their model up and placed it right next to the Gem City Market model for a photo op! Eateries ranged from “Better than Chipotle,” to food trucks, to an elevated restaurant with a view.
Chemistry – CSI with Chromatography and Spectrometry

Instructors: Jane Myong and Cheryl Thompson

In this lab, the girls were introduced to gas chromatography/mass spectrometry (GC/MS) and learned how it breaks compounds down into their individual components. The girls were given a sample of an unknown drug found at the scene of the accident and used GC/MS to analyze it. The girls then identified the compounds as either aspirin, caffeine, or acetaminophen. With further investigation of common analgesics, they were able to determine that the unknown drug was Excedrin.

To corroborate the GC/MS results, the girls used thin layer chromatography (TLC) to identify the individual components in Excedrin. They prepared a solution with the original unknown drug to use on the TLC paper along with solutions of known compounds such as Excedrin, aspirin, caffeine and acetaminophen. After spotting each solution onto the TLC paper, the girls placed it in a developing beaker. When developed, the girls removed the TLC paper, let it dry, and then used a UV light to see and circle the large spots that represented the individual components. Most groups were able to match the individual components to those in Excedrin. In a few cases the spots merged together making it difficult to identify without some guidance.

In the end, most girls felt that Excedrin did not play a role in the accident, but some said it could not be ruled out until all the evidence had been analyzed. Only a few of the girls, 16%, indicated that they had heard of or seen GC/MS before this workshop. Afterward, 96% indicated that they now have a better understanding of what GC/MS does, how it works, and how chemistry plays a roll in CSI.

Mathematics – Exponential Mystery

Instructors: Valerie Cope and Marie Stroh

For the mathematics lab, students learned about Newton’s Law of Cooling, a formula that applies to objects cooling (or heating) to match the temperature of its surroundings. First, students collected temperature data by using LoggerPro software and a temperature probe. Half of the girls measured the temperature of boiling water as it cooled every 10 seconds for a total of 10 minutes. The other half measured the temperature of boiling water sitting in an ice bath. The data of the first group showed a linear curve while the second group showed an exponential decay curve.

Once students understood Newton’s Law of Cooling, they were able to find the time of death of the victim. This led to a discussion about the process in which coroners investigate a crime scene and the possible sources of error to this method, such as the assumption that the body was actually 98.6 degrees Fahrenheit upon death, that the body temperature taken could vary depending on method, and that the temperature in an outdoor environment is not constant over time.

Physics – Analyzing Tire Tracks to Determine Speed

Instructors: Lori Cutright and Shan Huang

In this lab, students were introduced to two activities related to the CSI theme. The girls first learned about speed and the force of friction. The girls learned how friction depends on the types of surfaces in contact and on weight. They measured friction using a wood block with leather on one side, a board to pull the block over, and several spring scales. Afterwards, they discussed the crime scene where the girls answered questions such as: was the victim wearing a seatbelt, and what was the speed limit? In the second activity, they used the distance of the tire marks on the pavement behind the car and tables of stopping distances to determine if the driver was speeding. Finally, the girls listened to a presentation on careers and salaries available to people with a physics degree and learned that physics is applicable to a wide variety of subjects.
Guest Speakers

Guest speakers spoke each day during lunch. 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 applicability), and she supplied each student with a timeline to use as a guide. Ms. Rucker also covered estimated costs for the different types of colleges (private, public 2- or 4-year, and for-profit institutions) that illustrated the dramatic cost saving potential 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. WiSTEM students also had many questions about the financial aid process and how to pay for college. Additionally, Ms. Rucker provided resources to help students find scholarships for which they could apply.

On Tuesday, Beth Search, MBA, PMP, CPEL, the Executive Director of Information Systems Operations at Kettering Health Network, and Stacie Carnes, Information Systems Security Analyst at Kettering Health Network, gave students a fascinating and interactive presentation on the importance of Cybersecurity in personal and 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 and constant online connectivity.

On Wednesday, Elizabeth Pickering from the Air Force Institute of Technology at Wright Patterson AFB gave an interactive presentation regarding careers in STEM. Careers include Aerospace, Computer Engineering, Electrical, Electronics, Mechanical Engineering, Physics, and several others. She related each of these career fields to designing, building, or supporting the space shuttle. WiSTEM participants indicated in the post program questionnaires that the presentation was very helpful. As an added bonus, Ms. Pickering granted permission for her slides to be shared with each of the WiSTEM participants!

On Thursday, Kayla Manuel from the Dayton Region Manufacturers Association, Beth Graves from Prime Controls, and Kristie West from GE Aviation talked with the girls about opportunities for women in manufacturing. The speakers shared their experiences as women in the manufacturing field, the use of machinery in the field, salaries, and many other opportunities.
Closing Program

On Friday, the final day of the Institute, parents, faculty, staff, and Sinclair administrators were invited to an end-of-program banquet. A closing ceremony was held in the Tartan Dining Rooms. Approximately 60 family members were welcomed by opening remarks from Professor Eric Dunn, Assistant Dean of the Science, Mathematics, and Engineering (SME) division. Students presented on individual lab sessions and highlighted programs and career opportunities, as well as the income potential for each field of study. Families enjoyed the buffet lunch and later had an opportunity to ask questions and meet with faculty. Each student received a certificate of completion and a copy of the group photo. An SME informational table was also available for students and families interested in specific programs of study.

Thank You!

The WiSTEM Institute was a success due to the efforts of a very dedicated WiSTEM Planning Committee: Najat Baji (Chair), Dr. Sandy Specht (Chair elect), Valerie Cope, Lori Cudright, Eric Geiman, Nate Goodrich, David Griffith, Ralph Miller, Ben Sears, Cheryl Thompson, and Tillie Watts-Brown. Additionally, the fantastic support from faculty in each Department was essential to make the 2019 Institute an outstanding event. Faculty from each Department developed lab activities, worked with their Department chairs, and reached out to Sinclair staff and administrators to get the job done when it needed to get done!

Special thanks to the SME Dean, Dr. Tony Ponder, the SME Assistant Dean, Eric Dunn, and the SME Administrative Assistant, Monica Martin-Frayne, for their support and guidance, as well as to the Sinclair Board of Trustees for their financial support. Without each of these contributions, we would not have been able to offer such a positive educational experience for the WiSTEM students!

A thank you note with a chocolate bar given by a student to every faculty and staff supporting WiSTEM.

Future Plans

One of our WiSTEM program goals is to begin marketing the program earlier to reach even more students. We will put the 2020 WiSTEM Institute application online early in Fall Semester. Throughout the upcoming academic year, we plan to send email 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.

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

WiSTEM Institute 2020
Our Connected World
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