2014 WiSTEM Annual Report

Science, Mathematics, and Engineering Division
Sinclair Community College

This Year’s Theme: CSI Forensics

The 2014 Women in Science, Technology, Engineering, and Mathematics (WiSTEM) Institute was successfully held from Monday, June 16, 2014 to Friday, June 20, 2014.

The Institute is open to any girl entering or just completing grades 10, 11 and 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 that forensic scientists use to solve crimes, as well as trying to solve a case themselves using the daily lab activities.

The labs this year included the areas of Astronomy, Aviation Technology, Biology, Chemistry, Electronics Engineering Technology, Mechanical Engineering Technology, Geology, Mathematics, Operations Technology, and Physics.

Highlights from participants’ pre- and post-assessments

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 85% said they were planning on a STEM field. 50% of the girls said that they were considering a STEM career because of this institute. At the beginning of the week only 28% of the girls said they were confident they could handle college and by the end, 90% answered that they could handle college.

At the completion of the WiSTEM event, participants were positive in their praise of the program. 92% said the program sessions were informative; 96% said the program activities were fun; 100% reported learning a lot.

Submitted by:
Susan Luken
Associate Professor, Biology
2014 WiSTEM Project Director

Submitted to:
Anthony Ponder
Dean, Science, Mathematics, and Engineering
Sinclair Community College

For information, contact:
Susan Luken
WiSTEM Project Director
2014 and 2015
(937) 512-3049
susan.luken@sinclair.edu

Inside this report:
Introduction; Funding 2
Program; Planning, Marketing, and Recruiting 3
Program Opening - The Scene of the Crime; Meet the Suspects; Lifting Latent Fingerprints 4
Chemistry; Geology; Electronics 5
Biology; Mathematics; Physics 6
Engineering Technology; Astronomy 7
Aviation Technology; Operations Technology; Closing Program 8
Guest Speakers; Thank You; Future Recommendations 9

29 female students from 18 different cities participated in this year’s WiSTEM summer institute. (See city list below)

• Beavercreek
• Brookville
• Cedarville
• Centerville
• Cincinnati
• Dayton
• Franklin
• Hamilton
• Huber Heights
• Kettering
• Liberty Twp.
• Miamisburg
• New Carlisle
• Springboro
• Springfield
• Tipp City
• Troy
• Xenia
Introduction

The Women in Engineering Technology (WfET) 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 “CSI: Forensics.” The topics included: “DNA Fingerprinting” in Biology; “Analysis of Analgesics” in Chemistry; “Analysis of Skid Marks” in Physics; “Estimating Time of Death” in Math; “Lie Detectors” in Electronics … and more.

This year, not only were the labs connected by the theme of forensics, but there was also a crime scene introduced the first day. Each lab gave a vital clue towards solving the crime. At the end of the week, the student groups pooled together information to give their idea of what happened on the night in question.

Funding

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

A $25,000 budget allowed Sinclair to offer the one-week program to a diverse group of students.

As a result of these generous contributions, 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 explored the crime scene and the photographs of the crashed car. They heard opening statements from the actors introducing themselves and their relationship with the deceased. With the help from the Criminal Justice department, the girls then learned about fingerprinting.

For the 2014 program, 10 different labs explored the science and technologies that help solve crimes and analyze evidence. 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. Other responsibilities included taking attendance and distributing meal tickets and parking passes.

This year’s counselors were Susan Luken (Biology faculty) and Molly Rice (Biology adjunct faculty). Thanks also to Cheryl Thompson who stepped in during the week for extra support covering last minute changes to the schedule.

During Monday and Wednesday lunches, the girls had guest speakers from the field of forensics. 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 evidence and hear the group’s final decisions on who they thought committed the crime and why. Afterwards, they heard confessions from the actors and found out how close they guessed.

Planning, Marketing, and Recruiting

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

Committee members determine the Institute 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 2014 recruitment, the target student population was restricted to young women entering the 10th, 11th, and 12th grades.

High school teachers and other STEM related organizations received WiSTEM applications.

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 targeted on Sinclair’s website and several participate were reached from that advertising.

Did you know?

Founded in 1887, Sinclair is America’s oldest continuously operating community college!
Program Opening—The Scene of the Crime

The girls and their families registered Monday morning and were met by a crime scene. Kira (Sinclair Theater student) had been thrown from her car in a crash. What had happened? Was it a manufacturer’s defect, an accident, or was it foul play?

The students heard from two close friends of the victim who were the last to see her alive Sunday evening. Distraught, they agreed to help the girls as they try to find out what happened to their friend.

Afterwards the girls reviewed photographic evidence from the scene in order to start building the case.

Meet the Suspects

Sinclair Theater Students

Kira Miller (victim), Jenn Smith (suspect) and Austin DeVaughn (suspect) helped us each day of the event. Students inspected the crime scene on Monday and spent time interviewing the suspects during their lunch breaks. Each day the students were presented with lab reports (from the previous day’s labs) and could question suspects concerning their findings.

Grief stricken suspects, Austin and Jenn, look on at the scene.

Lifting Latent Fingerprints

Pam Chambers and her Criminal Justice Students

After examining the crime scene, the girls did a short lab in lifting latent fingerprints from glass surfaces lead by Sinclair Criminal Justice students and faculty Pam Chambers. The girls learned the typical fingerprint patterns found and tried to find which patterns they had on their own fingers! They also had a chance to get their own fingerprints taken.

Kira (victim) lies thrown from her car at the crime scene.
Chemistry—Analysis of Analgesics

Instructor: Jane Myong

In the Chemistry lab, students learned how to read Material Safety Data Sheets (MSDSs) for the chemicals they would be analyzing. They performed thin layer chromatography, found chemical melting points and analyzed several analgesics using a Gas Chromatograph/Mass spectrometer. They used resources to research toxicological levels of the chemicals in question.

The evidence for the crime in this section was a toxicology report. They found that the victim had toxic levels of acetaminophen in her stomach.

Geology—Sediment Analysis

Instructor: Cheryl Thompson

In the Geology lab, students learned about forensic geology. They used observation scopes to test soil samples to find differences that would match the sample to a specific location based on using textures, clay content, soil colors and sand grain sizes.

The evidence analyzed in this section showed that sediment found in the treads of the victim’s shoes matched soil found in one of the suspects shoes, as well as in the tire treads of one of the vehicles.

Electronics—Lie Detectors

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

In the Electronics Engineering Technology lab, the students learned soldering skills and then put together a lie detector. If a suspect caught in a lie were to touch the ends of the detector with sweaty hands, the detector would catch them.

The evidence from this lab showed lie detector results from both suspects on a list of questions from an examiner. The girls learned that the victim’s car was in good working order and that one of the suspects was hiding information about the case.
Biology—DNA Fingerprinting

Instructors: Marita Abram, Shiloh Graham, and Sandy Specht

The students learned about and performed a blood typing lab, which is the original method of blood analysis from a crime scene. Next, the girls did a DNA fingerprinting lab which is how evidence is analyzed today. They ran gel electrophoresis on the DNA samples and stained the gels to analyze the results.

The students ran the suspect’s DNA samples which linked one of them to the scene of the crime.

Mathematics—Estimating Time of Death

Instructors: Kay Cornelius and Najat Baji

In the math workshop, students measured the cooling rates and warming rates of chilled/hot liquids as they were left at room temperature. Using this data they were able to plot a standard curve and estimate the time of death for a body outdoors at a particular temperature.

From this lab, the students were able to determine that the internal temperature of the victim’s body in the autopsy report indicated that she had died before the car crash, not afterwards.

Physics—Analysis of Skid Marks

Instructors: Shaun Huang and Angelika Walczak

In the Physics lab, students learned to measure friction using weights on various surfaces with different textures. They discovered ways to reduce friction and move objects more easily.

The evidence found in this lab showed a tire tread at the crime scene. The girls measured and compared this tread mark to known tire treads to find that one of the suspects had stopped at the scene of the crime and had then peeled away.
Astronomy—Spectra Analysis

Instructor: Lori Cutright

In the Astronomy lab, the girls used a spectroscope to identify elements by their spectra. They compared unknown light spectra to unknown samples. The students also learned about light refractions through broken glass.

The evidence students found in this lab showed that glass fragments in one of the suspects’ shoes matched the broken window from the victim’s car, linking the suspect to the scene of the crime.

Did you know?
Over the past 5 years, Sinclair has increased the number of degrees and certificates awarded to women by 100%
Aviation Technology—Unmanned Aerial Vehicles

Instructors: David Haase, Donna Hanshew, and Don Stark

In the Aviation Technology workshop, the students learned about Unmanned Aerial Systems, a new program on the Sinclair campus. They operated small Unmanned Aerial Vehicles (UAVs) and found how difficult they were to control! Afterwards, they spent time in flight simulators practicing flying the UAVs and responding to disasters (a fire and a tornado).

The evidence from this lab showed a traffic report from an aerial drone that indicated one of the suspect’s vehicles was at the scene of the crime after the crash.

Operations Technology—Putting together the scene of the crime

Instructor: Becki Glagola

In this lab, the students put their heads together to try and look at the logistics of the case in an analytical way. They put together their final assessment of what happened leading up to the crime and who they thought was guilty.

Closing Program

Parents, faculty, staff, and Sinclair administrators were invited to a luncheon on the last day of the Institute. Tricia Tuffy (with Sinclair New Student Enrollment) spoke to the students and parents about registering for college and applying for scholarships.

Susan Luken, this year’s WiSTEM Director, and daughter of a former crime lab director and technician, spoke about how growing up surrounded by the field of forensics had impacted her life.

Keynote speaker, Tim Apolito, Professor of Criminal Justice at the University of Dayton, spoke about forensics, addressed those who had an interest in pursuing the field as a career, and added many personal experiences working in the field.

The group leaders and the director then presented certificates of completion and group pictures to Institute participants.
Guest Speakers

On Monday, the girls got a special visit from Laura Kiddon, a trace evidence specialist from the Miami Valley Regional Crime Laboratory. She spoke to the girls about what she does on a daily basis, what kind of education and training she has, and some of her most exciting moments as a forensic scientist!

On Thursday, the girls heard from the Wright State Air Force ROTC program about STEM careers in the military. They highlighted skills and training opportunities as well as financial assistance for college.

Thank You!

The dedication of many people is required in order to make the WiSTEM Institute happen. Department chairs, 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.

Thank you to Kim Borst and her theater students who were able to think fast as the girls questioned them about new evidence during the week.

Special thanks to Karen Butcher and Monica Martin-Frayne for their administrative assistance. Without their 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. We directly mailed past participants as well as those who were on the waiting list last year, of which many signed up for this year’s event. Faculty advertised the event at college fairs and dropped flyers off to area high schools.

One of the goals of WiSTEM is to reach female students who may not have been previously interested in going to college or in the STEM fields. A recommendation for next year is to target girls in both city and rural areas that have not had much previous experience with the STEM fields.

Did you know?
Sinclair offers 172 different degree and certificate programs!