DEEPER LEARNING FOCUS OF THE SAHI COURSES AT ONU

SAHI Stem courses utilize four areas of the Ohio Revised Science Standards and Model Curriculum: Life Sciences, Physical Sciences, Chemistry and Physics. These courses address specific areas of the standards and use guiding principles such as Definition of Science, Scientific Inquiry, 21st Century Skills, Technological Design, and Depth of Content, all while implementing assessment tools developed especially to be congruent with the standards. Faculty expertise includes subject areas such as cell, molecular, genetics, general chemistry, biochemistry, and organic and analytical chemistry and a thorough understanding of contextual analysis. These subjects utilize specific scientific content to bolster the goal of the integration of an extended curriculum using the scientific inquiry/learning cycle to develop skillsets for the application of specific science content of multiple disciplines for problem-solving and deeper, lifelong learning. The idea of knowledge transfer in context is one found in a July 2012 report from the National Research Council, “Assessing 21st Century Skills: Summary of a Workshop.”

This summer, Ohio Northern University will host its 11th Summer Academic and Honors Institute for gifted high school students who will be freshmen, sophomores, juniors or seniors in 2015-16. This year’s institute includes 14 challenging courses scheduled over the month of June. Each weeklong course provides a great way to investigate potential career choices or college majors. Plus, this is the perfect opportunity to interact with other gifted students with instruction provided by ONU professors and special guest lecturers.

Eligibility: To be eligible to attend the Summer Academic and Honors Institute at ONU, you must: Be entering the ninth, 10th, 11th or 12th grade in fall 2015-16 AND Be identified as “gifted” by a school district (Ohio gifted identification criteria as described in Ohio Administrative Code 3301-51-15). OR Be able to obtain a written recommendation from your high school counselor.

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Ohio Northern University
525 S. Main St.
Ada, OH 45810

Cost: $475 per week
*The following camps require an additional fee $50 for travel and/or supplies: Astronomy and Physics, Pharmacy, Engineering, Technology, Forensics (Basic and Advanced).

Registration deadline: May 6, 2015
Bring a friend, and you’ll both save $75. Students may sign up for more than one week. Space is limited, so reserve your spot today!

Students completing a course will receive one transferrable college credit hour. Requests for transcripts can be made by contacting the ONU registrar at registrar@onu.edu.

JUNE 14-19, 2015
(14 course offerings)
Design: Think. Know. Do.
Forensic Science (Basic)*
Mock Trial
Multimedia
Pharmacy*

JUNE 21-26, 2015
(10 course offerings)
Human Anatomy Exploration
With Histological Techniques
Astronomy and Physics*
Biochemistry
Chemistry
Cryptography
Engineering Pathways*
Forensic Science (Advanced)*
Mock Trial
Technology* - HOT

* These camps require an additional fee for travel and/or supplies.

FOR DETAILED INFORMATION AND REGISTRATION FORMS, VISIT ONU.EDU/SAHI
Astronomy and Physics June 21-26
Riding the Edge: The Physics of Cedar Point. Spills, thrills, chills – and that’s just the math and science.

Riding the Edge closely examines the physics behind the scream machines that make our hearts race and stomachs drop. You’ll gain fundamental knowledge of the principles of physics and solve problems in the context of using critical thinking and inquiry skills of applied physics. Classroom projects in engineering and physics will provide the basis for the science behind the thrill rides. The course’s “final exam” is a full day at the world’s biggest physics lab – Cedar Point in Sandusky, Ohio. Through the astronomy segment of the course, you will spend significant time exploring the skies by day and by night.

Biology, Biotechnology - Molecules to Medicines: Structure and Function June 21-26
Join the biochemists at Ohio Northern University for a weeklong experience to explore how DNA sequence is related to protein structure and how this affects protein function. You will examine the basic and advanced concepts needed to understand these relationships. This will be done through intensive laboratory experiences and exciting classroom discussion. You will be introduced to amino acids and how they form proteins, the “machines” or “appliances” in the body that do all the work and allow cells and life to exist. The structure/function relationship of proteins will be studied and how this plays a part in their role in molecular biology, medicine and disease. You will delve into lab work, grow cells and allow cloned proteins to be made by bacteria. You will use these proteins as tools to understand how a protein does its job and how a damaged or malformed protein can contribute to disease. Disease symptoms are often due to changes in the structure of a protein, which affect how it functions in the body. During this weeklong course, you will see how DNA mutations play a role in the formation of malfunctioning proteins and resulting disease states. As a visual demonstration of this, you will examine how changes at the DNA level can result in altered protein structure and properties as you examine the attributes of a protein that glows green but can be changed to a different color. You will also learn about engineering applications through field trips and meetings with professional engineers. You will learn about engineering applications through field trips and meetings with professional engineers.

Forensic Science (Basic) June 14-19
Through lectures on forensic theory and practice with hands-on activities, you will be exposed to many aspects of forensic investigation. You will explore the basics of DNA. The Crime Scene House recognizes and collects evidence. The week also will emphasize the importance of on-site and field-preparative testing and analysis with real laboratory data. Field trips will be taken to visit with practicing engineers to expand your knowledge of engineering and encourage interaction with professional engineers. You will learn about engineering applications through field trips and meetings with other practicing mechanical, civil and electrical engineers.

Forensic Science (Intermediate) June 21-26
The course will introduce students to several chemistry disciplines, including analytical, organic, biochemistry and physical chemistry, and will be guided by experts in each discipline. You will have a chance to become familiar with high-performance instrumentation used in each discipline.

Cryptography June 21-26
Cryptography is a key element of the computing environment in the contemporary world, with numerous applications (finance and banking, network security, electronic voting, encrypting music and video files, to name just a few). In this workshop, you will learn the basic techniques of secure communication and acquire a working knowledge of famous cryptographic protocols such as RSA, ElGamal and Goldwasser-Mical cryptosystems, Diffie-Hellman key exchange, and others. You will receive the necessary background in number theory (indispensable for a solid knowledge of cryptography) by experts in the field with extensive teaching, research and publishing experience. You will receive ample hands-on opportunities for putting your newly acquired knowledge to work with the help of sophisticated computer algebra systems such as MAPLE or MATLAB. Fun as well as challenging moments throughout the workshop will involve deciphering cryptograms, sharing secret keys and cryptography role-playing.

Design: Think, Know, Do June 14-19
During the design camp, you will embark on an exciting journey to explore the fundamentals of visual communication. Working in teams, you will redesign a non-profit visual identity, including the logo, through a combination of research activities. You will learn how a variety of visual elements and methodologies, such as color, typeface, illustration and photography, convey an identity. You also will work with other students to understand the organization’s market, gather research on the identity, develop design criteria based on that research, develop alternative versions of the identity, refine one version as the final design solution, and present a formal presentation of your design solution. Architecture, environmental design, landscape architecture, interior design and industrial design will also be addressed during morning sessions to introduce the education, career paths and professional practices of other major design fields.

Engineering Pathways June 21-26
Hands-on activities will give you an understanding of the three basic engineering fields: civil engineering, electrical/computer engineering, and mechanical engineering. Classroom and laboratory activities will place in the engin laboratories on campus and include hands-on activities related to engineering. As an example of activities, you might determine the aerodynamic loads on a car body, apply and use strain gauges on a test sample, conduct testing on materials, or use programmable logic controllers to control an automated system. Field trips will be taken to visit with practicing engineers to expand your knowledge of engineering and encourage interaction with professional engineers. You will learn about engineering applications through field trips and meetings with other practicing mechanical, civil and electrical engineers.

Chemistry – the Chemistry of the Tomato: See it, Live it, Taste it June 21-26
Join us as we dissect the tomato and discover the chemistry lurking behind its bright red cover!

Tomato...sounds boring. However, if you attend “The Chemistry of the Tomato” course at Ohio Northern University, you are in for a big surprise, because the tomato is full of interesting chemistry! During the course, you will investigate the attributes of a tomato that glows green but can be changed to a different color. Questions will be asked. Can we determine the chemical differences between the skin (cuticles) of tomatoes and determine what molecule makes some cuticles tougher than other cuticles? Why is the tomato so tasty? Why can the tomato be grown in water or soil? Does the growing environment change the tomato’s composition with respect to water and chemical content? What is the role of sodium in the tomato, and do we need to worry about the amount of sodium in a tomato to maintain a healthy diet? Discover a rainbow of colors that can be created when we add bromine to tomato juice! What are the chemical reactions that are taking place? Can we mimic this reaction in the laboratory? This course will introduce students to several chemistry disciplines, including analytical, organic, biochemistry and physical chemistry, and will be guided by experts in each discipline. You will have a chance to become familiar with high-performance instrumentation used in each discipline.

Advanced Forensic Science June 21-26
Exposure to the major probative areas of forensic science will be provided, including fingerprint analysis with latent print collection and examination, DNA analysis, firearms identification, toxicology, and illicit drug chemistry. There will be less emphasis on the crime scene investigation aspect and a greater emphasis on laboratory science, although the crime scene house will be utilized for collection of evidence to be analyzed. Laboratory reports will be written and assessed, and you will receive feedback.

Human Anatomy Exploration with Histological Techniques June 21-26
The human body is an incredible living machine. Have you ever thought about how the different tissues and organs are organized to function? In this course, you will explore the human body by looking at tissues and organ systems using three different approaches in anatomy: gross anatomy, histology (microscopic anatomy) and developmental anatomy. Gross anatomy is the “big picture,” and you will explore this level of anatomy by looking at the organ systems and major structures of human and animal specimens. Through the microscope, you will discover the patterns and internal organization of tissues and organs. You will look at many different tissues and organs mounted on microscope slides. The theories and application of histology will be explored and how they will be explained in detail.

Mock Trial – A Means to Litigate a Case June 14-19 or June 21-26
A robbery! A theme park! A victim in a coma! Put your critical-thinking skills to work and participate in presentation of opening statements, closing arguments and cross-examinations while working as a mock trial of this authentic case. You will gain confidence and improve your analytical and speaking skills as you explore the legal process of a criminal trial. While proceeding in the legal profession are often very serious, you will have fun in this course, challenging your colleagues as you learn to think on your feet and argue objections intelligently.

Multimedia June 14-19
“Put your hands on the art and The Art will give you a week of hands-on learning about multimedia news-gathering, including finding stories, interviewing newsmakers; recording interviews for radio, TV and online; shooting and editing video; and producing stories for display over radio, TV and online. You will learn about Adobe Audition and Final Cut Pro as you put together content for a WordPress website dedicated to the weeklong experience.

Pharmacy (Only Seniors accepted) June 14-19
In the pharmacy course, you will gain insight into the various science courses and laboratories involved in the development of pharmaceutical products. Through hands-on lab and research experiences, you will learn the steps required to manufacture a product, from the use of chemicals to the use of medications. You will visit four different pharmacy practice settings and prepare a final presentation for faculty and parents.

Technology: Hands-on Technology June 21-26
Innovations and technology abound in your journey from design to competition at the Hands-On Technology (HOT) camp. You will be exposed to a world of inquiry through problem-solving exercises to obtain a deeper learning of technology in action. You will have hands-on science, technology, engineering and mathematics as you design, develop, create and test the radio-controlled hovercraft. Use state-of-the-art software programs to design your prototype while operating and using cutting-edge technologies and equipment. Examples include advanced 3-D design, 3-D printing and rapid prototyping, creating printed circuit boards, thermal forming of plastics, material fabrication, metal casting, robotics and others that develop and test your abilities to create a competition winner. Each participant will take his or her creation with them when completed.

Course Descriptions

JUNE 14-19, 2015 (five course offerings)
JUNE 21-26, 2015 (nine course offerings)