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On the verge of summer, students in Columbus, Ohio, sifted through fertile topsoil to reveal the gruesome remains of a mock murder victim, while 100 miles north, students kayaking along the shores of Kelleys Island, caught a glimpse of bald eagles flying over the shimmering waters of Lake Erie. Thirteen hundred miles to the west, in the Black Hills of South Dakota, middle school students created canvas murals illustrating their Lakota heritage. In Reynoldsburg, OH, a student showed his teacher pictures from the night he performed in front of a packed house at the Shadowbox theater.

These experiences are the foundation of the PAST Summer Bridge Programs; holistic learning environments that immerse students in real-world problems with authentic partners and audiences. Each and every program requires energy, collaboration, and commitment from the students, staff and teachers. In return, the programs provide incredibly rewarding experiences that possess impactful learning.

The PAST Foundation Summer Bridge Programs vary in intensity and content depth, depending on the age and experience of the students.

1. Level I targets students transitioning from traditional learning environments to problem-based environments.
2. Level II is appropriate for students who excel at applied learning, and
3. Level III provides advanced student leadership opportunities in addition to the applied learning aspects of a program.
4. Collegiate Level programs serve motivated adult students with intense, content-rich experiences.

These different levels empower students to take full advantage of PAST’s offerings and fully employ the underlying principles of STEM program’s design and delivery.

Four Vital Components
No matter the level, the PAST Foundation design team instills each program with four vital components:

- Real Issues,
- Real Partnerships,
- Transdisciplinary Approach, and
- Presentations of Learning.

PAST measures its success in its ability to meet these ideals, and students enthusiastically recommend PAST programs because of their moving experiences and lasting memories.

All PAST Bridge Programs begin with a Real Issue that allows students to get engaged and help solve problems facing today’s world. The second essential component of all PAST Bridge Programs is Real Partnerships. Students learn from primary resources and work directly with experts in specific fields. PAST has spent over a decade forming relationships with experts from across the professional landscape and continues to do so.

Similarly, the PAST design team ensures that each program addresses a Real Issue with a Transdisciplinary Approach.
It is crucial to understand the context, as it provides perspective and encourages essential critical thinking skills. Each program is presented in the context of the surrounding community, and incorporates Science, Humanities, Technology, Language Arts, Math, and Design. In brief, every program is a STEM learning experience.

The final component of each PAST Bridge Program is the Presentation of Learning. This is an opportunity for each student to follow scientific protocol in detailing his or her own work at the culmination of a project. Program directors provide a rubric and examples to students, who then showcase their findings through entertaining and informative expositions. These presentations incorporate film, PowerPoint™, poetry, essays, and sometimes a bit of role-playing. Most importantly, they always involve student creativity and original research.

The year 2014 was a remarkable one that saw the expansion of many PAST Foundation programs. The STEM Outdoor Innovation Labs (SOIL) grant allowed PAST to expand the Kelleys Island Field Experience to reach over 150 students, while a new partnership with Dakota Wesleyan expanded summer offerings for teachers and students in SD. It was a year full of excitement and we are eager to share the highlights with you here.
2014 Bridge Programs

- South Dakota - FITC
- SOIL- Kelleys Island Field School
- OSU Forensics
- South Dakota-Art and STEM
- South Dakota- Limnology
- South Dakota/Metro- Robotic
- Kelleys Island-Botany
- Kelleys Island-Birds
- Kelleys Island- Limnology
- Shadowbox Academy Bootcamp Summer Program
- Reynoldsburg - FITC
- Minecraft Mathematics
The South Dakota-based session of Forensics in the Classroom capitalized on students’ natural desire to solve mysteries. Students assumed the role of a Forensic Scientist and spent the week learning forensic procedures such as footprint and fingerprint analysis, evidence collection, human skeletal identification, and blood spatter analysis. At the end of each week, students applied their newly gained knowledge to processing a mock crime scene. Partnering with The Ohio State University’s Department of Anthropology, participants learned from expert forensic anthropologists, local police, and other specialists as they deepened their understanding of specific forensic techniques.

On Monday morning, as students arrived at school they realized something was amiss... they had apparently stumbled upon a crime scene. Eager to find out what was happening, students looked around, whispered to each other and asked their teachers what was going on. Soon, the PAST Foundation staff explained to students that they would be spending the week learning how to process a crime scene. Each day would focus on a different topic and OSU Anthropology students would guide participants through activities and discussions around a few main topics:

**Impression Evidence**

In the impression evidence module, students learned about transfer evidence and Locard’s Principle of Exchange, which states that when two objects come into contact with one another there will always be a transfer or exchange of material or morphology between them, thus there will be evidence of their contact. The students learned that this applies to footprints, shoe prints, finger prints, handprints, and tool marks.

Students estimated a suspect’s height by measuring foot prints and shoe prints and inserting those measurements into mathematical formulae. They made casts of outdoor shoe prints using Traxtone, a plaster-like substance that hardens quickly. After lifting the casts, the students compared them to suspect’s shoes and measured each to determine the height of the individual who made the prints.

Additionally, the students learned to examine the marks left by different tools in order to apply them to a crime scene analysis. They used various tools to make impressions in Biofoam, a spongy material that retains the shape of anything that comes into contact with it.

**Fingerprints**

In the fingerprint module students learned that each individual (even identical twins) has his or her own unique set of fingerprints. They identified the different general fingerprint patterns, such as whorls and loops, and explored how to use those patterns to match fingerprints found on objects. Using fingerprint brushes and powder, students lifted prints from water bottles, boxes, tools, and other objects. They compared the lifted prints to those on the fingerprint cards of known suspects. Students also had a chance to make their own fingerprint cards to take home.

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**Movers and Shakers**

Alexis Dzuback, Facilitator

Melissa Clark, Co-Facilitator

Alexis Dubzak, PhD student and Melissa Clark, are both from the Department of Anthropology at The Ohio State University. Together they have facilitated multiple Forensics in the Classroom events for the PAST Foundation.
Learning Objectives

a. To engage students in the use of deductive reasoning and critical thinking skills.

b. To demonstrate that math and science concepts have practical applications in crime scene investigation.

c. To have students practice public speaking and presentation skills.

Highlighted Activities

The elementary students at Woosely participated in an abbreviated program during the week. Students tested their critical thinking and problem solving skills by finding evidence to figure out who stole their class stuffed animal! On Friday, students put all of the clues together and called the police to give a description of the suspect. A few minutes later the police arrived with all of the stolen items!

Introduction continued from previous page.

Blood Spatter
In the blood spatter module, students were shown how analyzing the patterns of blood spatter and spray provides important information about the events surrounding a forensic case. The students learned that the size of a blood droplet increases as the height from which it fell increases, and that the higher the velocity of the blood that leaves a wound, the smaller the droplets will be. In the lab portion, students experimented with dropping faux blood from various heights and spattering a wall. They measured these drops and patterns and used various mathematical formulas to see how changes in the size and morphology of the blood patterns can provide information about a crime.

Forensic Anthropology
In the forensic anthropology module the students learned how to examine the human skeleton in order to create a biological profile. This allows crime scene investigators to estimate a victim’s age, sex, and stature and aids in the identification of a victim. They learned to use tooth development and eruption to estimate the age of a child and how changes in the pelvis can be used to estimate the age of an adult. They also learned that differences in the shape and size of features on the skull and pelvis indicate whether the victim was male or female.

At the end of the week students put everything they learned into practice processing a new mock crime scene. Each student had a role, whether it was an entry-exit officer, a blood spatter analyst, a fingerprint expert, or a forensic anthropologist. On Friday, each student had a chance to testify as an expert witness at the mock trial.

Sponsors and Demographic

The Woosley-Wessington session had whole school participation, over 300 students participated from grades K-12

Web Links

- http://sdinnovationlab.org/

Visit the PAST Innovation Lab web site | www.pastinnovationlab.org
This year the Kelleys Island Field School program was expanded to include the nine schools participating in the STEM Outdoor Innovations Lab (SOIL) grant. Each participating school sent 20 students and two teachers to Kelleys Island for one week of immersion in transdisciplinary problem based learning focused on environmental issues. Students explored a variety of different issues facing the Kelleys Island ecosystem from improving infrastructure at state parks to creating habitats more suitable for the migrating birds. On Friday of each week, students presented their solutions to the local community.

**Movers and Shakers**

Beth Witte is the Bridge Program Innovator at The PAST Foundation. She employs her passion and genius for organization and developing exciting experiences for students and teachers to PAST. The SOIL Grant, a Straight A Round 1 Grant was judged highly innovative by the Ohio Department of Education. In fact the grant scored 47 points ahead of any other grant in round 1.

**STEM Outdoor Innovation Lab - Kelleys Island Field School**

- Kelleys Island Field School, Kelleys Island, OH
- Content Specialists:
  - Clara Cooper-Mullin, Graduate Student, The Ohio State University, Ornithology
  - Eric McCluskey, Graduate Student, The Ohio State University, Ecology
  - Amy Strieter, Naturalist, Cleveland Metro Parks
  - Jack Franz, Volunteer Naturalist, Cuyahoga Falls National Park

The Kelleys Island program was designed as a survey course on environmental issues through the lens of TPBL to help teachers and students experience immersive learning that can be translated back into their SOILabs at their home schools. Each day was led by a different environmental specialist.

**Ornithology**

Clara Cooper-Mullin and Eric McCluskey, graduate students at The Ohio State University, led the Ornithology program. The morning activities focused on how to identify birds out in the field. Students learned how to set binoculars, use spotting scopes, look up information in field guides and add data to an online database, eBird. In total students identified well over 50 species of common Ohio birds using sight, sound and behavior cues.

In the afternoon, students learned more about the range of challenges birds encounter while migrating. In one activity students take on the roll of a bird migrating from Mexico to Canada and navigate all of the same challenges that their species of bird would encounter - inclement weather and temperature changes, pesticides and other chemicals in water and food sources, navigating around windows and other tall buildings, avoiding wind turbines and airplanes and outwitting all natural predators. This activity helped make students acutely aware of how important it is to protect natural areas on bird migration paths.
Learning Objectives

a. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
b. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
c. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
d. Return to the respective schools with this knowledge in hand to help plan, promote and construct their own outdoor learning lab.

Highlighted Activities

Bald Eagles!- While on Kelleys Island students spotted two Bald Eagle nests! Each week students would go back and monitor activity in the nest.

Art Gallery Tour- Charles Herndon invited students to take a look around his art gallery located on Kelleys Island. Students enjoyed meeting the artist, learning about his process and exploring the large sculpture garden outside. Charles uses rocks he finds on the beach to create some of his pieces. This inspired some students to look for natural materials to make their own art pieces.

Ecology

Naturalist, Amy Streiter, from the Cleveland Natural History Museum taught students to see the interrelated connections between all natural elements. Students hiked through many different areas on Kelleys Island looking for ways living things interact with each other. Upon returning to the classroom, students analyzed their notes to identify the types of relationships- symbiotic, mutualism, parasitic, etc.

Geology

Geology study was led by Jack Franz from the Cuyahoga Falls National Park. Kelleys Island is home to some of the best examples of Glacial Grooves in the world. While climbing around on the massive rock structures, students learned about glaciation, erosion and deposition. Also, unique to Kelleys Island is the Alvar on the north side on the island. Alvars are unique landforms caused by glaciation that create habitats for numerous and distinctive plants and animals.

Sponsors and Demographic

Participating Students from each School:
9 schools from all around Ohio sent 20 students and 2 teachers each week over 9 weeks for a total of 160 students and 18 teachers to the Kelleys Island Field School. A variety of subject-matter-experts in the sciences of anthropology, ornithology, geology, limnology and botany worked with each of the schools to enhance the learning experience in the field for each school.

Web Links

• https://pastinnovationlab.org/students/bridge-programs/
SOIL 2014 – BIOMED Science Academy
Day 1 – May 27, 2014

Arriving on the Island.

Students identifying animals in the field.

Observing geology on the beaches of the island.

Having fun on the beaches of Kelleys Island.

Students dentifying birds and trees in the field.

Having fun in the field.

Students posing outside the dorms at the Kelleys Island Field School.

Conducting meteorology and limnology experiments in the field.

Day 2 – May 28, 2014

Analyzing research from the field in the classroom.

Students learned how to identify bird species from Clara.

Students head down the trail at Jones Point to observe bird species.

Students stop to identify a bird’s species.

Students found a Red-Winged Blackbird nest along a trail.

Students searched for birds in the trees. A common bird species is the Red-Winged Blackbird.

Student Devan examines a group of Cedar Waxwings.

Students look for birds in the forest.

Students continued their search for bird species at North Pond.

Students observed shore birds at Barrier Beach.

A sample blog for a school participating in the SOIL Field School on Kelleys Island.
SOIL Onsite Outdoor Lab Implementations

Metro Middle School & Early College High Schools

Akron National Inventors Hall of Fame Middle School

Starling K-8 School

Reynoldsburg Baldwin Road Middle School & eSTEM Academy

West High School

Westmoor Middle School

STEM Outdoor Innovation Labs
The left column illustrates the space on the school property where the lab was constructed. The right, multi-photo column details the improvements and innovations that each school implemented as a result of their Kelley’s Island Field School experience and their own ideas.
The field school challenges students to figure out “Whodunit?” in a mock murder case as they collect evidence at a crime scene, analyze evidence in the lab, and present their findings in court.

Forensic Science and Anthropology Field School
- The Ohio State University, Columbus OH
- May 5th, 2014 – May 30th, 2014
- Director:
  Adam Kolatorowicz, Ph.D. Candidate in Anthropology
  The Ohio State University
- Assistant Director:
  Alexis R. Dzubak, Ph.D. Student in Anthropology
  The Ohio State University

The Forensic Science and Anthropology Field School is a college level program. Students participate in, from the perspective of multiple disciplines, the resolution of a mock medicolegal death investigation from crime scene discovery to courtroom testimony. Students process an indoor crime scene where foul play is suspected to have happened. Evidence then leads them to an outdoor scene where they search for and recover buried human remains. Back in the lab, they examine evidence from both scenes and attempt to identify individuals by analyzing skeletal remains and matching them against missing person files. Participants synthesize multiple lines of evidence to reconstruct what occurred at the crimes scenes. Finally, students testify as a scientific expert witness in a real courtroom in front of an actual judge under direct and cross-examination by attorneys.

Movers and Shakers

Adam Kolatorowicz, PhD
Facilitator

Adam is a PhD Candidate at the Ohio State University Department of Anthropology. He has conducted radio, newspaper, and television interviews and given 30 talks for professional, private, and public organizations. He has presented the results of 15 independent research projects.

Students taking bone and evidence samples

Students recreating both the scene and the face of the crime
Learning Objectives

a. Improve interpersonal professional and public presentation skills.
b. Work cooperatively in a group and develop team skills.
c. Employ the scientific method to answer questions related to crime scene reconstruction.
d. Appreciate the role of an Anthropologist in medicolegal death investigations.
e. Distinguish between forensic science as portrayed in popular media versus the reality of forensic science as practiced by professionals.

Highlighted Activities

Identifying Skeletal Remains
One of the tasks a forensic anthropologist may complete during a medicolegal death investigation is to aid in the identification of human remains. A biological profile is constructed based on the skeletal analysis and is used to reduce the number of individuals law enforcement may be looking for. The biological profile includes sex, ancestry, age at death, stature, and unique characteristics.

Forensic Entomology
A detailed working knowledge of the variety of insects at a death scene, the timing of their arrival, and their life cycles is critical in establishing how long it has been since someone has died. Students worked with a forensic entomologist to learn how to collect and document entomological evidence from decomposing animal remains.

Outdoor Scene Excavation
Information about the mock case led students to Waterman Farm on OSU’s west campus where the victims are suspected to have been buried in a small plot of land. The students were responsible for locating the four burials using archeological search techniques, excavating the remains, documenting the scene, and properly collecting the remains and any associated evidence.

Facial Approximation
Forensic facial reconstruction artists combines training in anatomy and art to put a face back on the skull. Layers of clay are applied; lips, nose, and ears are molded; fake eyes and even a wig are put on the sculpture to approximate what the person might have looked like when they were alive. The reconstruction is then shown to the public to elicit information.

Courtroom Testimony
The capstone activity of the field school took place on the last day in which a mock trial was held at Franklin County Municipal Court in downtown Columbus. A real judge presided over the trial and actual practicing attorneys acted as the prosecution and defense. Each student selected a forensic science or law enforcement specialty to testify as to their involvement in the mock murder investigation. The trial is open to the public and a number of people stopped by to check out what was happening. Many commented that they thought it was a real trial!

Sponsors and Demographic

Nineteen undergraduate students, Sophomores, Juniors, and Seniors
Five universities including The Ohio State University, University of Michigan, Illinois State University, Grand Valley State University (Michigan), and Northeastern Illinois University
A variety of majors included Anthropology, Biology, Chemistry, Criminology, and International Studies.

Web Links

- https://pastinnovationlab.org/resources/past-programs/fts-2014/
- http://www.dispatch.com/content/stories/local/2014/05/22/Forensics_class_at_Ohio_State.html

Visit the PAST Innovation Lab web site | www.pastinnovationlab.org
The Art & STEM program is designed to give teachers and students, real hands on experience in problem-based learning. Through the program, students worked through the design process to complete a mural utilizing a variety of math and science principles. Students developed a deeper understanding of the role humanities play in a true STEM environment. The programs concluded with a gallery opening of the student’s work.

Movers and Shakers

Ketal Patel, Facilitator

Ketal Patel is the Assistant Director of Programs at the PAST Foundation. She is an Art Educator by training with degrees from the Ohio State University. She has 8 years of classroom experience working with students ranging from PreK-12 as well as facilitating South Dakota graduate class programming for teachers.

The goals of the Art and STEM program were two-fold. The first goals was for students to understand that a true STEM environment is holistic in nature and helps them develop a deeper understanding of the humanities as well as 21st Century skills. The second goal was to help our educators learn how to truly facilitate the creation of a student driven product, in this case the creation of a 12ft by 9ft mural.

The Art and STEM program highly emphasized the interconnections among all disciplines to give students a broader perspective to break down the silos of traditional teaching and learning. The program allowed students to work in design teams where they needed to work together from initial concept design to the final presentation day. At the end if the week students and teachers were more clear about holistic teaching and learning methods as well as skills needed for the next generation of jobs and careers.

The second goal was to emphasize the need and true power of student driven products in teaching and learning environments. Educators worked diligently side by side students to complete the mural within the given timeframe. By having an educator on each team, it allowed everyone to be truly empowered in completing a product/art piece where students clearly learned and mastered the skills and goals set before them.

Media Spotlight

Skills students learned:
- Grid Design
- Color Mixing
- Critiques
- Artist Statements
- Public Speaking
Learning Objectives

a. Work in teams to accomplish a physical learning product.

b. Use interdisciplinary skills (math, science, social studies, & language arts) to answer the question: Can you change the world?

Highlighted Activities

Grid Design
A major portion of the art and STEM program revolved around math connections to many disciplines. In the mural creation, students had to problem solve and master the task of grid creation to enlarge imagery. Teams accomplished this task by first gridding their 12in by 9in sketches into 1in by 1in grids. The task was then to enlarge their imagery onto a 12ft by 9ft canvas, where they created 1ft by 1ft grid marks. In doing so, students mastered the concepts of scale as well as accuracy amongst their work and measurement.

Color Mixing
Another portion of the programming was to allow students the time to master proportion and measurement. In doing so once again, students understood the connections amongst art and science as well as other disciplines. Students learned about and experienced how to proportionally create their own colors by only utilizing the primary colors of red, yellow, and blue. This was a crucial understanding for students, as they needed to utilize their resources wisely to cover their entire canvas. By the end, students had mastered the creation of many colors, but more importantly the concepts of proportion and measurement.

Critiques/Artist Statements
Throughout the program, students were continually asked to revisit and reflect upon their learning’s as well as their accomplishments. These regular intervals of students and facilitator monitored checkpoints allowed them the opportunity to correct their work immediately and offer written and verbal feedback. In addition to the use of art critiques to reflect upon their progress, each student was also required to write an artist statement about their mural and the work and meaning that went into the creation of such a product. In doing so, the facilitators and students were able to demonstrate their learning in a variety of ways.

Sponsors and Demographic

43 GearUp Students, all female, all part of cohort 21. 4 students at Dakota Wesleyan, 1 male, 3 female.
The PAST Innovation Lab offered the Limnology program this Summer. In Rapid City, SD in conjunction with the GearUP program at the South Dakota School of Mines in Rapid City.

Students participating in the Limnology program studied the biological, geological, physical and chemical attributes of the Rapid Creek.

Students examined the ecological and environmental impacts of recreation outlets, local industries and natural events. Throughout the week students were exposed to various forms of data collection and analysis.

Students participating in the Limnology program studied the biological, geological, physical and chemical attributes of the Rapid Creek. Each day students set out in teams of four to collect information at the various testing sites. Student data collection focused on four main areas:

Seine Nets
Students used seine nets to collect fish and other aquatic organisms in the shallow waters of the river. Students learned how fish counts can be valuable indicators of health in aquatic environments.

Chemical Testing/Water Temperatures
The locations for water testing were chosen based on natural and human impacts in and around the area. Chemical analysis tests on dissolved CO2, phosphate, and pH were also performed at each site.

Beach Mapping
Participants generated beach profiles and general area maps of each site in order to determine the processes of sediment transport, wave action, currents and wind erosion.

Photic Zones
The photic zone, the depth of the water that is exposed to enough sunlight for photosynthesis to occur, was measured using a secchi disk to determine water clarity.

After visiting each testing site, students returned to the classroom lab to analyze the data collected. At the end of the week, students presented their findings to the local community.

Learning Objectives

a. Teach students to use several field based data collection techniques, analyze data, and apply oceanographic principles to study local bodies of water.

b. Guide students in understanding the interconnectedness of human populations, recreation, industry and the natural world.

c. Give students an opportunity to practice compiling and sorting relevant data, gain confidence with public presentation skills and experience working in research teams.
The robotics camp is an innovative program allowing students the opportunity to design, build and program their own robots. Student robots were built from recycled materials and arduinos. Teams learned basic programming skills to maneuver their robot through light sensitive sensors. The week culminated with student teams sharing their robots and advertising their pieces to an audience.

Highlighted Activities
In South Dakota, the Robotics camp students were able to experience this work on the School of Mines campus as well as Dakota Wesleyan Campus, teams took on the challenge to design, build and program Arduino robots. Many of the students were excited to work on a college campus and learn basic coding skills through this program.

Mover and Shaker

Jeff “Slim” Schneider is a science teacher in South Dakota as well as a member of the PAST foundation. He has a masters degree in science education. Slim works with multiple school districts around South Dakota teaching both the physical and natural sciences.

The robotics program is designed to give students a variety of experiences from designing, programming, and building. Students were asked to design a solution for robots that could meet the needs of a variety of populations as well as explore the concept of light sensitivity. The process in which they constructed their work followed the design cycle.

Students began by working in groups, brainstorming the essential components necessary to construct a robot. The teams used the design cycle to design structures, try out programming ideas, and test prototypes. Throughout construction of the robot, students learned basic soldering and electrical skills as well as Arduino programming.

Once a final design was tested and fully developed each team presented their robot at the South Dakota School of Mines. Students presented their final robot, their design solutions, and successes and challenges in programming. The robots continue to be put on display and utilized in classes in South Dakota.

Learning Objectives

a. Students will apply the design process to building a robot to complete a basic task.

b. Students will be able to identify essential components necessary to build a robot.

c. Students will apply soldering skills to basic electrical components.

d. Students will demonstrate their ability to program a robot to respond to input from the environment.

Sponsors and Demographic

50 upcoming 9th grade boys in GearUP program
In early June, students from around Ohio spent a week studying the unique natural features of Kelleys Island and their affect on island plants. The Botany study included the scientific identification and classification of plants, including their ecology, distribution, and economic importance. Students conducted a site survey of three natural areas on Kelleys Island - North Loop, Schele Preserve, and old Quarry area. At each site students completed a site survey of plant diversity, density, and mapped each site which included boundaries, location on the island, major landmarks and natural features. The week concluded with a public presentation at Kelleys Island School.

Students from all over the state of Ohio came to Kelleys Island to find out more about plant distribution, diversity and speciation. Students were able to visit specific locations on the island to see how different locations affect the species found and the distribution of species on the island.

Plant identification was the focus for the first few days as it was a foundational skill required to later study plant density and distribution. To familiarize themselves with the variety of plant species on the island, students utilized a detailed and complex key involving a broad range of botanic vocabulary to help them determine the different names of plant species. At the end of the week students could key an unknown plant all the way to its species by looking only at its leaves, bark, buds and/or twigs.

Students were taken to 3 different sites on the island, a mature coastal forest, inland grassland and a former quarry site. At each site students took samples, pictures and drew sketches which would later help them document species present, variety, and density.

At the end of the week, students presented to the local Kelleys Island community.

Students were treated to a kayak adventure to explore the shores of the island and sample the flora of Kelleys Island from the vantage point of the water.
Learning Objectives

a. Students will be able to sight identify the 10 most common botany species on the island.

b. Students will learn how to create map sites which include keys and boundaries.

c. Students will explore how natural features affect plant ecology, density and diversity of botany species.

Highlighted Activities

Ohio Botany Field Guide

Each student created their own Ohio botany field guide with an identification key, pressed leaves, photos and tips for ticky identifications.

Kayaking

Taking a break from research, students had an opportunity to try kayaking on Lake Erie. The waves were a bit high but our guide taught everyone how to paddle perpendicular to the on coming waves to give us more stability. What a fun adventure for everyone!

Sponsors and Demographic

Participating Students By School:
15 students participated, 2 Columbus Africentric Early College, 5 MC2 STEM High School, and 8 Kelleys Island summer residents

Web Links

- https://www.facebook.com/pastfoundation/posts/10152194522147338

Visit the PAST Innovation Lab web site | www.pastinnovationlab.org
Students in ornithology explored the interdependent nature of bird species and their environment. Each day students explored a different ecosystem on Kelleys Island. After identifying and collecting information at each location students posted valuable bird data to eBird, an international database. Each team of students was also responsible for researching bird adaptations, bird migration and bird behavior and presented all their findings at a public presentation at the end of the week.

During Bird week, the summer bridge participants were immersed in the natural world constantly looking and listening for the many bird species that inhabit Kelleys Island. Throughout the week students were instructed on how to bird using various birding identification skills and resources.

Each morning after breakfast blurry eyed students trotted into the field to see if they could find any new species of birds they had yet to identify. Students quickly became experts at using bird websites, blogs and various bird apps on their smartphones to help successfully ID birds. After each bird had been identified, students drew a sketch in their field notebook and wrote down any pertinent information about the sighting.

Back in the lab, students eagerly entered their data into a citizen science database, eBird, which tracks bird sightings across the world.

Students also had a special opportunity to work with a local bird expert, Tom Bartlett, at his bird banding station on Kelleys Island. Mr. Bartlett met with students in the field to watch him set up mist nets, record, document and band birds. Once birds were banded, students could hold and release each amazing wild creature.

At the end of the week, groups of students worked together on a presentation for the community showcasing what they had learned about bird adaptations, flight, habitats, and migration hazards. Each student left the program equipped with the resources needed to continue studying birds as well as an understanding of the importance of conservation and how they can make a difference.
Learning Objectives

a. To develop an appreciation of these fascinating, wild creatures and all of the perils they encounter.

b. Teach students how they can use technology to help them identify birds and how to enter their findings onto a database.

c. Encourage students engage in citizen science and be advocates for conservation.

Highlighted Activities

Bird Banding

Tom Bartlett, an Ornithology expert from the Cleveland Natural History Museum, invited the students to participate in his June Bird Banding session at Long Point on Kelleys Island. Students got a chance to hold and touch a beautiful Baltimore Oriole and a Yellow-billed Cuckoo.

Night Hike

On Thursday evening, students got to stay up a little later than normal for a night hike! Around 10pm students went to the Scheele Preserve to observe nocturnal birds. They were particularly interested in spotting eagles and tried to lure them out of their nests with recorded calls. The eagle sightings were unsuccessful but the mosquitoes came out in droves!

Web Links

- https://www.facebook.com/pastfoundation/posts/10152194522147338

Sponsors and Demographic

16 students participated representing MC2, Metro Early College, Findlay Schools, Kelleys Island Summer Residents, and Columbus Africentric Early College

Students encountering the birds of Kelleys Island in the field for the first time. Come rain or shine there was time to learn.
The PAST Innovation Lab offered the Limnology program twice during this Summer. This limnology course was held at the Kelleys Island Field School on Kelleys Island, Ohio.

Students participating in the Limnology program studied the biological, geological, physical and chemical attributes of Lake Erie. Students examined the ecological and environmental impacts of recreation outlets, local industries and natural events. Throughout the week students were exposed to various forms of data collection and analysis.

Students participating in the Limnology program studied the biological, geological, physical and chemical attributes of Lake Erie. Each day students set out in teams of four to collect information at the various testing sites. Student data collection focused on four main areas:

**Seine Nets**
Students used seine nets to collect fish and other aquatic organisms in the shallow waters off the shore. The organisms collected were identified and counted to establish an estimate of the wildlife population. Students learned how fish counts can be valuable indicators of health in aquatic environments.

**Chemical Testing/Water Temperatures**
The locations for water testing were chosen based on natural and human impacts in and around the area. At each study site, surface and bottom water temperatures were recorded at regular intervals of increasing depth. Chemical analysis tests on dissolved CO2, phosphate, and pH were also performed at each site.

**Beach Mapping**
Participants generated beach profiles and general area maps of each site in order to determine costal process such as sediment transport, wave action, currents and wind erosion.

**Photic Zones**
The photic zone, the depth of the water that is exposed to enough sunlight for photosynthesis to occur, was measured using a secchi disk to determine water clarity.

After visiting each testing site, students returned to the classroom lab to analyze the data collected. At the end of the week, students presented their findings to the local community.

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**Movers and Shakers**

Dr. Andy Bruening is a teacher at Metro Early College High School as well as a member of the PAST foundation. He has a PhD in Geology and won the Mentor of the Year Award at the Ohio State Championships 2013. Dr. Bruening works extensively mentoring students in fields as diverse as robotics, engineering and the natural sciences.

Andrew Bruening, PhD, Facilitator
Learning Objectives

a. Teach students to use several field based data collection techniques, analyze data, and apply oceanographic principles to study local bodies of water.

b. Guide students in understanding the interconnectedness of human populations, recreation, industry and the natural world.

c. Give students an opportunity to practice compiling and sorting relevant data, gain confidence with public presentation skills and experience working in research teams.

Highlighted Activities

Kayaking

Students on the Kelleys Island trip had a unique opportunity to kayak on Lake Erie. At first some students were hesitant but after getting a few pointers from the staff, they paddled away to explore the island.

Web Links

- https://pastinnovationlab.org/students/bridge-programs/limnology-ki-2014/
What happens when you combine engaged students, enthusiastic teachers, and skilled community experts in a performing arts experience like no other? Shadowbox® Academy Summer Bootcamp! The joint efforts of Shadowbox Live®, ECOT (Electronic Classroom of Tomorrow) and the PAST Foundation piloted a three-week arts intensive program that provided master class workshops in four performance disciplines: singing, dancing, acting and musicianship as well as discussions of arts administration, production, life skills, and professionalism. Led by theater and educational professionals, teachers worked alongside students gaining valuable experience in the performing arts AND created innovative curriculum that can be used in their virtual classrooms!

Inspired by its success with the STEM Rocks the Box project, Shadowbox Live® implemented the Shadowbox® Academy Summer Bootcamp. Shadowbox Bootcamp is a three-week summer intensive experience for students, 15 to 22 years of age. This year, both students and teachers auditioned in all four major Rock Art discipline areas: modern dance, rock vocals, rock instruments and acting.

The Shadowbox Bootcamp has a holistic educational goal of teaching students life skills. The program teaches students how to build resilience and perseverance, to overcome their fears, to receive constructive feedback and, ultimately, to experience the thrill of performing before a live audience. Students who have participated in the Summer Bootcamp often cite it as one of the most pivotal, life-changing events they have experienced.

This partnership creates a lasting educational legacy from the experience of the participating teachers, and gathers both qualitative and quantitative data that charts the change caused by this process as well as a path for program growth. This systematic approach raises the experience of Shadowbox’s innovative Bootcamp to new levels.

“I am excited to be an integral part of this phenomenal experience this summer! By using the arts to captivate and engage students and teachers, there is no limit on how successful this program can be.” Lori Trent

Movers and Shakers

Lori Trent
Facilitator

Lori Trent is an art educators and STEM innovator who works with the PAST Foundation.
Lori brings her passion for education and the arts to this project in support of both the students and the teachers who participated in this inaugural three-week Bootcamp at Shadoebox Live.

Teacher Professional Development

The Shadowbox Live Bootcamp was transformative for the teachers too. A wonderful synergy was created by students and teachers working alongside one another, having experiences and learning content — together! Unfortunately that does not happen often in classrooms today, but it should. I feel confident that these teachers will fold their experiences into their classrooms to help engage even more students and ignite their passions.
Learning Objectives

a. To teach students life skills such as building resilience and perseverance to overcome their fears.
b. To help students receive critical and constructive feedback.
c. To offer students the experience and the thrill of performing before a live audience.
d. To give students a real world experience of being a Rock Arts performer.

Highlighted Activities

- Participants experience workshops and training in each of the four major Rock Arts disciplines.
- Instructors for the program are professional performers.
- Participants are invited to attend Lunchbox shows.
- Participants are juried in each of the disciplines to determine their best talents.
- Participants experience rehearsals prior to the show.
- Participants join the professional performers in an evening show for the general public.

Sponsors and Demographic

Students from various high schools and colleges participated in the bootcamp. The 26 students who participated represented 12 high schools and four colleges and universities. The teachers that participated were ECOT teachers.

Web Links

- [http://www.thisweeknews.com/content/stories/reynoldsburg/news/2014/08/05/back-to-school-forensics-study-helps-identify-learning-styles.html](http://www.thisweeknews.com/content/stories/reynoldsburg/news/2014/08/05/back-to-school-forensics-study-helps-identify-learning-styles.html)
The Ohio-based session of Forensics in the Classroom capitalized on students’ natural desire to solve mysteries. Students assumed the role of a Forensic Scientist and spent the week learning forensic procedures such as footprint and fingerprint analysis, evidence collection, human skeletal identification, and blood spatter analysis. At the end of each week, students applied their newly gained knowledge to processing a mock crime scene. Partnering with The Ohio State University’s Department of Anthropology, participants learned from expert forensic anthropologists, local police, and other specialists as they deepened their understanding of specific forensic techniques.

On Monday morning, as students arrived at school they realized something was amiss... they had apparently stumbled upon a crime scene. Eager to find out what was happening, students looked around, whispered to each other and and asked their teachers what was going on. Soon, the PAST Foundation staff explained to students that they would be spending the week learning how to process a crime scene. Each day would focus on a different topic and OSU Anthropology students would guide participants through activities and discussions around a few main topics:

**Impression Evidence**
In the impression evidence module, students learned about transfer evidence and Locard’s Principle of Exchange, which states that when two objects come into contact with one another there will always be a transfer or exchange of material or morphology between them, thus there will be evidence of their contact. The students learned that this applies to footprints, shoe prints, finger prints, handprints, and tool marks.

Students estimated a suspect’s height by measuring foot prints and shoe prints and inserting those measurements into mathematical formulae. They made casts of outdoor shoe prints using Traxtone, a plaster-like substance that hardens quickly. After lifting the casts, the students compared them to suspect's shoes and measured each to determine the height of the individual who made the prints.

Additionally, the students learned to examine the marks left by different tools in order to apply them to a crime scene analysis. They used various tools to make impressions in Biofoam, a spongy material that retains the shape of anything that comes into contact with it.

**Fingerprints**
In the fingerprint module students learned that each individual (even identical twins) has his or her own unique set of fingerprints. They identified the different general fingerprint patterns, such as whorls and loops, and explored how to use those patterns to match fingerprints found on objects. Using fingerprint brushes and powder, students lifted prints from water bottles, boxes, tools, and other objects. They compared the lifted prints to those on the fingerprint cards of known suspects. Students also had a chance to make their own fingerprint cards to take home.

**Movers and Shakers**

Alexis Dzuback is a post-grad student in the Department of Anthropology at the Ohio State University. Alexis is passionate about her forensics field work and has facilitated many of the PAST-sponsored Forensics in the Classroom events in both Ohio and South Dakota. She plans on pursuing her PhD in Forensic Archeology in the fall of 2015.
Learning Objectives

a. To engage students in the use of deductive reasoning and critical thinking skills
b. To demonstrate that math and science concepts have practical applications in crime scene investigation
c. To have students practice public speaking and presentation skills

Introduction continued from previous page.

Blood Spatter
In the blood spatter module, students were shown how analyzing the patterns of blood spatter and spray provides important information about the events surrounding a forensic case. The students learned that the size of a blood droplet increases as the height from which it fell increases, and that the higher the velocity of the blood that leaves a wound, the smaller the droplets will be. In the lab portion, students experimented with dropping faux blood from various heights and spattering a wall. They measured these drops and patterns and used various mathematical formulas to see how changes in the size and morphology of the blood patterns can provide information about a crime.

Forensic Anthropology
In the forensic anthropology module, the students learned how to examine the human skeleton in order to create a biological profile. This allows crime scene investigators to estimate a victim's age, sex, and stature and aids in the identification of a victim. They learned to use tooth development and eruption to estimate the age of a child and how changes in the pelvis can be used to estimate the age of an adult. They also learned that differences in the shape and size of features on the skull and pelvis indicate whether the victim was male or female.

At the end of the week, students put everything they learned into practice processing a new mock crime scene. Each student had a role, whether it was an entry-exit officer, a blood spatter analyst, a fingerprint expert, or a forensic anthropologist. On Friday, each student had a chance to testify as an expert witness at the mock trial.

Left: A student learning the art of obtaining and lifting fingerprints in the hands-on lab.
Right: Students staged a mock crime scene with which clues and evidence could be collected to solve a crime.

Sponsors and Demographic

The Ohio State University
Department of Anthropology

Reynoldsburg City Schools

The Reynoldsburg High School session had participation from 30 incoming 9th Grade Students.

Web Links

Video games drive you crazy? Why not use them to improve your child’s math skills? Minecraft Mathematics is an enrichment program offered by The PAST Foundation. Minecraft is a video game about breaking and place blocks to build 3D structures. We believe that the skills that are developed by playing Minecraft help students develop creativity and problem solving skills.

Media Snapshot

To teach students basic skills:

- physics
- mapping
- scale and ratios
- problem-solving
- interpersonal skills

One of the video games that is taking the world by storm is Minecraft. Minecraft was created by Mojang, an indie game developer studio based in Stockholm, Sweden. Mojang was recently purchased by Microsoft for $2.5 billion. Not only does it captivate players, it also teaches math, engineering, and programming skills. This is a relief for parents who are concerned about screen time. Minecraft also has an education component in which allows you to write your own content, thereby creating your own customized version.

We offered four different Minecraft programs. Our pilot was conducted at Wickliffe Progressive School in Columbus, Ohio last January and February, as an afterschool program for 4th and 5th graders. Students worked in teams of three and were presented with problem scenarios to solve using the design cycle process. They exchanged ideas, collaborated and ultimately created a solution to share to an authentic audience. The program created such a buzz that we offered a modified program as a summer enrichment experience in three different locations -- two in Columbus and one in South Dakota.

The summer programs were conducted as weeklong immersion experiences lasting ½ day for elementary students and an entire day for middle school students. The summer programs expanded beyond math, engineering, and programming to include literacy and communication skills. Students worked in pairs, selected a local or famous building to replicate, sketched prototypes, journaled their process, modified their designs, and finally shared their solutions.

As a result, students developed an understanding of basic physics concepts including circuits, a knowledge of coordinate planes, which can help describe physical locations, knowledge of geographic places, and experience scale and perspective in a real and meaningful way.

Steve Lewis is a former STEM innovator with the PAST Foundation and is a PhD student in Mathematics and Game Theory. Steve is passionate about ways to use gaming to make mathematics fun and accessible to students. He is an avid Minecraft gamer and inspires all of his students to dream big and use math to make the dream a reality within the Minecraft worlds.

Movers and Shakers

Steve Lewis, Facilitator

Visit the PAST Innovation Lab web site | www.pastinnovationlab.org
Wickliffe Progressive School, Upper Arlington, Ohio (4th-5th grades)  
After school program January & February 2014 - 25 students

Dakota Weselyn University, South Dakota (4th - 6th grades)  
Summer Program, June 6-13, 2014 - 22 students

Metro Middle School, Columbus, Ohio (6th-8th grades)  
Summer Program, July 14-18, 2014 - 25 students

Wickliffe Progressive School, Upper Arlington, Ohio (4th-5th)  
Summer Program, July 21-25, 2014 - 50 students

Learning Objectives

Develop an understanding of basic physics concepts including circuits, knowledge of how coordinate plans can help describe positional locations, delve into scale and perspective, develop critical life skills like problem solving and working collaboratively, and expand their literary and communication skills.

Highlight Activities

Students discover organically the equation for modelling a 3-Dimensional sphere and the topologies of a pagoda arch and a ships’ hull in the course of modelling their Minecraft palaces.

Several high school interns helped middle school students from Metro and Wickliffe Progressive write, assemble and implement complex javascript functions to enable the students to unlock aspects of the Minecraft platform to create dynamic and responsive themed constructs.

Brothers and sisters were able to sit together in a class for a week and not have one fight. In fact several of these siblings were able to meaningfully collaborate and problem solve solutions for complex constructs that had major design constraints.

Sponsors and Demographic

Visit the PAST Innovation Lab web site | www.pastinnovationlab.org
2014 Design Challenges

- STEM Rock the Box - Shadowbox Live
- Spring Fling Ohio
Did you ever have a dream to be on stage? A desire to entertain others? Students from area STEM high schools did just that.

Students interested in performing first started with auditions in two of their preferred rock arts disciplines. Once accepted into the program, students begin an intensive two week rehearsal schedule. Students worked side by side with professional artists to learn comedy acting, singing, dance, musical instruments, backstage, theater lighting and sound, and other related entertainment jobs. At the end of the week, students performed in a Shadowbox Live showcase.

Students from Columbus Africentric, Metro High School, Reynoldsburg eSTEM and West High School participated an extraordinary performance experience on Monday, March 3rd.

This program aims to provide students with an authentic experience of life as a performer. Following auditions, students were cast in either one or two disciplines depending on their talents. Not all students are accepted into the program - which further exposes them to the competitive nature of this occupation.

Students are welcomed into the program with everything needed to be successful. Their informational packets include a letter of assignment with their instructor’s name and list of expectations, an information sheet for costumes, an information sheet for media relations to help with personal promotional and instructional materials to help guarantee the students’ success.

Next a rehearsal schedule is created for each student. With over 30 participants, once the rehearsal schedule is set students are expected to attend those times. With a two week window to perfect the performance, it is critical that everyone takes responsibility for their own success.

Finally, the students put their knowledge into practice by performing alongside seasoned actors, singers and musicians for a real audience in a one time only sketch comedy and rock ‘n rock show called “STEM Rocks the Box” to a sell out crowd. This program is designed to give the students a real world experience and explore the possibility of a career in entertainment.
Learning Objectives

a. Experience the life of a performer and explore the possibility of a career in entertainment.
b. Learn to schedule work, rehearsal and performance timelines and schedules
c. Experience the audition process and the character traits that make competing in theater an easier and manageable experience.
d. Integrate financial planning and budget strategies into the process to give students a leg up for managing a career where a steady paycheck is not always a given.

Highlighted Activities

- In its fourth year, STEM Rocks the Box had the largest class size ever, and the most returning students.
- For the first time ever the highlight of the STEM Rocks the Box Event, the capstone performance was held in the evening to a standing-room-only house.
- Also for the first time in the history of the STEM Rocks the Box history performance spaces were held in a newly built rehearsal space, and auditions were held at COSI.
- COTA and Franklin County Commissioners stepped up to provide discounted bus passes to students participating in the program.

Sponsors and Demographic

- Columbus Africentric West High School
- Metro
- eSTEM

Participating Schools by Student:
Columbus Africentric - 1    Metro High School - 19    Reynoldsburg eSTEM - 6
West High School - 8

Web Links

- https://pastinnovationlab.org/students/design-challenges/
- http://www.shadowboxlive.org/academy/steam-rocks-the-box
Students interested in physics, culture and live performing were again offered the chance to compete in the Spring Fling 2014 at Pickerington High School. The teams competed in the Catapult, Trebuchet and Globe Theater Challenges. 11 teams of future warlords or engineers competed with their catapults and trebuchets and three teams of aspiring playwrights, actors and directors participated in the Globe Challenge. The Globe Challenge was particularly exciting this year as scenes from Shakespeare’s “Macbeth”, “Hamlet” and “Julius Ceasar” were all adapted to modern themes and circumstances to thrilling effect.

Spring Fling is a Science Technology Engineering and Math [STEM] centered challenge and competition for students of all ages. High School participants will design and build trebuchets. Along with this classroom built machinery, students have an opportunity to design heraldic banners, and modernize a scene from a famous Shakespeare play.

Here are the challenges for 2014:

- Siege Machine: Catapult Challenge
- Siege Machine: Trebuchet Challenge
- Castle Siege Board Game Challenge
- Globe Performance Challenge
- Heraldic Banner Challenge
- Marshmallow Catapult Challenge

The Catapult Challenge is for students in grades 5 - 8. Students will design, build and operate a catapult within the prescribed specifications in order to compete against other teams by flinging water balloons at a set of fixed targets to demonstrate the team’s ability to control and predict where the water balloon will land.

Catapult Competitions (three attempts each)
The catapult competition will consist of three challenges. Points can be earned in each challenge and the winning team will be the team with the most points earned throughout the three challenges. A total of 110 points can be earned overall.

The Trebuchet Challenge is designed for students in grades 9-12. Students will design, build and operate a trebuchet within the prescribed specifications in order to compete against other teams by flinging water balloons at a set of targets to demonstrate the team’s ability to control and predict where the water balloon will land.

Trebuchet Competitions
The trebuchet competition will consist of three challenges. Points can be earned in each challenge and the winning team will be Introduction
Learning Objectives

a. Experience rapid prototyping and construction deadlines in response to a design constraint in the field.
b. Learn to apply physics, engineering and mathematical concepts to a real-world problem or challenge.
c. Opportunity to apply modelling a diagramming skills to illustrate their designs and make their solution understandable to the public at large.
d. Integrate teamwork and social skills into a flexible strategy for building a prototype or putting on a performance.
e. Practice apply and adapt writing and modelling skills in a competitive environment.

Highlighted Activities

- Student teams competing against each other in the trebuchet challenge showed both teamwork and good sportsmanship. There were not enough weights for all teams to compete without sharing. Teams had to share their weights to get the job done.
- The accuracy and precision of the student-designed seige machines continued to improve with a variety of innovative designs and modeling strategies employed in the competition.
- The Globe Theater entrants were well-prepared and wildly original in their adaptations to three of William Shakespeare's most innovative plays to modern themes and situations.

continued from previous page,
the team with the most points earned throughout the three challenges. A total of 110 points can be earned overall.

The Globe Performance Challenge is for students grades 6-12. In this challenge select a scene from a Shakespeare play and modernize it for today's issues and audiences. Each of the competing teams compete before all the assembled Spring Fling competitors and will be judged by a panel of three judges on their originality, adaptation to the core scene and use of props.

Students, judges and team leaders meeting to determine launch order and the strategy for sharing weights amongst competing teams. Students performing in the Globe Theater Challenge adapting a Shakespeare scene to a modern-day issue within a 20-yard stage. Volunteer students working as targets for the competing students in the field in both the accuracy and precision as well as the moving target.

Sponsors and Demographic

metro

Participating Schools by Student:
Pickerington High School 10 teams (23 students), Metro Early College High School 1 team (6 students)