



# 2.0 Spotlight



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## 2.0 STEM Projects (Reported)

### 3D Engineering Design

California (San Diego)  
Ohio (Wright-Patt)

### Aerodynamics

Oklahoma (Fort Sill)

### CO<sub>2</sub> Dragsters

Oklahoma (Tulsa)

### Construction

Ohio (Wright-Patt)  
Oklahoma (Canute) - *Spring*

### Forensics

Texas (Houston)  
West Virginia (Charleston)

### Robotics

Maryland (Pax River)  
Ohio (Wright-Patt)  
Oklahoma (Fort Sill)  
Oklahoma (Oklahoma City)  
Oklahoma (Tulsa)

### Rocketry

Ohio (Wright-Patt)



## Spotlighting STEM Projects

One of the most important components of a successful STARBASE 2.0 program is the chosen STEM Project. This month, we will spotlight some of the STEM projects going on at different STARBASE 2.0 sites from around the country, so you can identify other resources for STEM Project ideas.

During the collection of this data, it became clear that several 2.0 programs are enriching student learning by incorporating several different STEM Projects into their schedules.

### STARBASE RAPID CITY

STARBASE Rapid City has three STARBASE 2.0 programs/locations at this time. They have combined efforts with the local 4-H and Operation Military Kids (OMK) to provide two separate programs and have called this collaboration "STARBASE 2.0 Tech Wizards." They serve North Middle School, which is predominately Native American, and Douglas Middle School, which has a very high transient population as it serves Ellsworth Air Force Base.

The key part of their STEM activities is robotics. These locations are mimicking a competition similar to First LEGO League. They meet every other week, and during each session, they also do a short, "WOW" science or engineering activity where they focus on a different science or engineering discipline each session. They cover physics, chemistry, EDP, solar power, electricity and circuitry, as well as quick engineering and teamwork challenges.

For their third STARBASE 2.0 outreach program, STARBASE Rapid City has collaborated with CATERPILLAR and have a STARBASE Short Circuit First LEGO League team. This is their second year with the team, and their entire focus is in line with the First LEGO League team.

"The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' but 'That's funny...'" -- Isaac Asimov

## STARBASE OKLAHOMA

The DoD STARBASE Oklahoma 2.0 STEM Projects this year include a variety of endeavors. Most of the DoD 2.0 sites will be utilizing activities that include the use of a flow visualization tunnel. The tunnels use a harmless fog that is passed through a clear wind tunnel. This apparatus demonstrates the airflow around any object and reveals drag-inducing features.



In Tulsa, the Hamilton Elementary site will be building CO<sub>2</sub> dragsters and SeaPerch submersible robots. The Springdale Elementary site will also build CO<sub>2</sub> dragsters, but will compete in the Engineering Challenge contest by manufacturing a ping pong ball launcher in the spring.

On the west side of the state, the Ft. Sill 2.0 site will have several activities. Their STEM Projects this year include building a radio controlled blimp and airplane, building a SeaPerch submersible robot, and studying aerodynamics using a wing cutter.

The Oklahoma City 2.0 site at Carl Albert Middle School will study STEM through LEGO Mindstorms. Finally, the 2.0 site at Canute will begin in the spring of 2013 and will study architecture through utility building construction.



## STARBASE-ATLANTIS PAX RIVER

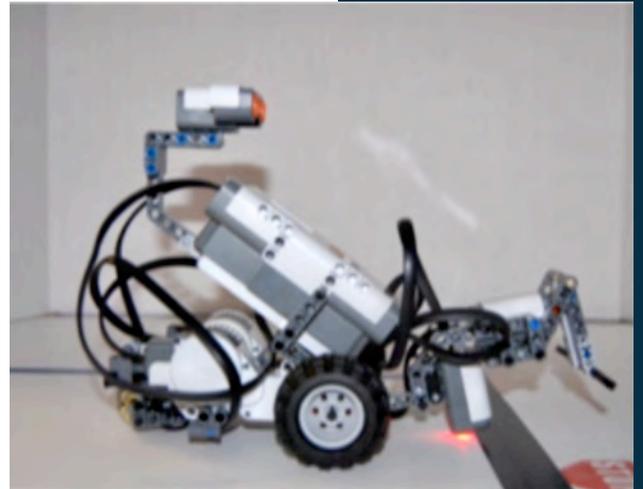
After a phenomenal first year participating in the Scalextric4Schools competition, the Pax River STARBASE 2.0 Program is scheduled to utilize Robotics as this year's Spring Ridge Middle School STEM Activity. Student recruitment is well under way. So far, 14 mentors (both civilian and military) are signed up and eager to begin sessions in January!

Teams will be building their own LEGO MindStorms robots and learning how to use the NXT 2.1 Programming software to control their robots using the touch, ultrasonic, and light sensors.

An "In-House" competition will be held, where teams will complete mini-challenges after learning how to use each of the sensors, earning points based on their final results. The mini-challenges are meant to teach students basic programming skills in preparation for completing missions from the 2010 First LEGO League (FLL) Competition, "Body Forward."

Teams will work at their own pace to work through the mini-challenges, earning points based on their robot's performance, documentation of their use of the Engineering Design Process, and evidence of teamwork skills implemented throughout the challenges. Each "Body Forward" mission that they finish will also be scored and added to their points. Awards will be presented to the teams with the highest total scores, based on the total number of challenges that each team is able to complete.

Mentor training has been scheduled for the first week of December, and club sessions are due to begin January 10, 2013. It will be exciting to see how many challenges the students are able to complete during their 20 hours of meeting time!



## STARBASE-ATLANTIS SAN DIEGO



STARBASE-Atlantis San Diego recently held its fifth STARBASE 2.0 meeting of the 2012-2013 school year. Over the past five weeks, students and mentors have covered an incredible amount of material and have designed their first CO<sub>2</sub> car on the PTC ProEngineer 5.0 CAD software.

During the first three weeks, they started with a basic primer lesson where their students designed and built multi-faceted cubes and connecting struts. They then assembled those cubes and struts into one unit.

On the fourth week, the students began work on their prototype cars. It has been fascinating to see how much the students have been able to accomplish in such a short span of time.



They believe all the credit goes to their absolutely fantastic mentors. The students have really bonded with their mentors and the positive impact has been self-evident.

During the Thanksgiving school break interval, they will be printing the student's CO<sub>2</sub> cars in their 3-D printer, so when the students return, they will be ready to begin time trials.

Engineers from Naval Air Station North Island, Senior Enlisted training instructors from Training Support Center, San Diego, UCSD student(s), and a 6th grade teacher have volunteered to spend twenty five after-school hours working with 22 selected sixth-grade students from Ira Harbison Elementary School, National City School District on teamwork, goal-setting, and their CO<sub>2</sub> dragster STEM project.



## STARBASE WRIGHT-PATT

DoD STARBASE Wright-Patt 2.0 students will undertake four major STEM topics this year. The 7th and 8th grade students will be working on First LEGO League (FLL) Robotics from August to at least December. If they continue further into the competition season, they may work until April.



The 6th grade students will be working on five different major topics from September to April. These topics include 3D Engineering Design with CREO, Rocketry with the Ohio Rocketry Club, Bridge Building, Energy, and STEM Career Exploration.

The 6th grade students are currently working on their CREO Design derby cars. The students began their experience by testing various car models in a wind tunnel to determine which body type was the most aerodynamic. The process continued as students worked on sketching their car profiles.

Once this was completed, students worked with their mentors to create a basic car design using the CREO program. They were able to fine tune their designs, adding fins, spoilers, rounding and/or chamfering edges, and adding a space for additional mass.

The cars were saved as STL files and are in the process of being printed with the UPrint Plus 3D printer. Once all cars are printed, the students will test them with the wind tunnel, add mass as needed, and prepare them for racing. The derby car race will take place this winter. While their cars are being printed, the students will explore the engineering behind bridge building.



They began this experience by completing a team building exercise to create a bridge from parts they were given that was strong enough and big enough for each student and mentor to crawl through.

They are also working with KNEX to build a prototype of the bridge they will build out of toothpicks. These bridges will be tested for strength in the spring.

The final project for the 6th grade students will be rocketry. Partnering with the Team Ohio Rocketry (TOR), the students will create a rocket and test their designs using a simulation. Students will then build and launch their rockets in the spring. The Energy project has students partnering with the local electric company, Dayton Power and Light (DPL), to explore energy saving methods. Each student will receive an at-home kit with items such as a water saver shower head, fluorescent light bulbs, and temperature gauges.

Energy exploration will continue with students using an Energy Bike and creating catapults. The 6th grade students will visit WPAFB labs for presentations, including one on using the scanning electron microscope, and investigate careers in STEM fields.

The 7th and 8th grade students started their experience last summer by attending an FLL camp sponsored by the Dayton STEM Academy and WPAFB. They took this expertise into the competition season. This year's FLL topic is Senior Solutions.

Students are working on projects that help senior citizens with everyday tasks, as well as building and programming an autonomous robot that can complete tasks on a 4' x 8' table. The FLL program allows students to become robotic engineers, marketing professionals, production engineers, teamwork experts, and programming wizards. Teams participated in a mock competition in November to help them prepare for their Regional Competitions in December.



# The Details: STEM Crime Scene Investigators

## TEXAS STARBASE 2.0 - HOUSTON

October 4, 2012 was a big day for some 6th grade students at Milstead Middle School. It was the first Texas STARBASE 2.0 afterschool program class, and it quickly became evident that this Forensics program was not for the faint hearted! Working as forensic scientists, the students' first investigation was to solve the case of Leopold Reyna. This required performing an autopsy on Leopold (a frog) to examine stomach contents and draw a conclusion of innocence or guilt based on observable evidence.



The following week, volunteers from the Houston Police Department's Latent Lab explained crime scene procedures and taught students how to record and analyze fingerprints. Students quickly put this knowledge and skill to good use during their next two class meetings when they worked as a forensics team to secure a mock crime scene, take photos of crime scene evidence, dust for latent prints, examine "blood" and food to determine possible time of crime, and identify witnesses.



These are only a few of the many hands-on, minds-on investigations that are scheduled for students participating in the Texas STARBASE 2.0 Houston afterschool program, a pilot collaborative initiative of the DoD Texas STARBASE Program, the Pasadena Independent School District, Milstead Middle School, and the Texas Afterschool Centers on Education. The program is an active multidisciplinary approach to Crime Scene Investigations for students and targets 6th graders who have completed the 25 hour STARBASE Program during their 5th grade year.

During the coming school year, students will meet two hours per week at Milstead Middle School to explore and investigate a variety of forensic science content. All activities are student centered and simulate real world context for learning. A number of community agencies will provide guest instructors, and two weekend field trips with parent involvement are scheduled.

Activities are correlated to state and national standards and are designed to enhance students' problem solving abilities, teamwork skills, scientific research proficiencies, and analytical thinking skills.

## WEST VIRGINIA STARBASE 2.0 - CHARLESTON

**Forensic Science:** Students at South Charleston Middle School learned the fundamentals of forensic science alongside mentors from Dow Chemical, Bridgemont Community and Technical College, and the WV Air National Guard. Their club mascot "Bob," the skeleton puppet, also lent a hand with the activities. The first half of the 10-week program focused on the basic knowledge and skills necessary to be a successful forensic scientist.

### Activities included:

1. *Latent Fingerprint Collection* - Using fingerprint powder to dust for prints, then collecting the developed prints with adhesive tape, and using the cyanoacrylate vapors to "fume" fingerprints that cannot be collected with the dusting technique.
2. *Blood Analysis* - Learning how to "type" a blood sample and use the blood type to eliminate suspects and studying blood spatter patterns.
3. *Document Analysis* - Using the science of chromatography to determine the type of pen that was used to produce a forged signature on a document.
4. *Forensic Odontology* - Creating dental impressions and studying bite marks.
5. *Field Trip* - Students visited the WV State Police crime lab and met with a forensic scientist.





Tragedy struck STARBASE 2.0 about halfway through the program. Their beloved mascot, Bob, was kidnapped. The only clue to his disappearance was a mysterious backpack that the alleged kidnapper dropped on the far side of a raging river. Students and mentors worked together to apply the steps of the Engineering Design Process by developing devices to reach across the treacherous river and retrieve the backpack. Once retrieved, the backpack contained a variety of clues students used to solve Bob's kidnapping and rescue him from certain death. Students used their forensic science skills - blood typing, fingerprinting, bite mark analysis, and document analysis to unravel the clues. The investigation uncovered a set of GPS coordinates that students used to locate additional clues and ultimately to locate Bob, who was discovered unharmed, chained to a table and handcuffed, in an abandoned science lab. Sadly, Doug - one of their dedicated mentors - was implicated as the kidnapper.

**Genetics:** Students at Horace Mann Middle School studied the science of genetics, learning about DNA, heredity, inheritance, and genetic mutations. Along with their mentors, students prepared for their hands-on investigations by designing and decorating lab coats.

**Activities included:**

1. Studying inherited traits like earlobe shape, the ability (or inability) to "roll" their tongues, and whether or not they possessed the ability to taste certain substances on tasting papers.
2. Growing corn plants that carry the genetic mutation for "albinism," which results in plants lacking the ability to produce chlorophyll, a chemical required for photosynthesis. Students used Punnett squares to determine the probability that a plant from parents with a specific genetic makeup would express the albino trait. Then they planted seeds and collected data to compare the number of normal "healthy" plants to the number of albino plants.

3. Studying the genetics of the common fruit fly. Students began by studying the life cycle of *Drosophila melanogaster* - the common fruit fly - as it develops from an egg to a mature adult fly. They also learned how to determine the sex of a fruit fly by anesthetizing flies and studying them under magnification with the help of iPads and Proscope digital microscopes. Students then began raising their own colonies of fruit flies, by creating "fly cultures." The cultures were created by crossing normal "wild type" flies with abnormal flies with various genetic mutations that affected wing and eye development. Students used Punnett squares to predict the likely genetic makeup of the offspring in their cultures.



4. As a culminating activity, students used an iPad app called "Stop Motion" to design and produce stop-motion videos about various genetics concepts. They researched content, developed storyboards and scripts, designed and built characters, sets and props, then recorded their videos.

STARBASE partnered with the University of Charleston to offer a course called "Science Practicum." Four college students registered for this course and earned college credit and their community service "Liberal Learning Outcome" for working as mentors. In addition to working with the middle school students, UC students were required to maintain a journal and to write two reflective papers.



## Spotlighting the Way Ahead:

### The 2012-13 Call for Participation

Throughout the 2012-13 school year, this newsletter will continue to spotlight the achievements, partnerships, and tips of the participants of the STARBASE 2.0 program.

Each month, a call will be sent out to all site participants focusing on a different aspect of the STARBASE 2.0 program.

The December 2012 issue will focus on the collaborations that make the STARBASE 2.0 program possible. Participants are asked to share more about your program's collaboration by sending information to [jennifer.buck@mac.com](mailto:jennifer.buck@mac.com).

## Spotlighting Collaboration: STARBASE Oklahoma - Tulsa & The Oklahoma Aeronautics Commission

Springdale Elementary School DoD STARBASE 2.0 club is utilizing a unique opportunity in building their CO<sub>2</sub> dragsters this 2012-2013 school year. The Oklahoma Aeronautics Commission awarded a grant to the STARBASE program to purchase flow visualization tunnels.

Using the engineering design process and previous knowledge of Newton's Three Laws of Motion, the 2.0 club members designed prototypes of their dragsters and tested the models' aerodynamics in the flow visualization tunnels.

During the experiment, fog traveled through the clear wind tunnel, demonstrating the airflow around the dragster and revealing drag-inducing features. This test exposed areas that might slow their dragsters and provided the knowledge to improve their prototype redesigns.

