



Helios STEM Schools Updates



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January 2014

Issue 3

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A Message from Science Foundation Arizona

Science Foundation Arizona is honored to be working side-by-side the seven programs selected as Helios STEM Schools. This program's key premise is that STEM education is an integrated, interdisciplinary approach to learning that provides problem-based and relevant experiences for students. Ultimately the initiative will support the successful implementation of Arizona's College and Career Ready Standards and the anticipated Next Generation Science Standards.

Each school or district is transforming its approach to STEM education in a way that addresses its particular needs and builds on its unique advantages. Successfully implemented programs will prove they can be sustained and measured and will ultimately offer STEM models that can be used statewide. The schools describe their progress in this newsletter to share lessons learned and to express appreciation to everyone contributing to the programs' successes.

Alhambra Elementary School District

Mark Laliberte, Academic Coach

At the Alhambra Elementary School District (AESD) we have just completed 2nd quarter and are pleased to say that we had our first group of 8th graders complete a full round of our STEM **ActionLabs**. These labs expose students in a hands-on way to concepts such as structural engineering, alternative fuels, and forensics (just to name a few). Students consistently called the **ActionLabs** their favorite class. We are eagerly awaiting the results of the STEM Attitude Survey to see the impact these classes have had on students' views about STEM and ideas about what degrees/careers they wish to pursue as they continue on life's path.

In addition to our STEM **ActionLabs** – which are now part of the daily curriculum at Granada East and Cordova Middle- AESD is pleased to have a robust extra-curricular STEM Club Program. In all, more than 600 students attend over 25 clubs that include MESA, Design Squad, Engineering is Elementary, and FIRST LEGO League. Each of AESD's 15 schools has a variety of STEM Club offerings for students across numerous grade levels. For the purpose of brevity, this article will highlight two.

Design Squad

Engineers figure out ways to apply science concepts, such as electricity, to make things people want and need. In Design Squad (DS), our 4th grade students apply science concepts to design creative machines based on a specific challenge. In the process, students learn about the science and engineering behind the challenges as well as work on team building and collaborative strategies. There are over 200 students in eight schools that currently participate in Alhambra's Design Squad Clubs weekly for 25 weeks. At the end of the year, students in Design Squad participate in unknown challenges with each of the other participating schools during the district's STEM Showcase. They have approximately one hour to complete the engineering challenge with limitations on materials, demonstrate how it works, and compete against each of the other DS teams.

Engineering is Elementary

Engineering is Elementary (EIE) is designed to give second and third grade students the opportunity to use their knowledge of science and engineering to work collaboratively to design and create solutions to problems. Students are introduced to the Engineering Design Process through the reading of high quality literature and well-planned out activities. The Engineering is Elementary program is housed on the campuses of eight of our schools, serving over 288 students who participate weekly for 25 weeks. Throughout the year, students are engaged in high interest topics such as Insects/Plants, Light, and Sound. Students have the opportunity to explore pollination, design a lighting system, and work on a challenge to create a system.



Two students from Ms. LaValley's 3rd grade class at Sevilla Primary School work on a hand pollinator in their Engineering is Elementary club.

Altar Valley School District

Kathryn Zanin, STEM Coordinator

December and January were busy and exciting months for the STEM teachers in the Altar Valley School District. In the month of December, teachers worked closely to create and deliver STEM lessons using the “I teach, We teach, You teach” model. The model provided teachers with an opportunity to see a STEM lesson taught, and then practice presenting a lesson to their students with guided support. The process began with the STEM Coordinator working alongside each teacher, discussing current units and lessons they were teaching in science. Using the 5E lesson plan template and Next Generation Science Framework, teachers identified standards, engineering practices, cross cutting concepts and core ideas to present during each lesson. By looking at the nouns and verbs in the standards the teachers were able to identify specifically what they wanted students to know, and be able to do, at the end of each lesson. This process allowed teachers to develop precise lesson objectives, which were assessed using various active engagement strategies. Within three weeks, teachers representing preschool through eighth grade, watched, co-taught, taught and debriefed each lesson to identify areas of strength and refinement to improve their lesson. Throughout the process teachers believed the time spent developing a STEM lesson was invaluable.



Julie Venglarcik, facing and Karla Tubal test their Whirligig for accuracy.



Dan Nicolette discussing engineering designs for Whirligigs with DaNel Hogan.

In January, twenty four supporters of STEM; teachers, partners, Helios, Science Foundation Arizona, elected officials and administrators came together to experience AVSD’s STEM Initiative during a STEM teacher professional development day. The day began with Dr. Nathan McCann, Superintendent, providing a brief overview of where the District started its journey with STEM and continued to where the STEM Team is today. Dr. McCann publically thanked and presented each organization represented with a coffee cup embossed with the AVSD STEM logo. Next, DaNel Hogan, STEM Coordinator for the Pima County Superintendents Office, had everyone participating in a Science of Nature activity. Following Ms. Hogan’s activity was Dr. Jo Anne Vasquez, author of “*STEM Lesson Essentials*”, who had teachers work through a STEM lesson and debrief the lesson as the focal point for explaining what made each part of the lesson multidisciplinary, interdisciplinary or transdisciplinary. This process made it possible to connect the lesson with each component of a multidisciplinary, interdisciplinary and transdisciplinary unit. A key benefit to this session was the teachers’ ability to stop the lesson, ask clarifying questions and unscramble their confusion about STEM. After a great lunch, teachers worked to enhance STEM lessons they had written over the winter break, taking the time to talk with local experts and explaining their lessons/units to Dr. Vasquez. Dan Nicolette, 7th – 8th teacher stated, “This is the best professional development we have had this year. Having the time to talk to others about math and hear what my colleagues are doing in their class really put STEM into perspective for me.” Being a part of the Helios grant and supported by Science Foundation Arizona has provided teachers with a new fresh perspective to teaching and learning for all students.



Bagdad School District

JJ DePanfilis, STEM Site Coordinator

In the Bagdad Unified School District, STEM is incorporated both in and outside of the school day! At the high school level, Anatomy students are utilizing their laptops, purchased through the HELIOS STEM grant, during physiology labs to create lab write-ups, graphing results, and sharing these files via Google Docs, all while improving their technical writing skills. The High School Engineering Class, while working on their solar car, has drafted plans, built solar powered models, ran tests and analyzed the results on their new laptops, as well.

The Science and Engineering Fair is quickly approaching as Engineering Week is planned to motivate students with a presentation involving a STEM competition supported by the Engineers and Metallurgists working at FMI. This is an exciting weeklong event highlighting the skills and work place competencies in the field of Engineering. Research is already underway in the 7th grade classroom, which is engineering earthquake proof structures using household items. They use computer simulations as they draft their designs, handle a budget, and work through the design process while improving their critical thinking skills.

Animal study is underway at Bridle Creek Habitat Enhancement Area (BCHEA). The Junior High Desert Ecology Class set up game cameras and input data points using GPS units. The coordinates were put onto a digital topographical map with the help from one of Freeport McMoRan's, (FMI's) Environmental specialists. 7th grade science students pressed and identified native and invasive plants at BCHEA. They built a class PowerPoint by sharing files through Google Docs and presented their findings about the importance of this riparian habitat. The 1st and 4th grade classes visited Bridle Creek once again this winter in order to compare the seasons regarding the plants, birds and insects of the area. They partnered with our fine arts teacher to produce watercolor paintings in a STEAM unit to show the similarities and differences.

The sky's the limit with the Aviation Math Class as they spent another day with a pilot flying high above the Sonoran Desert, all while applying their mathematical reasoning skills. This is an exciting program that cumulated on December 6, 2013 on a cold but exquisitely clear afternoon up on the mesa in Bagdad, where eight students from Mr. Griffith's "Mathematics in Aviation" class had gathered in anticipation of their first private airplane flight. Moments earlier, several pilots from Chapter #883 of the EAA (Experimental Aviators of America – www.eaa.org), as part of EAA's "Young Eagles" program (www.youngeagles.org), had arrived up at Bagdad airport, having winged their way north from Aguila and Wickenburg for the day's Rally. Thus began an exciting afternoon of "Wow's and "That was AWESOME!" – and a never-to-be forgotten experience for each student.

Every Young Eagle was airborne for 30 minutes - front-seat, one-on-one - with the pilot who called her/his name. They took off down runway 23 (230 degrees on the compass), and were soon over the copper mine - the pilot doing a wing-dip to give his student a view deep into the pit. Then they headed south and east, looping around Hillside, Kirkland, and Skull Valley, before heading west back toward Bagdad and the low winter sun. And the best part...after the pilot established level flight, each student got to actually take the yoke (or stick, in some cases) and fly the plane! The Young Eagles Rally is a culminating activity to all the classroom and field activities each semester. Thanks to EAA #883 (Monroe McDonald, Chapter Leader), you can look for 13 new Young Eagles to be on the wing again in April!

Congratulations also to Jennifer Lopez who was the National Geographic Future of Science Front Page Winner, which was made possible through Arizona State University!



Congress School District

Stephanie Miller, Superintendent

S.T.E.M. continues to be an ongoing focus of Congress Elementary School. Grant funding includes: After School Drama/STEM Club, After School Legos Robotics Club, VoiceThread, Defined STEM, and ST Math.



After School Programs: The After School Programs with a STEM focus included, Drama Club, and STEM Club.

The STEM Club students, in grades 3-8, presented to parents in December. Students worked in groups to create a functioning soccer game. As a closing piece to the STEM Club, students presented to classmates and parents scientific and engineering principles used to make their LEGO creation come to life.

Voice Thread: December/January professional development involved teachers learning how to take photos and video with their Windows 8 tablets and upload them to Voicethread. Teachers spent time investigating sample Voicethreads, creating their own Voicethreads, and brainstorming practical application of Voicethread for use in their classrooms.

ST Math:

ST (Spatial Temporal) Math is done weekly by students. Individual goals are set for students and progress is checked regularly. ST Math provides monthly reports that show progress of classes and these reports are discussed in staff meetings.

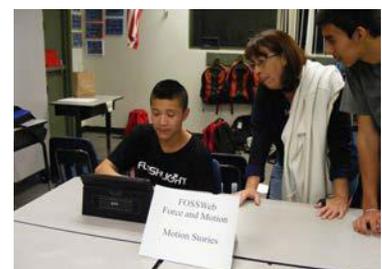
Defined STEM:

In December, Defined STEM personnel hosted a webinar. The webinar focused on thematic lesson planning that reaches across multiple disciplines to support the learning of the Arizona College and Career Readiness Standards (AZCCRS). In January’s professional development, teachers selected a Defined STEM assignment to incorporate into their upcoming lesson plans.



Other Grant Goals

As a part of the grant’s goals, the 6th through 8th grade hosted their first S.T.E.M. Fair. Middle school students shared STEM learning with parents and family members as they visited STEM theme based rooms.



W.F. Killip Elementary School

Ted Komada, STEM Coordinator

STEM Integration

We hear about “integrated instruction” or “an integrated curriculum” a lot. Idealistically, we can probably picture what this looks like in a classroom. Yet when you engage in the work of designing and implementing an integrated curriculum, a number of questions arise that can threaten that idealistic picture.

- What does an integrated curriculum look like in the classroom on a daily basis?
- Where does the time to plan for integrated instruction come from?
- How do you balance developing integrated curriculum in the face of incoming mandates and accountability to standardized assessment?

Here’s an example of how these questions played out as we planned a 4th grade STEM unit on Energy, Fuel and Natural Resources. We started with the NGSS 4th grade standards on the topic (4—ESS3 1, 2 &3). We then found several reading texts on the NGSS topic that were at appropriate Lexile level for 4th grade. Using these texts, the teachers then identify the daily activities for teaching their reading standards. Hands-on STEM activities are created that give the students a chance to apply or extend the science content they have read about. Within the STEM activities, we try to incorporate an engineering activity with connections to the math content being taught, and include the student’s use of technology. Substitute coverage is brought in to provide time for teachers to collaboratively plan for these units. We also recognize that not all math and reading is easily integrated with NGSS standards. We still have very specific instruction that occurs in just reading or math and are very aware of our preparation for AIMS. By the completion of the grant we hope to develop a model of education that fully supports AZCCRS while providing our students with STEM content and real-world experiences within which they can apply that content.

Engaging Community in Partnership

On January 29th, Killip hosted a STEM Kick-Off event for the HSSP project. We invited leaders from local business, industry, education and community that have an interest in and ties to STEM education. We celebrated the years of hard work that teachers, staff and community partners have invested in Killip to put us in the position to be selected for the HSSP project. We also took the opportunity to present the curriculum work we are doing as we develop a STEM education model. We put a call out for community partners to join us in the opportunity to identify and provide real-world application experiences for our STEM units. We have already been approached with interest and are excited to begin working through the logistics of making these kinds of partnerships a reality for the students at Killip.



Celebrating the “Harvest Meal” from our Garden

Salt River Elementary School

Lynette Charlie, STEM Coordinator



Salt River Elementary School started 2014 with a STEM bang! Salt River Elementary teachers continue to be engaged in professional development that included coaching this month. Each grade-level is working hard to take an in-depth look at their current science units from a STEM perspective so that STEM is evident in all aspects of their teaching day.

Here are a few examples of what we have been up to and how we continue to make STEM come alive at SRE:

Kindergarten-Mrs. Dawn Burstyn-Meyers: Dawn is a Kindergarten teacher whose classroom is teamed with another kindergarten class in Punxsutawney, PA. Ms. Fedigan's students and Mrs. Meyer's students have been comparing weather through pictures, email and letters. Our Salt River Students understand that Arizona weather is much different than in Pennsylvania. Of course students have also learned about Mr. Groundhog, Punxsutawney Phil. This lesson has also gotten our students learning about shadows. Maybe one day one of our SRE students will visit Punxsutawney, PA...It's possible...Anything's possible!

3rd Grade-Mrs. Anissa Bark: In third grade, our team is working to incorporate a STEM lesson for our social studies "Underground Railroad" unit. We would like students to engineer either a boat to cross the mighty Ohio River, or make a carrying carrier for a doll (ties to a book our reading class is reading) or perhaps design a secret hide-a-way for runaway slaves. We look forward to all the exciting finished products. Science enthusiasm is in the air!

4th/5th/6th Grade STEM Science-Dr. Keith Idso: The after-school STEM club started its second semester in January. We are excited to continue enriching the education of our students with fun and challenging hands-on activities in STEM areas. We recently learned about the classification system used for animals and even created our own dichotomous keys for organism identification. We are currently designing and building flight machines that are powered by "thrust" engines, similar to those used by octopus to propel themselves through the ocean. We anticipate engaging our students in many more exciting activities this semester!

Salt River Elementary Girl's Robotics Team-Mrs. Kerri Tuchawena-Norris: Under the coaching of Mrs. Norris, the Salt River Elementary girl's robotic team qualified for the Arizona State Tournament. We are so proud of this young team as they received outstanding compliments and comments on their overall robotics programming and research performance from the state judges. Coach Norris was also selected as the Phoenix Suns Sunsational Teacher for January 2014. We are very proud of our robotics' team and Coach Norris.

Yuma Elementary District

Theresa Lowe, Grant Coordinator

STEAM efforts in Yuma District One have been “full steam ahead” during December and January.

iPads are now in use in all of our Helios Pilot grade levels, and teachers have received additional training in their use. Both middle school and elementary school teachers report a variety of science-related activities using iPads with students. Some of these include an iPad scavenger hunt for fifth graders new to iPads to build their confidence in exploring various science related apps, several different methods for asking middle school students to explore and evaluate apps, and having students use iPads to research content supporting hands-on science lessons. For example, elementary students have used an iPad app called “Magnet Boy” to understand how polarities work. Middle school teachers were treated to a demonstration by one of their peers on how to use the cloud-based NearPod content media tools to make a presentation work interactively with student iPads. Students stay more actively engaged in learning content. The teacher notes that his students are required to take high-quality Cornell notes, as always, but they report that they are “taking notes—but not really.”



Fifth grade teachers learn to use iPads to help students create texts about science.

Middle school teachers from science, language arts, and social studies attended a grade-level specific interdisciplinary planning day in January to expand and refine their science-based unit plans. Because the plans incorporate Project Based Learning, there is a lot of new learning involved for the teachers. A particular challenge has been to write “driving questions” that incorporate a “big idea” in science and motivate students to learn content in several disciplines. The teams also used the district interdisciplinary unit planning rubric developed as part of this project to review each others’ plans and provide feedback.



Students take notes in interactive science notebooks after blowing up balloons with vinegar and baking soda as an introduction to chemical change.