

**ALPHAS: Alta Loma Peers Helping the Advancement of Science**

A report submitted by

Society of Physics Students Chapter 0202

Angelo State University, San Angelo, Texas

Written by

Blake McCracken, President

[bmccracken@angelo.edu](mailto:bmccracken@angelo.edu)

Hardin Dunham, Ph. D, Chapter Advisor

[hdunham@angelo.edu](mailto:hdunham@angelo.edu)

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The Society of Physics Students at Angelo State University created an outreach program with a local elementary school, Alta Loma Elementary (one of the lowest scoring schools in the San Angelo School District), called ALPHAS: Alta Loma Peers Helping the Advancement of Science. During the entire 2012-2013 school year, eight visits were made to Alta Loma including one school-wide demonstration show and one science night. Third, fourth, and fifth-grade students were targeted and multiple fields of science, including physics, biology, geology, and chemistry, were included in the demonstrations which were aligned with the TEKS (Texas Essential Knowledge and Skills) requirements set by the State Board of Education.

The first event at Alta Loma was a Peer-Pressure Team "Science Kick-Off Show". This involved the entire school, and many fun and exciting demonstrations on pressure, sound, temperature, light, and mechanics were performed for the students. The show was completed by the signature Nitrogen Thunder Cloud, after which the students screamed in excitement.



James Anderson (left) and Blake McCracken (right) after the Nitrogen Thunder Cloud.

Photo Credit: Jeremy Johnson

During the fall semester, Alta Loma was visited four times for lab activities. Depending on schedule, sometimes only one grade would be visited and other times all three grades would be visited. In depth labs were performed on topics ranging from simple machines, to electricity and circuits, light and optics, water quality, mineral, fossil, and soil identifications, and mixtures and solutions. For instance, one week fourth and fifth-grade students studied electricity and circuits; what it takes to make a circuit, how to wire a series and parallel circuits, and how to troubleshoot a circuit. Likewise, simple materials like a nail, paperclip, graphite, wood, and plastic were used to demonstrate the idea of an insulator and conductor. As an extreme example of conductivity, students were shown that a pickle arcs between two nails that are inserted into the pickle and plugged into a wall outlet. In the same day, third grade students were taught about different types of homogenous and non-homogenous mixtures and how properties of mixtures differ from properties of solutions. This was accomplished by allowing the students to mix a wide variety of grocery items. On mixing, they were to predict the outcome as either a mixture or solution and then analyze the results based on the properties of their combinations. They were also shown the behavior of corn starch and water as a non-Newtonian fluid.



SPS Student, David To, shows Alta Loma students about circuits.

Photo by Patrick Dove with the San Angelo Standard-Times

On another visit we only worked with fifth grade and third grade. Fifth grade was introduced to the concepts behind light and optics. Reflection and refraction and dispersion were first introduced, followed by students exploring the difference in concave and convex lenses and mirrors. Additionally, behavior of white light and laser light was also discussed. Several activities focused on lines of symmetry in each of the letters of the alphabet and various shadow objects. Third-grade students measured different properties of water from different sources. Local tap water, creek water, lake water and bottled water were all tested for hardness, ph, copper and iron content, lead content, dissolved oxygen, and chlorine content.



Olivia Skeen demonstrates the testing for copper and iron impurities in a water sample.

Photo Credit: Jared Walker

During the second semester, Alta Loma was visited three times. One visit gave the fourth grade students an opportunity to learn about magnetism. Magnetic fields were shown with a liquid magnetic field viewer, magnetic flux was demonstrated by showing how a magnet reacts to a solenoid when a current is applied to the solenoid, magnetic strength was shown by comparing Earth's magnetic field to that of other magnets, and other magnetic experiments were provided to solidify the concept of magnetism.

In one visit, third graders learned about the Solar System and relative distances between the Sun and all of the planets as well as the relative mass between the Sun and other planets. This was accomplished by relative sized balls to represent Solar System objects, and taking the students on a trip across the campus and "visiting" each planet while counting out a relative step scale for Solar System distances. The differences in mass were described by relating known, everyday items to the planets and their relative masses. During this visit, the fourth grade students learned about different kinds of energy. Radiation energy was shown with a Geiger counter and radioactive samples, sound energy was shown with a Theremin, light energy was shown with a laser, the Sun and a radiometer, while electrical energy was shown with a Tesla Coil, and chemical energy was shown by igniting flammable compounds.



James Bufkin demonstrates sound energy with a Theremin.

Photo Credit: Jared Walker

In another visit with the third graders the water cycle was discussed. Condensation, evaporation, precipitation, transpiration, and runoff were all discussed. A plant leaf in a bag was shown to the students so they could visualize transpiration, while evaporation, condensation, and precipitation were all shown by boiling water in a covered bowl and allowing the collected water vapor on the cover to drip into a secondary bowl, which was inside of the original bowl.

The last visit was with the fifth grade. Here we introduced them to differences in life cycles, habitats, and environments. The students made a foldable of common animal life cycles, including the butterfly, frog, pig, and human. Then, a matching game was made for different animals in different biomes. After the game, an explanation was provided to help the students understand their correct or incorrect matching. A similar game was held for different animals in different habitats and how certain adaptations of those animals have helped them in their specific environment.



James Anderson describes the water cycle.

Photo Credit: Jared Walker



Blake McCracken (middle) and Olivia Popnoe (right) discuss life cycles with the students.

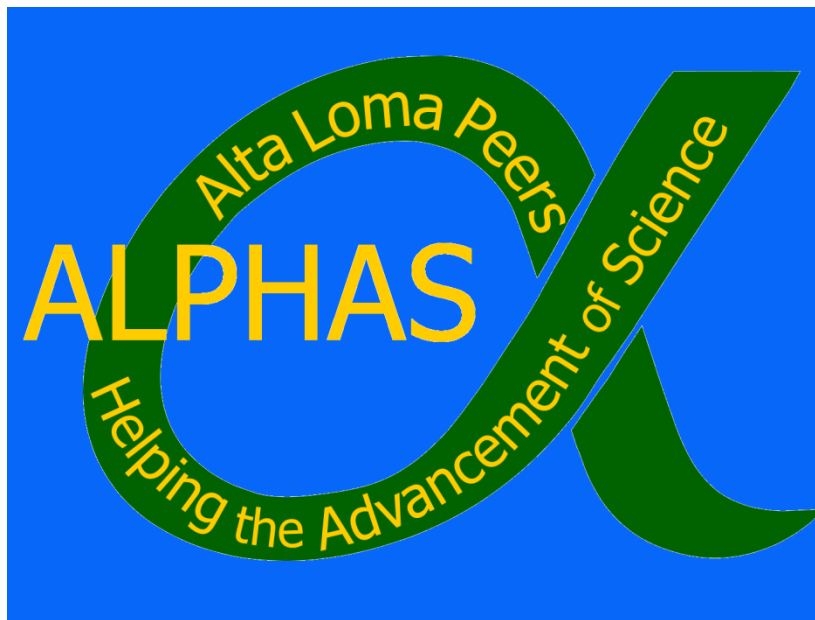
Photo Credit: Jared Walker

Overall, the students at Alta Loma Elementary were introduced to a great amount of supplemental material that was strongly correlated with the Texas required curriculum. This, combined with peer instruction, provides a stronger learning environment for the students to absorb the material. This program is being planned for the next year, and of the data that has been collected thus far, the impact that is being made on the students at Alta Loma Elementary is exceedingly positive.

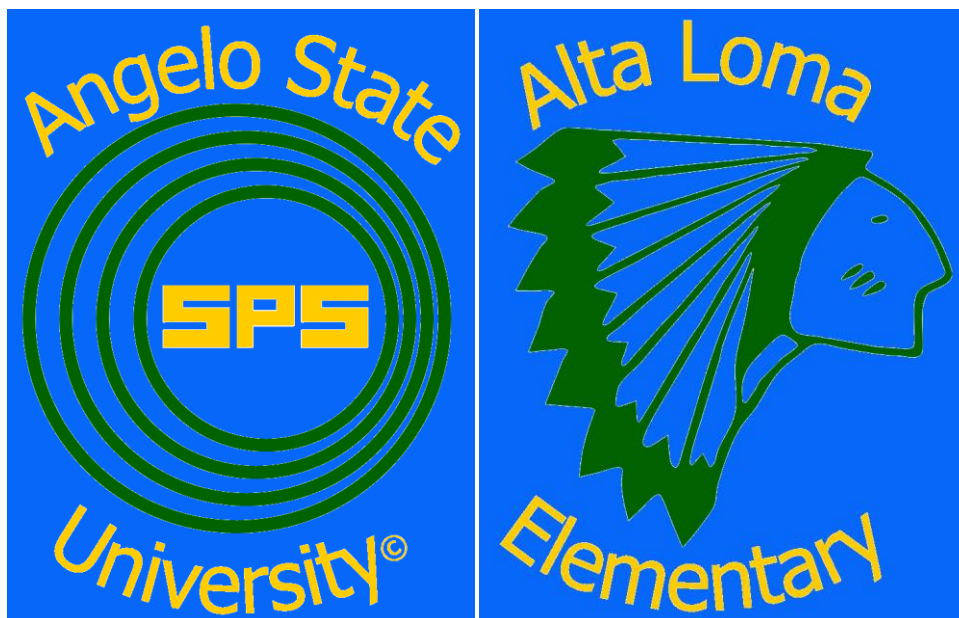
## Expenditures

Originally, the proposal asked for \$150 in support with consumable items and \$150 for help in purchasing shirts for the SPS student participants. Because the funds for the FFP awards were not allotted until late February 2013 and the ALPHAS program was scheduled from August 2012 to April 2013, SPS purchased the consumable items needed in January and waited to purchase shirts for the presenters until after awards were announced. Thus, accounting wise, all funds were officially used to purchase the ALPHAS shirts for student mentors. Front and back shirt logos are shown below. (Blake McCracken and Olivia Popnoe can be seen wearing the shirts at the final ALPHAS lab session in the last photo above.)

Item	Cost
ALPHAS T-shirts for SPS Students	297.90



Front Shirt Logo



Back Shirt Logos