California Innovation Corridor

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Summary of Balloon Launch Program and Mentoring with Sherman Oaks Charter School

For tasks 3.3 and 3.10, Sherman Oaks Charter School, Campbell, CA., was selected for elementary school outreach.

The Sherman Oaks School with grades K-6 has a total of about 500 students. One of the major efforts of the school is to serve a large Hispanic population. The classes are taught one-half day in English and the other half of the school day in Spanish. This outreach program is taking a different approach than usual science type programs with schools. Rather than providing one or a few days of contact with students, the initial idea was to select one grade in Sherman Oaks. The emphasis of the program will be with students in the fourth grade. There are three classes of fourth grades with about 20 students/class.

A senior engineer (Mr. Alfred Tadros, an MIT graduate) from Space Systems/Loral in Palo Alto, Ca has volunteered to be the mentor for this fourth grade at Sherman Oaks. He will be working with the teachers for these classes, meeting or in contact with them 1-2 times per week until the end of the spring term. Mr. Tadros will then start in the fall term and meet with the same students that are from the fourth grade now when they are fifth graders. Our intent is that he will follow this class all the way through high school. This approach is very well received and exciting for the teachers.

With little time left in the 2007 school term before summer, it was decided that two phase projects could be accomplished with one mentor. The first phase was to work with the students in the fourth and fifth grades to do a science project with the students. This project was to work directly with the students to do an electronic project that had them build a simple series/parallel circuit with a switch, LED and a buzzer. This demonstrated and reinforced some simple circuit principles that the fourth graders had used earlier in the year in building a model of a house where the built simple circuits to represent the electrical connections in the house. See Mr. Tadros notes on his mentoring effort below.

The second phase was a project for the entire school. This was called the PearlSat project. 300 ping pong balls that had been cut in half and had a drinking straw inserted through and glued to the ball halves. This then allowed the students to select experiments to do with the ping pong balls when they were attached to a high altitude balloon that went to near 100,000 ft. This balloon was provided by the Space & Systems Development Laboratory graduate students from Stanford University. The balloon is released with a package that has radio communications with a tracking crew that follows the balloon as it ascends. Near 100,000 ft, the balloon bursts and the payload package descends to the earth on a parachute.

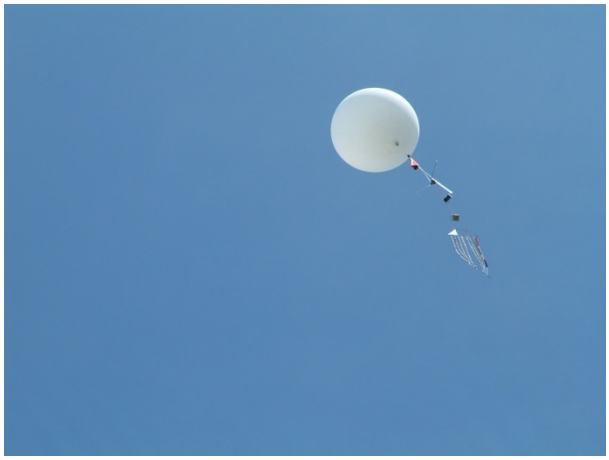
It was decided that teams of two students would do this PearlSat experiment. The teachers and students were informed about the near space environmental conditions that the package on the balloon would experience near 100,000 ft. There is very little atmosphere, it can get as cold as -40 degrees centigrade and experience much higher space radiation than experience on the ground with the protection of the atmosphere.

Many students put candy in the ping pong balls believing that maybe the space radiation would change the candy and give it properties like the Superman Kryptonite and give them super powers. Due to the freezing and drying out, it mainly comes back as hard candy.

The balloon was launched from the helicopter landing pad near the Mt. Hamilton Observatory near San Jose and was recovered near Stockton about 120 miles away. The total flight time was about three hours. During the flight, period announcements of the balloon's position were announced over the school public address system.

Both students and teaches declared this project a great success and would like to have two-three flights next school year. This flight was covered by the CSA media specialist Wil Simon and appeared as an article in Launch magazine.

Testing is required by the State of California each year at all elementary students in the fourth grade to check their performance. One area of the test areas is science. Sherman Oaks Charter School in Campbell, CA that we worked with in the first half of 2007 has had a science proficiency score of 12% for both 2005 and 2006. This year the science grade for the fourth grade students was 90%, the highest every achieved at this school. We believe it was due to the additional attention given to the children by the mentor and the PearlSat balloon flight.



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Notes on Mr. Tadros Mentoring Efforts:

Mentoring at Sherman Oaks 2007 - 2008

The mentoring in the spring of 2007 worked with 4th and 5th grade teachers at Sherman Oak to set up a "Circuits" module during the school's science week. I helped prepare the kits for the classes with each kit containing a prototype board, resistors, switches, LEDs, batteries, buzzers, wires, and a few tools. I also prepared some presentation material to talk to the students about 1) the importance of electronic circuits in our everyday life, 2) the characteristic of a series circuit, and 3) the characteristics of a parallel circuits.

During science week I held a one hour session with three classes. In each class I first talked about where and how electronics are used in our life. We talked about series and parallel circuits. Then the students paired up and each opened up their electronics tool box. We went through building a series circuit which had a switch and a buzzer in series with a battery. I helped students understand the simple schematic. Most students were able to follow the schematic to build their circuits and get the buzzer to work. I helped the others "debug" their circuits. When all were done we added another path to make a parallel circuit with an LED.

In the fall of 2007, we coordinated with the Sherman Oaks 5th grade class some ideas for "Exhibition", a science fair for the 5th graders. I along with Spencer Studley and Dave Keller brainstormed a few project topics for the teachers to consider in their suggestion list to the class. Subsequently, spring of 2008, in preparations for Exhibition, the students worked for 2 days to finish their projects. During those two days I spent ~8 hours~ helping the students with the projects. Both researching and creating the storyboards. Some students picked space related topics that we had suggested, like GPS, rockets, and robotics.

On Exhibition day the students set up their science projects and that night during the school open house the students manned their displays and presented their project. I attended Exhibition and "quizzed" some of the students as I had told them I would. You could see they were very proud of their accomplishments, especially with their families and friends milling in the crowd of attendees.

During preparations for Exhibition I found that just having a resource present who can answer technical questions for the students was 80% of what the class seemed to need. The kids were not bashful at all to approach me and ask questions or simply say "I'm stuck" or "I don't understand". That's was the opening for a mentor to guide the student into areas and topics they didn't known about, yet were often excited and could run with it once they heard just a bit. For example, two students wanted to do a project on "space". I talked to them about a few things they could think about and one was astronauts living in the International Space Station. They didn't know there was a space station and when they started researching it they started finding out that eating, sleeping, bathing,

"walking", and many more things that we take for granted on Earth is done differently on the space station and they were able to put together a storyboard on how micro-gravity on space station affect the way astronauts live.

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Notes from Arturo Zamora, Stanford Graduate Student, who assisted with Sherman Oaks mentoring:

I started out with a brief talk about the history of rocketry and kicked off the chapter on Newton's Laws and energy. I thought it best to include one demonstration, one small activity, and one larger project to help them cement the concepts.

To demonstrate the way energy can be stored in one form (chemical) and turned into another, I used the Diet Coke and Menthos trick. I filled a film canister with the diet coke and floated a little piece of Menthos in a chap stick tube cap within the canister. I dropped the canister into a graduated cylinder, with the impact causing the Menthos to fall into the coke. A very short time later, the canister's lid would come popping out of the tube, demonstrating the conversion of the chemical energy into kinetic energy.

To help them grasp Newton's laws, I led the kids through an exercise in which they threaded a little piece of a drinking straw onto a string, and then affixed one end of the string to the floor and the other to a table top. They then blew up a balloon and taped it to the straw. Upon letting go of the balloon, it would fly up the string. We talked about why

the balloon did so (Newton's 3rd Law) and saw how different amounts of air in the balloon led to different heights of travel. Some students went so far as to tape pencils to the straw and observed how the increase in mass affected the balloon's travel.

The final project was a 2-Liter bottle rocket made from a soda bottle and construction paper, cardboard, etc. After the time we'd spent talking forces and energy, the kids were able to explain how the work I was doing on the bicycle pump was being turned into energy in the bottle, and how that energy was turned into kinetic and potential energy as the rocket flew upwards. They were able to explain how the force of the bottle pushing the water out was the same and opposite as the water pushing the bottle up. Plus, it was great fun to launch 30 rockets.

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