

**Report on Elementary School Outreach Program Implemented by
UC Davis Chapter of the Society of Physics Students
Funded by award from Marsh White Foundation**

Team Leader: Alex Spear

Team Members:

Matt Klint, Mark Triplett, Payton Kimbrough, Hillary Brunner, Alex Price, Ryan Mangan and support from our entire SPS chapter and Physics Club

The Concept

The UC Davis chapter of SPS has had numerous experiences with outreach programs at several schools in recent years. However, these schools have all been of grades 9-12 (high school). This year we felt we would like to reach a younger audience. As many of us know from personal experience, an exposure to science at a young age can stimulate a lifelong interest in the subject. Therefore we felt it important to begin exposing children to some scientific demonstrations to spark an interest in science not just as a “smart-person” future but as a way to also have fun.

A standard physics demonstration would normally consist of “no-touch” experiments that a classroom could sit back and watch. For example: Exploding wires, liquid nitrogen, etc. We felt that a younger audience (4-6 grade) would react better to a more hands on demonstration. We wanted to build something with the entire class that each student could take home as a reminder of our time with them and as a fun toy that utilizes some aspect of science.

As the centerpiece of our outreach, our team decided on a small electric motor that the students could build and take home and that could be made using simple items posing no harm to a young audience. We created a design and purchased enough supplies to make 120 of them (we expected 4 classrooms with 30 students each). We also purchased polaroid sheet, cut it into pieces, and let students take these home to investigate the nature of light on their own. We then decided on a couple extra “no-touch” demonstrations that would amaze the young students and which could be safely shown to the class. Since our chapter has a shoe-string budget, the Marsh White Award helped us to purchase and organize all of these supplies (though we had several permanent demonstrations already built).

The Schools

We chose three elementary schools in the Twin Rivers school district of Sacramento, CA for our outreach. These particular schools (Strauch Elementary, Woodlake Elementary, and Smythe Elementary) have a particularly high population of Title 1 students. They do not have as much access to scientific programs as higher funded schools. Our club felt that these schools would have the biggest benefit from our program. We also chose to visit the Montessori School of Fremont, CA. This school is on the other end of the spectrum than the previous three schools. We were interested in seeing the difference of education and scientific exposure at the different schools.

The Outreach

Some of our team members for the outreach program had never presented anything in front of students so young. We simply didn't know what kind of reaction we would get. Here are the results:

Mrs. Qualls Classroom – 5th Grade, Smythe Elementary



Left Picture: Alex Spear (center) and Matt Klint (right) introduce the class to the motor project. Many of them were unsure they could build a motor at all but by the end of class they all had working ones.

Right Picture: Alex helping a student and talking about a mutual interest in Pro Wrestling.



Left Picture: Matt helping a student who simply excelled at building these motors. Shortly after this picture the student went around and helped his co-students with their projects.

Right Picture: The class is amazed at a balloon's reaction to being dipped in liquid nitrogen. As the balloon started "inflating" everyone kept screaming "How is the air getting in!?! It's sealed tight!"

Mrs. Deffenbaugh's Classroom – 5th Grade, Woodlake Elementary



Left Picture: The classroom had tons of questions. Many of the more interesting ones came from this class.

Right Picture: Matt showing everyone how to make the magnet coil. These 5th graders were very fast learners. Most of them had perfect coil making techniques.



Left Picture: Payton Kimbrough helping a couple of students. We all enjoyed the one-on-one contact we got from personally helping each student.

Right Picture: Alex and volunteer about to shatter a frozen flower using liquid nitrogen. We found that LN2 is the hands-down favorite demonstration for 5th graders.

Mrs. Schaffer's Classroom – 5th Grade, Strauch Elementary



Left Picture: The classroom is entertained by demonstrations.

Right Picture: Alex is demonstrating capacitors by lighting a bulb then promptly vaporizing a wire.



Left Picture: Hillary Brunner (left) and Alex Price (center) prepare frozen gummy worms for the class using liquid nitrogen. We found this to be a big hit and a good closer to our visit.

Right Picture: Alex handing out frozen worms. We started perfecting our organization technique when handing out frozen gummies. Our previous class visits became very chaotic at the mere mention of frozen candy.

Mrs. Brunner's Classroom – 5th Grade, Fremont Montessori School



Left Picture: The classroom is getting an introduction to what and where UC Davis is.

Right Picture: Alex is explaining the exploding wire demonstration. We vaporized a record number of wires at this class due to a very popular reaction.



Left Picture: Hillary (left) and Alex (right) answering a plethora of science questions.

Right Picture: The class is busy working on the electric motors. This was the biggest class so far with 40 students and 3 teachers in one room.

Our team was very surprised at how much fun working with grade school students could be. We went in with very well prepared explanations of our experiments that could be understood by fifth grade students. However, we found that the students were so fascinated by the visuals and interactivity of the demonstrations that they didn't give us a chance to really explain much of anything in detail. Instead, we started focusing on how much fun being a scientist is and that they can do all the cool things we get to do if they get into science. We showed the children that being a scientist isn't being just some guy in a lab coat slaving away in a laboratory; it is about doing fun things with fun equipment and tools. We emphasized that being a scientist doesn't mean becoming a physicist. We strongly impressed the idea that they can be scientists by simply wondering about the world around them; that they should look at things in everyday life and start wondering how or why things work - that just finding things out about something they had no knowledge about makes them a scientist. By the end of our demonstrations almost all the students in each class wanted to be a scientist (and by that time they understood that the term "scientist" included medical professionals, engineers, chemists, biologists, etc).

Of course, the highlight of our visits was the close interaction with the students. Each member of our team went around to different students not just to help with building the little electric motor but to also answer any questions the students might have about science. We were pleasantly surprised about the intuitiveness of the students and their questions. Many of them were wondering about modern things such as the "particle gun that makes black holes" (referring to the LHC). We answered many questions but made sure to leave simple ones for them to explore on their own.

The Conclusion

Our outreach program was a smash success. We came away from our visits to the schools with a very positive feeling about ourselves and knowing that the students thoroughly enjoyed our visit. In fact, two of the classrooms actually skipped a scheduled recess just to stay with us a bit longer (the students refused to leave the room so the teachers let them stay). Our strategy of building little electric motors as a way to have solid interaction with the classroom was extremely successful. Our chapter plans on doing a similar program next year (hopefully bigger) if we can find the funding. We hope to build a continuing relationship with the Twin Rivers District schools that we visited so that we can continue to enrich different classrooms and provide a bigger impact. Our chapter still feels (more so after this program) that exposing children to a positive view of science at an early age is dramatically important in stimulating an interest in science.

The UC Davis chapter of the Society of Physics Students would like to thank the Marsh White Foundation for its award of \$300 towards our outreach program. Without this money our plans for public school outreach would have been severely curtailed.

Costs:

Electric motors

Magnets – 300x circular refrigerator magnet	\$150
Paper Clips – 400x clips	\$12
Paper Cups – 150x paper Dixie cups	\$15
Electrical Tape – 4x rolls of electrical tape	\$10
Insulated Wire – 300x 6” lengths of 22gauge	Donated
Magnet Winding – 150x 18” lengths of 24gauge	Donated
Batteries – 160x AA batteries	\$40
Polarized Film – 300x 1.5” square polarizer pieces	\$120
Liquid Nitrogen – 8x liters of LN2	\$20
Gummy Worms – 2x 5 pound bags (LN2 fun)	\$20

(All other demonstrations were loaned from Physics Dept)

Total: \$387

We exceeded the \$300 grant received from the Marsh White foundation but we were able to offset our costs using money from club fundraising activities. Our costs were greatly reduced due to donations from professors and students to pay for random supplies and necessities such as gasoline.