

The following essays are from the three undergraduate science majors that accompanied the HGT Team on a field trip to Cuatro Ciénegas Mexico, August 2004. Dr. Carlos Solis is creating a documentary on the trip and interactions of the investigators with the students.



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I believe that preserving the pozas in Cuatro Ciénegas starts by educating the students that live there. Not only can it get them interested in science, but it would teach them to respect and protect the diverse ecosystem that is Cuatro Ciénegas. Being that they are from the area, the students should be familiar with the pozas, but as mentioned by one teacher there, it is sometimes hard to get permission for them to visit. Because of this, I would first start off by explaining to the children how unique and rare these bodies of water are. By rare, it should be said that Cuatro Ciénegas is the only place that has

these pozas. It would be good to explaining in detail how different pozas have different characteristic like temperature, pH, salinity, color, etc. The age of the pozas is also a very good way to trigger the kid's interest in preserving them. Although the exact age is not known, a comparison can still be made with the dinosaur's era and how old they are.

It can also be explained that even by eliminating the farming business, the town can still financially thrive on the many scientist, environmentalists, geographers, and tourists that come see these marvels. If the pozas are not cared for, not only will the farming have to stop, but the national interest that Cuatro Ciénegas brings and continues to bring will stop as well. Instead of using the pozas as a natural pool, maybe one can be built for the public in efforts to preserve the conditions of the water in the pozas. That, no matter what, will be a good investment because of how hot it gets there.

As far as getting kids interested in science, even in the U.S., I found a lot of websites that have "experiments" that kids can do. One activity could be having a "Mad Scientist Day" in which the students dress up like a mad scientist and show their own experiment to the class. I also remember an activity in which we had to study an ecosystem and make a model of it that shows the characteristics that made it unique. Hands-on activities, in my opinion, are the best way to interest kids in science. I also think that teachers need to respect the ecosystems around them and be educated as well in the sciences or there is no way that the students will learn to do the same.

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Educating and Creating Interest in Cuatro Cienegas

As everything wireless or internet-related increases in popularity, science and the environment become less popular areas of study for children. The question brought up at a group meeting during our trip to Mexico was how to create an outreach program to educate students and instill in them an interest in the natural wonders of the Cuatro Cienegas valley. In order to accomplish this goal, several questions need to be answered. First, who constitutes the target audience? Should the program be designed for a specific age group or for students in a certain location? Secondly, what areas of science should be the focus of the program? Finally, what methods should scientists undertake to put the plan into action? By answering these questions, we can design an outline for the project, from which details can be further developed.

The target audience is a very important question that needs to be addressed. In our meeting, we came to a realization that by limiting the program to local Mexican students, less money would be needed than if students were to be transported from the United States or from distant regions of Mexico. Depending on the funding for the project, I believe the students involved could range from just those living in the Cuatro Cienegas valley, to those living throughout the state of Coahuila. The money saved by limiting the regions from which students could participate would allow the total number of

participants to increase dramatically. Another point that should be considered is the age level of the students involved. For the most part, many basic scientific concepts can be taught to children of any age. However, the idea of splitting the program up among age groups is appealing. A suggestion was put forth to train some older students to help with the younger ones, an idea I found very practical. Teaching a concept to another student is a proven way of effectively understanding and remembering that concept. Therefore, this type of instruction will benefit both older and younger students simultaneously. Once the decision is made as to what topics the program will cover and what methods it will employ, we can determine specific content in regards to age group.

The next step is to focus on the specific fields of science that the program would cover. I believe it would be a good idea to mirror the disciplines already being studied by scientists and researchers in the valley. Microbiologists and other biologists are studying the bacteria, fish, viruses, and other species of organisms present in the valley's pozas and deserts. Scientists are studying the appearance and behaviors of these organisms, as well as chemical and physical properties of the land and water. I think that limiting the concentration to the areas of biology and the environmental sciences would keep the program simple enough for the children to understand, and still give them a wide enough view of the importance of science and of this specific ecosystem.

Finally, the methods of instruction are an integral factor to this project. As we discussed the possibilities at our group meeting, many suggestions were given as to how to make science more appealing to youth. One way could be for teachers to integrate new, scientific lessons into their previously existing curriculum. For example, they could create lesson plans with the help of scientists that teach the children about the organisms

and environment of the Cuatro Ciénegas Valley. Multimedia, such as photographs and video footage (of the environment, or of research being conducted in the valley) could be used to supplement these lessons. Local scientists could also visit classrooms on a semi-regular basis to tell about the work they have been doing in the field or in the laboratory. A kind of “show and tell” format could be applied with younger children. The visiting scientist or researcher could share a sample of stromatolite, for example, with the class, explaining its function and how it fits in with the rest of the ecosystem. By bringing some of the environment to them, the children would be more excited about learning than by just reading it out of a book, because they would be able to see it with their own eyes instead of listening to someone else’s account. Throughout the schooling of my peers and me, those lessons that involved physical interaction were the ones that we were able to understand and remember most accurately. Thus, due to my own personal experiences and those of my peers, I believe that hands-on lessons would be the most effective and beneficial to the students. While the “show and tell” format would work with the younger children, it is doubtful that this would be enough to convince older students to want to study science. I believe that the older students would get more out of the program by actually visiting the field or the laboratory. I think this could be arranged through existing classes or after-school clubs, or by creating new ones. These visits could occur either on a one-time or regular basis. I think a fun one-time event to bring students out to the field or lab would be to organize a day like the “bring your child to work day” that is observed annually in the United States. Scientists would act as mentors for the day, in charge of a small group of students. The students would go with their mentor to work, where they could help collect samples or complete basic tasks such as temperature readings. They

would learn how to collect and record data, how to analyze the data, and make conclusions. Even if the students were only able to observe the scientists at work, it would be a beneficial experience for them to be there. I can say this because during my time in Cuatro Ciénegas I did not collect one sample or temperature reading, but my interest in becoming a scientist was strengthened by just seeing research in action. If the visits were to occur on a regular basis, the same procedures would be followed. However, with more frequent trips out to the field or lab, the students could learn to design and carry out their own simple experiments. I believe this would be an excellent way not only to expose the students to the diverse environment around them, but also to introduce them to the scientific method and the process of creating and running experiments. As previously mentioned, I believe that older children could be used to help teach the younger students. When the scientists visit the classrooms of the younger students, some of the students working in the field under them could also visit and present their findings.

In conclusion, there are many ways in which the scientific community can make studying the diverse environment of Cuatro Ciénegas more interesting to local students. Creating classroom lessons and arranging visits by local scientists would allow students to learn about the valley without traveling too far. Trips to the field or laboratory with scientists and researchers would be even more effective in instilling an interest in science in the students because it would allow them to have a hands-on experience. This way, students could observe science at work, as well as develop their own research and analytical skills. Creating such an interest in the youth of this area is vital to the conservation of the valley. If the students can become excited enough about the environment and about science, they will hopefully want to make it their career choice.

With proper funding and efforts put forth by American and Mexican scientists and researchers, we can create the next generation of passionate defenders of this diverse ecosystem.

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Broader Impact

After an amazing trip to Cuatroceneagas, and experiencing the process of developing a proposal, I realized how much I have to learn. I may not be able to understand all of the science lingo but I can help develop an idea for educating the public about the importance of science. I think I will give some basic ideas that I think could be used to meet this requirement for the proposal. Keeping in mind I believe that hands on experience are very important.

My first idea could be used on a broad scale, not just the local children. I think a closer look needs to be taken at the “World Wind” website. This seems to be very interactive and could be used in schools all around the world. It is not limited by language or location. It would probably have the broadest impact of any idea. Like Rose said there would need to be development of lesson plans and some ideas on some uses for the website. The website already has some great information and has great potential. This idea would be great to help kids understand the importance of unique places like CC, and how to conserve them. There are many things that can be linked to this website. For instance some of Dr. Forest Rohwer’s underwater footage could give students an up close look at the stromatolites and the other organisms that live in the pozas. This site would also show students that all areas of science are important and that they can be studied together. This is very important to get across, the proposal itself does this. I do not know how much money will be devoted to developing the learning tool but

this website has the great potential and if used right could very well stimulate some young minds and increase science awareness.

The second idea also would be a broad impact learning tool. Dr. Siefert brought up the idea of a computer game. This could be very neat but remember that with youth today graphics are very important. If enough money is available this idea could be linked to the World Wind website. This game could allow students to be "in control" of a poza and carry out experiments, and see the impotents of environmental protection over time. The game could also be developed for different age groups. For example for younger students the experiments could be more basic and older students could have more control of the game. Again the important thing is to remember that graphics are important. This may be one of the cons to developing a computer game. You just can't get by with graphics that are comparable to "The Oregon Trail" of "SimCity".

The third idea would be to bring student to the pozas and allow them to carry out actual experiments. This would be great for local children but would defiantly have a very limited impact. This is great to do if the money is tight and you want to educate the students around CC about this unique location and science in general. As Nancy Reyes pointed out, science needs to be made real to students. I believe with hands on experience like this would spark science interest in students. I am not sure this idea will have a broad enough impact. It would help solve other problems of keeping a constant eye on the pozas. Again depending on money this may be coupled with other ideas. The other issue is logistics it may be hard to get student out to the pozas and training them to carry out the experiments. It would just have to depend on money and amount of time that is available for this one aspect of the proposal.

In conclusion, I think these ideas are just the beginning of the opportunities that are available to you. Such an amazing, and beautiful place as CC can only be expected to spark young minds to become interested in science. The best idea may be the simplest. It may be sponsoring a few students to carry out experiments or helping develop a science workshop for local youth. But out of the ideas I have mentioned and those that were mentioned in the group meeting, I believe would be the development of the World Wind website. This can be built on by future research done at CC and opens many new doors. I think it has the broadest impact and be used by a broad range of age groups.

Coupled with underwater footage and a possible game this could be a great tool to be used by teachers all over the world. We all agree that this site is awe inspiring and has great opportunity, it needs to be protected and the CC community need to realize the treasure they are living among. Any broader impact proposal needs to incorporate some type of workshop/field trip program for the local community. IT is a given that the youth in the CC community must benefit from any idea that is adopted. I will continue to think about possible ideas and will be glad to help in any way that I can. Thank you for allowing me this opportunity to share some ideas and feelings. I really hope will help in the development of a broader impact idea.