Report to FILIUS on Consulting Activities for "Project Earth +"

Prepared for FILIUS by Farzad Mahootian, PhD Date: Feb 12, 2007

Introduction

I attended the Project Earth Group meeting in December 2007 in order to provide assistance, comments and evaluation to the project team. The meeting lasted two days, including presentations from individual group members, FILIUS staff, a roundtable discussion with teachers from around the island, and a teacher training workshop. In what follows, I will present a summary of a) the roundtable discussion, b) discussions with individual team members, and c) observations on the teacher training workshop.

In general, the meeting was very fruitful and enriching, both for the Earth+ development team as well as for the teachers of Puerto Rico who donated their time and expertise to improve the effectiveness of the Earth+ software.

A. Roundtable Discussion

The discussion centered around 5 questions. The questions, and a summary of observations of the discussion of each one, are noted below:

1) What do we know about the demographics of minority individuals with disabilities in science endeavors? During the discussion a number of reports (e.g., US Dept. of Education statistics; a report sponsored by the American Association of University Women, etc.) and the existence of documentary films and audio were noted.

> *Action: collect and annotate known statistics and reports to make an up-to-date basis for future research and development of products and service for minority individuals with disabilities in science endeavors.*

2) What benefits are there for society in improving science learning for Latino students with disabilities so that they can become scientific researchers? Our discussion highlighted the fact that individuals with disabilities in science endeavors contribute alternate ways of sensing and thinking about the world in ways that increase our depth of understanding the natural and designed world. Project scientist for Earth+, Dr. Robert Shelton, and FILIUS researcher Jose Alvarez, provided examples of this.

> *Action: collect and annotate more such examples to familiarize administrators and the general public with this way of perceiving opportunity potentials in students with disabilities.*

3) What are some organizational resources and challenges that could help or hinder individuals with disabilities in learning science and becoming scientific researchers? A number of items were listed in response to this question. It was noted that there is a lack of understanding of the depth and breadth of potential contributions from people with disabilities. Furthermore, it was noted that institutions ought to be concerned with moral as well as economic obligations. Under examples of success, the following were listed: the team work of Puerto Rico's special education teachers with regular teachers; a Mayaguez microbiology student; FILIUS development of video games for sight-impaired students(Alvarez), NASA development of math and earth science education software for blind and sighted students(Shelton); a blind UPR physics student who acts as mentor for sighted physics students.

Action: Collect and document products of the type mentioned above, including evaluatiosn of their effectiveness in the classroom to justify the further extension and development of such products.

4. What are some successful strategies to improve science learning for individuals with disabilities to help them become scientific researchers? The strategy of mentoring has gained a very high profile recently. The California State Department of Education now mandates that all new teachers be mentored during their first two years. Studies have shown that mentoring not only makes for better teachers, increases their retention and induction rates, but that it also increases their effectiveness as teachers such that student learning is positively affected. Studies have measured the effectiveness of new and inexperienced teachers, demonstrating that the latter learn from and transfer the skills of their experienced mentors to the classroom, resulting in notable benefits of their students.

Action: Collect reports on mentoring (from NSF, US Dept. of Education) as well as research and methods articles (from the New Teacher Center at UC Santa Cruz) to investigate the feasibility of a mentoring program for teachers of Latino students with disabilities in Puerto Rico, and beyond.

5. If you were to propose a collaborative, multi-institutional project to improve science learning for individuals with disabilities so that they could become scientific researchers, what would it be? What principles would you need for such a project? The principles would include: inclusiveness, simplicity, and effectiveness. Given the effectiveness of teacher mentoring and the strong sense of camaraderie among Puerto Rico teachers, it would be advisable to partner with the University of Santa Cruz department of education and with the Director of the University of Santa Cruz New Teacher Center to discuss a research and development proposal to extend and apply their program techniques for the benefit of Latino individuals with disabilities.

Action: Contact the Director of the University of Santa Cruz New Teacher Center to begin preliminary discussion. Organize a visit of a team from New Teacher Center to discuss possibilities of a joint California-Puerto Rico study of how to help Latino students with disabilities become confident and effective in science.

B. Discussions with Individual Team Members

During my visit I had the opportunity to engage each of the team members in discussions about the Earth + project. Some of these discussions are reflected in the notes listed above. Other specific points are noted here. I spoke with Robert Shelton about extensions of his existing Earth+ software to include more features of Math Trax, an existing math education software he previously developed for NASA to serve both sighted and sight-impaired students of mathematics. Math Trax has a rich list of resources only some of which are being used in Earth + at this time. We also discussed enhancing the capability of the Earth+ software to ingest and display a variety of Earth science data from NASA.

I spoke extensively with Laurie Cook, a Maryland teacher who is associated with Earth+ through the University of Maryland Baltimore County team member, Dr. Susan Hoban. Laurie is developing Earth science lesson plans and student research projects within which the Earth+ software can be used to answer question, solve problems and explore

the Earth system. I informed her about existing research-oriented and interactive Earth science lesson plans with I had created and was instrumental in developing for NASA during the1990s. Many of these are still available on the Web. I discussed the salient features of successful examples of such educational products and we shared ideas about standards and best practices for such educational tools. I have sent Laurie the web addresses of these products.

C. Teacher Training Workshop

The Earth+ team worked with a group of teachers to show them how the latest version of Earth+ software works. The team also presented them with an actual lesson plan which uses the Earth+ software to help students learn about hurricanes. The second half of the workshop was focused on teachers' comments and suggestions for improvement to the software to make it more effective in Puerto Rico schools and specifically for students with disabilities. The Earth+ team found that they learned more from these teachers in one hour about how to improve their software than they had in working with any other group of teachers in the United States. The Earth+ team also distributed a written survey to collect additional information about each teacher and her school. With regard to this point I made an additional request for information on the survey in order to make for more effective entry into the schools: a description of the computers specifications and internet capabilities present in each of their schools. This information will help the software development team to make the software more suitable to the working conditions experienced by teachers on the island.

There was a clear consensus that future visits of the Earth+ development team to Puerto Rico should involve more time and opportunities for interaction with the enthusiastic and capable teachers of Puerto Rico.