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SCIENCE ENRICHMENT
THROUGH INFORMAL SCIENCE

Final Report

Hands On Science Outreach, Inc. (HOSO)
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PREFACE

This report is being submitted to make sure that the Hands On Science Outreach (HOSO) program is in compliance with all reporting requirements. HOSO had submitted a continuing grant proposal on its successful project in November 1994. With declining federal government funding, the Science Education Office of the Department of Energy was not able to ascertain and communicate funding ability. In July 1995, HOSO received a phone call that was followed by letters indicating that continued funding would not be available to this project. A small amount was awarded to allow project sites that had expectations in place to make adjustments. This final report follows the actual project completion as it occurred in school year 1995-96. Three sites have found alternative funding sources to continue the work started under the grant project.

PROJECT DESCRIPTION

Hands On Science Outreach (HOSO) is a program of informal science education. Its mission is to bring to communities the option of out-of-school science explorations to small groups of children from the ages of 4-12. Such experiences encourage children to enjoy science without the fear of the consequences of failure that can occur in a formal school setting. It can start them on a life long pattern of participation, awareness and perhaps career interest, motivated by this kind of pleasurable learning. Since HOSO binds together adult training, materials and written guides, many of those not professionally employed in education, including parents, can and do become involved in "science for the fun of it."

The DOE grant to the HOSO program has funded the delivery of HOSO programming to five selected sites over the 1992-96 school years. It is the intention of both the DOE and HOSO to reach children who might otherwise not be able to afford the programming, with emphasis on underrepresented minorities.

HOSO has developed fall, winter and spring theme-oriented informal science sessions on four age/grade levels. One hour classes take place once a week for eight weeks per session. At the original Washington, D.C. site, the program uses a mentoring model named STEPS (Successful Teaming for Educational Partnerships in Science) in partnership with the District of Columbia Schools, as well as HOSO and the DOE. That model continues to work in Washington, D.C. and has been replicated in parts of the Sacramento and Denver sites.

Description of 1993-94 HOSO Themes and Classes:

HOSO has developed a three year cycle for its afterschool programming. This enables children to participate in these regular science activities as a choice, without the possibility of repeating a series within the cycle. Each yearly theme is subdivided into sessions. For example, the year's theme for 1993-94 was ENERGY. The fall

subtheme was "Natural Energy (exclusive of solar);" the winter's was "Mechanical and Electrical Energy;" the spring subtheme was "Solar Energy." Each theme is explored in activities that are developmentally appropriate for that age/grade group. The poster insert has brief descriptions of all programs on the back.

PROJECT DATA 1993-94 BY SITE

There were 2873 total student enrollments, as reported from the project sites this year. The request for renewal of this grant from the U.S. Department of Energy asks for the same level of support to maintain this level of impact, although the numbers per site have been adjusted in some cases, to reflect the project history.

Communication between HOSO and the DOE/HOSO project sites takes place when session information is distributed, when age/grade group materials are ordered, when financial paperwork goes back and forth, when monthly HOSO Coordinator Newsletters are mailed out, when data is collected and when phone conversations take place for further information or discussion.

HOSO collects data on the project to monitor program quality, to monitor project progress and to check on grant requirements for compliance. Data is collected in the form of questionnaires from Coordinators, adult leaders and children, in anecdotal letters and conversations and in photographs from the sites. An independent evaluation, funded by the National Science Foundation, was conducted by Sierra Research Associates of Cambridge, MA, which issued its report in 1993. Copies have been distributed and excerpts were published by HOSO as *FINDINGS*. This research found that participation in HOSO classes widened the view of children as to who could do science, increased their content knowledge and maintained or increased their pleasure in science activities.

Data collected in the 1993-94 school year continued to provide evidence that children repeatedly say that they enjoy the HOSO classes and like keeping their materials. They like the adults with whom they work and the teen interns, when they are part of the program. Both the children and the adults agree that learning is taking place and that children are broadening their perspectives around science and their potential use of it in their lives and for career options.

Operationally, the project has generally run smoothly. The Baltimore site was not sustained. The Washington, D.C. site dropped in numbers from the first project year because of the difficulty in recruiting both DOE mentors and reliable teen interns. These are the realities of running a project in an inner city area, depending on volunteer time and competing for teenage time commitments as well. The materials allocations were shifted within the scope of the program to reach the targeted minority populations under other trained Coordinators within the DOE/HOSO project.

Below are summary data from each of the project sites:

Site: Washington, D.C. (Dean Sterling)

Class levels offered: 2-3, 4-6

Number of Classes: Fall: 32 Winter: 30 Spring: 33

Number of enrollments: 802

Population served: 84% African American; 9% Hispanic; 7% Other

Adult leaders were recruited at the Forrestal Building in Washington, D.C. through flyers, posters, exhibits and word of mouth. Of 49 leaders recruited and trained for the STEPS program, 16 were African Americans; 1 was Hispanic; 3 were Asian and 29 were not in these groups.

Teens were selected by the program coordinators (usually science teachers) at their high schools. Of the 31 teen assistants, 23 were African Americans; 3 were Hispanic; 1 was Asian and 4 were not from these groups.

Classes were held in D.C. public schools and in church recreation centers. Children were selected to participate at each site by an afterschool coordinator who generally signed them up on a first come, first served basis.

Comments:

Written responses were gathered from students, DOE mentors and teen interns. About half of the students missed at least one of the classes for reasons relating to adult needs in their family or personal illness. An overwhelming number said that they had fun and took home their projects, while about half said that they repeated their activities at home. Virtually all of the children said that they liked their HOSO adult leaders and high school student interns. Over 90% of the children perceived that they had learned something new, wanted to take more HOSO programs and were more interested in science as a result of their HOSO enrollment.

Both DOE mentors and student interns reported that their training prepared them "adequately" to "very well." About half of the interns said that they learned something new about science and teaching children and that they would participate again. DOE staff found that they enjoyed working with the children, that the children seemed somewhat more willing to explore towards the end of a session than the beginning and they applied ideas from one class to the next. Questions of continuing as a mentor were consistently tempered with work scheduling fluctuations and the ability to volunteer and maintain the workplace load.

Site: Atlanta, GA. (Nettine Steed)
DOE Regional Educational Director: Elizabeth Palmer

Class levels offered: 2-3

Number of Classes: *Fall: 10 Winter: 10 Spring: 10*

Number of enrollments: approx. 300

Population served: The Atlanta DOE/HOSO program is held at Oglethorpe Elementary School, in the heart of Atlanta. All are African American and thus the DOE/HOSO classes were entirely African American. Adult leaders for the classes were recruited from Clark Atlanta University, Morehouse and Spelman College and were also entirely of African American heritage. No high school students were involved at this site.

Comments:

Formal classroom teachers commented that the children in the DOE/HOSO program had learned to manipulate objects differently and were asking more questions. In the Curriculum Based Assessment test administered to all students, project students increased their scores by 18%.

Childrens' responses indicated that there was a high level of attendance and that they had fun. Almost all took their projects home and about 80% said that they tried their materials at home again. Most reported increased interest in science and a desire to take more such classes. They especially liked the greenhouse and sundial activities in the solar energy unit.

* * * * *

Site: Denver (Linda Preston)
DOE Regional Educational Director: Jamie Evans

Class levels offered: K-1, 2-3, 4-6

Number of Classes: *Fall: 22 Winter: 24 Spring: 36*

Number of enrollments: 800

Population served: 3% African American; 69% Hispanic; 3% Asian; 25% Other

Children were selected by application. There were 3 non-English speaking children who received assistance through a family member or teacher. One child had Down's Syndrome and participated with the assistance of parents. Linda Preston, the DOE/HOSO Coordinator and a former Presidential Award winning teacher comments that "this program improves science interest, changes the children's views on science study and processes and improves their self image."

Of 99 Adult leaders, over half were female. They were recruited through the NREL Newsletter, local professional engineering organizations and parent meetings. One leader was African American; 10 were Hispanic; 3 were Asian and 85 were other than those already listed. Among the teen interns who were recruited from the National Honor Society, the student council and science teachers, 14 were female. They identified as 4 Hispanic, 2 Asian and 10 Other.

Comments:

All children reported having fun and liking their leaders. Most said that they had experienced an increased interest in science. Over 90% said that they liked taking their projects home and sharing them with their parents, and that they felt they had learned something new. They also liked the greenhouse activity and mentioned sunprints, solar water heaters, solar ovens and bubbles (younger children) as their favorite activities.

Adult mentors who wanted to continue enjoyed helping children discover science, liked "opening doors" for children who wouldn't otherwise have a chance, and felt strongly about the opportunity for everyone to have an understanding of science.

In the spring, a lack of cooperation on the part of the sun made teaching solar energy difficult at times. Suggestions for adapting to adverse conditions included more alternate activities, moving classes to before, instead of after school and running two units from which to choose at the same time. HOSO considers the national trends in these suggestions as it edits each set of materials prior to the next cycle.

Site: Sacramento (MESA Program, Delores Terrell)
DOE Regional Educational Director: Lani MacRae

Class levels offered: K-1, 2-3, 4-6

Number of Classes: Fall: 5 Winter: 10 Spring: 46

Number of enrollments: 641

Population served: 18 % African American; 75% Native Americans; 7% Hispanic

The children for the program were selected on the basis of their interest in science and mathematics, their appropriate behavior patterns and their expressed willingness to attend all sessions.

Native American Education Centers, the MESA program and school districts recruited the adult leaders, among whom were 12 African Americans, 17 Hispanics, 4 Asians and 32 Caucasians. Teens were recruited by teachers in schools and Indian

Education Center Directors. There were 10 African American teens, 41 Native Americans, 3 Hispanics.

Note: As the DOE grant was to close in May '94, HOSO asked each Coordinator if he/she could make use of the materials that had not yet been ordered, but had been allocated to the grant sites. Delores had the most ready mechanism, through the statewide MESA network in California, to absorb additional programs for targeted populations. Her numbers therefore increased dramatically for the spring 1994 session and the renewal proposal increases her allocation as well.

Comments:

Delores reports an increased sense of self esteem and confidence along with an increased interest in science from the children. Formal school teachers reported improved classroom performance and interest in the exploration of careers in science, which is one of the goals of MESA.

Children again asserted that they had fun in the DOE/HOSO classes, but fewer reported repeating activities at home, although those who did said that they especially liked taking things apart and rebuilding them themselves at home. The involvement of schools, Native American Educational Centers, the DOE and HOSO made this an especially collaborative and successful effort to reach the Native American minority population in need.

Site: Sacramento (Howe Elementary School, Tambria Swift)
DOE Regional Educational Director: Lani MacRae

Class levels offered: K-1, 2-3, 4-6

Number of Classes: *Fall: 10 Winter: 10 Spring: 10*

Number of enrollments: 330

Population served: 50% African American; 25% Hispanic; 5% Asian; 18% Russian immigrants and the remaining were "others" including one Native American.

Children were enrolled on a first come, first serve basis and the classes took place at the Howe Elementary School. Without making a special effort, the groups were roughly equal in gender. Teen assistants, who mirrored the minority population of the students, were recruited from neighboring schools. Parents were recruited to lead the classes.

About a quarter of the children were non-English speaking and were assisted by bilingual school personnel or bilingual parents. Special Education students were also part of the program with extra parent support.

Comments:

Tambria, who is African American herself, says genuinely that she feels that one of the major benefits of the program is that minority students are involved in science. As in the other sites, the children report having fun and like to keep their materials and take things home. Many report an increased interest in science and a sense of learning new things.

PROJECT DATA 1994-95

Site: CA (Statewide MESA program)

Coordinator: Dolores Terrell

Population(s) Served:

Over 500 Native American children.

40% female

Adult leaders were 2 Hispanic females, 1 Asian male, 7 Caucasian males, 5 Caucasian females.

Impact:

Adult leaders were recruited as teachers from local schools and the STEPS/HOSO programs took place at the schools. The teen aides and assistants were recruited by the teachers and Indian Education Center Directors. Parents participated as guest speakers and guests. Dolores reports that parents benefitted by more clearly understanding their children's activities and by developing closer ties to the teachers. The teachers, on the other hand, became better acquainted with the American Indian community and students. Students developed increased self-esteem and ability to communicate. They did better in school science. The school and community communications increased around the STEPS/HOSO program. Local business people participated as guest speakers.

Site: Oglethorpe Elementary School, Atlanta, GA.

Coordinator: Nettine Steed

Population(s) Served:

100 % African American

Adult leaders were 8 male and 12 female

Impact:

The class leaders were recruited through the Atlanta University system comprised of Spelman College, Clark Atlanta University, Morehouse and Morris Brown. Children included all third graders and teacher-recommended 2nd graders. Parent volunteers were involved. Nettine reports that several principals and resource personnel came

to the school, observed the programming and would like to be a part of it.

Fifth grade students who were involved in the program return and express that they "wished" that they were still involved. One of the leaders wrote "Before I joined the science program, I didn't like science. By observing the children's eagerness to learn science, I became motivated to teach and learn more about science. The students motivated me so much that I plan to return next year."

Site: Howe Elementary School, Sacramento, CA

Coordinator: Tambria Swift

Population(s) Served:

Adult Leaders: 1 African American female, 1 Hispanic female, 5 Caucasian males and 10 Caucasian females.

Teen Aides: 2 African American females, 1 Native American male, 1 Hispanic female, 3 Caucasian males.

Children: (Spring 1995 data) 17 African American males, 15 African American females, 1 Native American males, 10 Hispanic males, 22 Hispanic females, 2 Asian females, 19 Caucasian males, 24 Caucasian females.

1 Special Education child was served.

Impact:

Tambria personally recruited Adult Leaders. Children were registered through flyers. Bilingual children were assisted by bilingual leaders. Half of the leaders were parents and they were delighted to become empowered in science. Professional teachers participated as resources and substitutes. They mentored and supported the parents and other teachers. Tambria produced a videotape entitled "Democracy and Parent Involvement," featuring the HOSO programs. She has long waiting lists for participation. The Rotary participated in Science Night and the Western Area Power Administration remains a strong supporter.

Site: Denver, National Renewable Energy Laboratory

Coordinator: Lisa Joss

Population(s) Served: (94-95)

Adult Leaders: 39 Caucasian males, 36 Caucasian females.

Teens: 6 Hispanic males, 3 Hispanic females, 15 Caucasian females.

Children: 15 African American males, 24 African American females, 6 Native American males, 15 Native American females, 122 Hispanic males, 140 Hispanic females, 5 Asian males, 7 Asian females, 104 Caucasian males, 82 Caucasian females.

Impact:

The science enrichment programming takes place at school sites. Teens were recruited among former HOSO program students. About 20 children are non-English

speaking and are assisted by a bilingual teacher and volunteers. Some parents participate via recruitment and some come early and help out before pick-up time. Professional teachers assisted volunteers with the classes. Teachers were able to see alternative ways to teach science concepts. Lisa says that both teachers and parents are learning new teaching styles. Parents have reported an increase in their own interest in science. She also says "that many engineering firms encourage their engineers to work as volunteers due to positive feedback from schools."

Site: Washington, D.C.

Coordinator: Dean Sterling

Population(s) Served:

Adult Leaders: 8 African American males, 13 African American females, 7 Caucasian males and 7 Caucasian females.

Teen Aides: 8 African American males, 15 African American females, 1 Hispanic male, 2 Hispanic females, 1 Caucasian male.

Children: 189 African American males, 248 African American females, 28 Hispanic males, 36 Hispanic females, 6 Asian females, 18 Caucasian males, 14 Caucasian females.

Impact:

82% of the DOE volunteers at Forrestal taught more than 2 sessions.

Classes took place at elementary schools.

Science teachers/coordinators recommended teen assistants.

About 62 children were bilingual and were able to participate without special assistance.

There is competition for class slots, indicating recognition of a good experience.

Pre-K classes were implemented at Shepherd Elementary by two parents. The school science teacher took the HOSO training.

Gay Wilson, science teacher and STEPS Coordinator noticed a "heightened awareness, a greater attention span and more probing questions in the classroom" from students who were enrolled in the program.

Sierra Research Associates conducted a study of student impact in which the STEPS program was one of four sites. A copy of FINDINGS is appended to this proposal.

Informal science is difficult to assess in the quantitative ways that formal science can be assessed. Part of the value of informal experiences is that they are voluntary and self-evaluative. Adults and children continue to participate because it gives them personal satisfaction and growth.

Project Class Data 1995-96

	Fall 1995	Winter 1996	Spring 1996
Denver (NREL)	0	10	0
Washington, DC	0	3	0
Sacramento, CA	10	10	3*
MESA (CA)	0	0	0
Atlanta, GA	0	0	0

* Non DOE funding provided for continuity of a HOSO research project focusing on perceptions of changes experienced by adults using HOSO training and materials to lead classes.

Recognition is due to Delores Terrell who died of cancer in 1995. Her efforts to reach the Native American population in California, through the MESA program resulted in the participation in this project of hundreds of children and the adults who led them.

Data Collection and evaluation in informal science programs are different from data collection in school settings. The nature of informal science education is partly that participants are not being "tested" and can learn at their own pace. Hence, questions about cognitive growth are inferred through parameters such as attendance and anecdotal expressions and questions. Site visits were not attempted. There is questionable value in "spot" checks. It is often not clear whether any impact can be derived from site personnel putting their best feet forward on a single observation basis. For this reason, the HOSO project didn't request travel money for site visits. The feedback in this project has been continually and generally positive as presented in previous reports and funding applications. A sample data collection form follows. The project was monitored by phone support, written pieces and as the technology evolved, electronic mail.

A sample data collection sheet follows.

**DOE - STEPS - HOSO PROJECT
DATA UPDATE, 1994-95**

NAME _____ LOCATION _____

Please fill in the information below and return it in the stamped, addressed envelope or fax it to HOSO (301-816-6934) by May 10th. Numbers should reflect the entire year. Please estimate to the best of your knowledge if you don't know the exact record. Thank you again for your help with this.

	African American		Native American		Hispanic		Asian		Other	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Number of Adult Leaders or Teachers										
Number of Teen Aides or Assistants										
Number of Children										

1. How were your Adult Leaders or Teachers recruited to the project?

8. How were professional teachers, if any, involved in your program?

2. Where did your HOSO/STEPS classes take place?

How did they benefit?

3. How were your Teen Aides or Assistants recruited?

9. How would you (briefly) describe any impact on the regular school community because of the presence of this project?

4. How were the children selected or designated to participate?

5. About how many of the project children have been non-English speaking? _____
How were these children helped?

10. Have you seen or have you heard from others that siblings, classmates, neighbors and others in contact with project children have shared or benefitted from the presence of this project?

6. Were any handicapped children enrolled in your program?

How were they accommodated?

7. How were parents, if any, involved in your program?

11. How have local businesses, if any, become involved around this project?

How did they benefit?

Please use other side of page to expand your answers, if needed.