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PERFORMANCE REPORT

THE NATURAL SCIENCE INSTITUTE

FOR

TEACHERS OF MINORITY STUDENTS

PI: Carmel J. Ervin
JULY 6-30,1993
NATIONAL MUSEUM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION
NATURALIST CENTER

I. Overview

PROGRAM PURPOSE

The purpose of the Natural Science Institute for Teachers of Minority Students is to enhance the science knowledge and skills of grades four through twelve science teachers in the District of Columbia Public Schools. The Institute brings school teachers together with practicing scientists and experienced science educators who are currently doing or involved in research and publication , especially in the area of global change. Special emphasis is placed on the interdisciplinary nature of science and the part played by the understanding and teaching about the dynamics of the environment and global change. In addition to these goals, teachers will learn a number of successful alternate strategies for teaching science to minority, disabled and non-English speaking students.

II. OBJECTIVES

GLOBAL OBJECTIVE

The purpose of the Natural Science Institute for Teachers of Minority Students is to improve the natural science knowledge base, and increase the quality and quantity of science teaching methods of grade 4-12 teachers in Washington, D.C. schools. A major goal of the Institute is to show teachers how to teach students about environmental and global change issues.

INSTITUTE OBJECTIVES AND IMPLEMENTATION STRATEGIES

1. To use the wealth of natural science resources within the Smithsonian Institution , the Federal Government, and the surrounding areas (within a one-hundred mile radius of the Washington, D.C.) in a comprehensive interdisciplinary science teacher training program that emphasizes "learning by doing".

2. To use the knowledge and skills of Smithsonian scientists, museum educators, informal science educators, university science professors and environmental scientists who are actively involved in scientific research to improve scientific literacy among minority teachers and teachers of minority students.

3. To provide teachers with an opportunity to interact with **"real"** scientists in scientific environments and laboratories where they will learn firsthand, how scientists use their tools, set up experiments, collect data, interpret data and apply the information that is learned.

4. To present to teachers the **"Object Based Method"** of science instruction which includes a workshop on **" Learning How to Read Natural History Objects".**

5. To introduce and educate teachers about **Hueristic** instruction which refers to styles of teaching which emphasize the development of self-initiated and self-directed student learning. Special focus is placed on students discovering rather than absorbing knowledge, which place the student in the role of inquirer, and which aim at heightening the relevance of school to the student's life. This approach is also concerned with the student's emotional and social development and cognitive growth.

6. To show teachers how, through creative questioning techniques, they can develop creative thinking and problem solving skills in their students. Teachers will learn how to analyze, synthesize and apply strategies that not only develop problem solving skills, but at the same time, help to build student awareness and self esteem. Teachers learned how using "Experimental Design" techniques, emphasizing process as opposed to product, and increasing the amount of hands-on learning activities in the classroom, develops and enriches the student's innate ability to solve problems.

7. To involve teachers in the analysis of their teaching styles. Teachers were able to identify their own personal learning style preference and learn how personal style influences instruction in the classroom. Ultimately, this experience concretely demonstrates to teachers the need to recognize, accommodate and utilize the diverse strengths or weaknesses of the variety of learning styles in any classroom.

8. To provide teachers with alternative approaches for teaching science. These methods take into account the negatives students associate with science education: over reliance on textbooks, that required high math aptitude, constant lecturing and lack of opportunities for experimentation.. Teachers learned how to develop and teach concepts

without the use of books, vocabulary lists, etc. They also learned how to incorporate reading skills, vocabulary, mathematical concepts and environmental issues into science curriculum in an informal and non-threatening way.

III. PROGRAM DESIGN

The Natural Science Institute For Teachers of Minority Students was planned to bring District of Columbia teachers from various racial, ethnic, social and economic backgrounds together with museum scientists in a comprehensive natural science education course.

DESIGN COMPONENTS

A. **Targeted Schools:** The Institute targeted elementary , middle, junior high and high schools in Washington, D.C. and the surrounding areas. Teachers from the following schools participated in the Institute

-Shelly Skomra
Watkins CHCS
12th &E Sts. S.E.
Washington, D.C. 20003

-Patricia Stanley
Birney ES
MLK Ave. & Sumner Rd.,S.E.
Wash. D.C. 20020

-Gloria Allen
Bunker Hill Elm.
14th/Michigan Ave. N.E.
20015

-Sheila Garner-Allen
W.B. Patterson Elem.
S. Capitol & Elmira Sts., SW
Washington, DC 20032

-Alvin Cunningham
Sub-Teacher P.G. County
10413 Parapet Court
Ft. Washington, MD 20744

-Georgia Herron
Howard University
School of Education
Howard University
Washington, DC 20459

-Maura Kinney
Watkins Elementary
12th & E Streets, SE
Washington, DC 20003

-Kevin J. Leach
Bancroft Elementary
18th & Newton, Sts., NW
Washington, DC 20010

-Zoe McNair
Cora Kelly Elem.
3600 Commonwealth Aveue
Alexandria, Virginia 22306

-Serafat Ojo
Howard University
School of Education
Washington, DC 20059
-Darnice Scott
Brookland Elementary
Michigan Ave. & Randolph Sts., NE
Washington, DC 20017

-Russell Vale
Fort Washington ES
Fort Washington Road

Fort Washington Maryland, 20744

-Kevin Vale
Potomac HS
Fort Washington, Maryland 20744

B. Curriculum Components

The Institute course content was divided into the following areas.

Science content and teaching program: was conducted by museum scientists, informal science educators, education specialists, museum science technicians and professional educators and scientists at local universities. Specific content topics include physical anthropology, invertebrate zoology, vertebrate zoology, physics of marine systems, toxicology, botany, geology, zoo conservation, entomology, and collecting and preserving materials for classroom study. Special attention will be placed on studying specimens indigenous to the metropolitan area.

The methods of science teaching program: was taught by one of the nation's leading science educators. The presenter, **Dr. Ronald Giese**, recently published " Teaching Scientific Research Skills and Experimental Design". In addition to a three day workshop, teachers learned alternative approaches for teaching science to minority students.

The fieldwork and naturalist program: took teachers out of the classroom and into the earth's laboratory. In this component of the project teachers discovered, analyzed, and learned to effectively use local natural science resources for instructional purposes. They learned ways to make simulations of these environments in the classroom for environmental, ecological and global change studies.

COURSE AND WORKSHOP DESCRIPTIONS

Teachers participated in the following workshops. Overall, they looked forward to participating in all of the hands-on activities and sessions. Workshops that stressed scientific theories seemed to be the least favored. The comprehensive evaluation and the DOE Template, conducted

with the teachers, provides more detailed information about this.

Experimental Design. This workshop was led by scientist, educator and author, Dr. Ronald Giese. His most recent publication, "Students and Research, Teaching Experimental Design", has received national recognition. In this course teachers field-test teaching strategies for developing research skills in students at the elementary, middle, senior high, and college levels. Techniques for helping students design experiments, generate ideas, construct tables and graphs, and write simple reports are presented. In part II of the course, teachers learned how to expand students' research skills to include more sophisticated data analysis, experimental design, and reporting by using library resources, applying descriptive and inferential statistics, designing complex experiments, and writing formal papers. Implementing science fairs also will also was covered.

Learning to Read Natural History Objects. This workshop illustrates to teachers some examples of innovative, object-oriented approaches to teaching science. The teaching techniques used in the workshop also meet the needs of teachers whose students pose special educational challenges, such as gifted, hearing and visually impaired, or reading disabled students. The workshop involves:

--in-depth discussion on teaching complex scientific concepts;

--discussion on teaching methods and inquiry techniques;

--participation in small group problem solving exercises; and

--training in the development of observation activities in which teachers and museum educators work together to create classroom and museum programs to utilize the techniques learned.

Learning Styles and Instructional Strategies. This workshop explored ways of teaching science that contain contemporary views of what science is and how to teach it to accommodate the four basic learning styles. Teachers learned how emotions, values, excitement, commitment, and concern are joining the arena of discipline, responsibility, and integrity. Emphasis was placed on the idea that science is sensing, questioning, hypothesizing, analyzing, synthesizing,

investigating, guessing, tearing apart, putting together, measuring, feeling, and looking into the unknown, all with curiosity and excitement. The 4Mat science teaching model is based on research from science and psychology.

Outdoor Science Learning Opportunities. Teachers learned that science labs are all around them. This workshop centered on showing teachers how to use the natural environment as a science lab. Participants collected botanical specimens, learned how to identify leaves, do plant projects, made materials from plant parts, set up and care for plants in the classroom, and constructed viable ecosystems that contain plants and animals (insects and worms).

Entomology. This workshop focused primarily on introducing teachers to the major orders, classes, species, and identification of insects and bugs. Teachers visited, studied, researched and observed these organisms at sites such as the Naturalist Center, the Insect Zoo, the National Zoo and other field-trip sites. Concepts studied included, but were not limited to, identification, anatomy, reproduction, growth, development, habitat, relationship to humans, and role in the biosphere. Teachers explored ways in which insects are collected and maintained for short intervals of classroom study. Designing appropriate environments for the organisms will be emphasized, especially for the benefit of learning about the effect the environment has on organisms and vice versa. Insects indigenous to Washington, DC was studied. Entomology topics were included in all of the other workshops. For example, during the botany class teachers learned about insect pests and how to minimize the damage they may cause to plants. Teachers also learned how to identify and study living ecosystems found on plants.

Environmental Science Studies. In these workshops, teachers became familiar with many natural science resources in the metropolitan area. The Smithsonian Environmental Research Center is one of the most important sites. There, for example, teachers studied estuarine and terrestrial flora and fauna. They learned about research currently being done in connection with the Chesapeake Bay. Learning stations explored topics such as crabbing, water turbidity, salinity, and dredging the floor of the bay for identification and analysis of estuary populations. In the area of global change, teachers observed experiments and interacted with scientists who are currently doing research in global change. Examples of

such research include: blue crab ecology studies, marine nematodes and ecological interactions, denitrification of a forest receiving agricultural runoff, and the effect of raising atmospheric CO_2 (carbon dioxide) concentrations on ecosystem processes in a Chesapeake wetland. In addition to this, teachers learned about the rich history of the Java Plantation upon which the research center is built. This interdisciplinary history lesson included exhibits, performances, literature, hands-on programs and discussions about the various ethnic groups that once inhabited the land around the bay, and built the Java Plantation.

Comparative Vertebrate Zoology. This workshop compared the anatomy of various higher order phyla if the animal kingdom. Topics explored included the respiratory, circulatory, and skeletal systems of primitive vertebrates through higher chordates. Emphasis was placed on vertebrate growth and development. Examples of hands-on activities includes dogfish dissection, chick embryo examination, and metamorphosis, adaptations.

Primate Zoology, Zoo Conservation, and the Amazonia Rainforest. A field-trip to the National Zoo began with an introduction to the educational resources and special programs available at the Zoo. The history of zoos and the role they play in wildlife and conservation education will be discussed. The teachers took an in-depth tour of the resident primate houses, learning much about their social habits, family structure, and recent attempts to re-introduce these animals into the wild. The next adventure was to the Herpetology and Invertebrate Labs where they compared specimens, design lesson plans that utilized the living exhibits, and received commercial copies of some of the lab's most popular teaching modules. Finally, teachers met and interacted with scientists at the New Opportunities In Animal Health Sciences Center (NOAHS) where state-of-the-art medical and reproductive research is conducted.

Geology of the Washington, DC Area. Workshop participants examined NC geological specimens. In this workshop they met and worked with geologist, Dr. Jim O'Connor, and Smithsonian geologists. Teachers examined and studied igneous, sedimentary, and metamorphic rocks and the major rock-forming minerals. They learned the distinctions between rocks and minerals, classify rocks, determine rock origins, explored relationships between texture and mineral composition, learned ways to

collect rocks for classroom study, and learned techniques that are used to analyze rocks and minerals. Special emphasis was be placed on teachers learning about the specific geological processes and structures common to the Washington, DC area and, particularly, the Anacostia neighborhood. An example of an innovative activity that teachers learned to conduct is the earth science component of the "Careers in the Sciences" program. Dr. Michael Wise, an African American geologist, talks with teachers about his research with pegmatite, an igneous rock. Using a hands-on geology kit he constructed with the assistance of the Institute director, teachers learned firsthand how to use the kit in the classroom, and integrate the DC geology curriculum. The hands-on geology kit contains a video in which Dr. Wise discusses how and why he became a scientist, and explains his work with pegmatite. The "Careers in the Sciences" program was piloted in three DCPS schools: elementary, middle/junior high, and secondary in the spring of 1994. Teachers will also receive a comprehensive earth science resource guide for the DC area.

Integrating Technology into the Science Curriculum: One of the 1990 Institute participants stated in her evaluation that, "of all of the workshops we had, when you said computers, I was frightened". This workshop introduced teachers to the IBM and Apple PCs. Classes were conducted at the Smithsonian Computer Education Center in the Office of Information Resource Management. Technology specialists from Open Systems Technology, Inc. conducted the training. In April 1994, OST and the Institute director met with DCPS administrators to form a partnership through an NSF Technology Education Grant program. OST is an Access 2000 partner. Through the partnership they have designed all training activities to facilitate and support MSTI objectives. Besides OST training, additional computers, instructional activities and software was be located in the NC for teachers to use daily. One of the course activities will focused on why and how computers work. This helps the teachers to understand the systematic steps, logical sequence, and languages computers use. Other fundamental activities center on understanding commands, using disk drives, exploring science software, integrating computer activities into the DC school curriculum and exploring ways of getting computers for schools. The project director has negotiated free computers for Institute graduates through federal agencies and Cap Access (a DC area telecommunications project) initiatives. Teachers will explore interactive software programs: National Geographic will provide teachers with instruction and software

to run the telecommunications KIDNET program on "Acid Rain", the Smithsonian National Diffusion Network Clearinghouse, the Museum of American History's Science and Life exhibit and technology programs. OST technologists are also working in partnership with Doris Cuffee and Jacob Collins at the Takoma Technolohy Training Center.

Invertebrates : In this workshop teachers observed,compared and contrasted a variety of small and large invertebrates from the Naturalist Center collections, the Coral Reef, the Smithsonian Chesapeake Bay model, at St. Leonards, Maryland, at the Environmental Research Center and at science centers in Virginia. They discovered both the bio-social similarities between these organisms and humans. Some of the other concepts that were studied included phylogeny, morphology and taxonomy. The St. Leonards expedition provided teachers with an opportunity to collect beached specimens for classroom use.

Paleontology: Teachers visited the Virginia Living Museum where they worked with staff scientists exploring the museum's collections, ecosystems, laboratories and hands-on materials. Collecting took place along the James River in Hampton, Virginia. There, specimens of various kinds were gathered: invertebrates, plant,shark teeth, and animals on the beach. Throughout this field trip geology lessons were taught and corresponding specimens were passed around.

Living In Water, Fishes, and Squid Studies at The Baltimore Aquarium : These workshops focused on vertebrates. Teachers learned about the extensive number of science education programs available to students at the Aquarium in Baltimore. There they worked with scientists who discussed creatures such as dolphins, whales, sharks, rays, skates,etc. Teachers then did several experiments including dissecting a shark and squid. For the culminating activity teachers cooked and ate the squids not used in the experiments. The Ichthyology workshops focused on the orders, classes, species, habitats and behavior of fishes. Teachers learned how to use common fish found in pet and/or grocery stores for classroom projects.

Physical Anthropology. Here teachers learned how to interpret bones. This was done in two parts. The first is the physiology of bone formation and structure which includes the activation of specific cells to build and break down bone. Hormonal, dietary, and environmental factors of bone

formation will also be examined In part two, teachers will identify specific bones in the human body, and be able to compare those to non-human bones. This is important because students need to know about the components and interrelatedness of good health and exercise.

Multicultural Perspectives. The rich and vast history of ethnic people and their contributions to science, mathematics, and technology were explored. Through literature, film and personal interview, teachers visited the African continent where they were introduced to great African scientists. They also learned about early contributions that evolved from Native American and latino ancestry. From Africa, teachers traveled to North America where they learned about the contributions of African and African Americans from the eighteenth century to the present. A variety of trade books, hands-on activities, and other educational media are incorporated into the program. Teachers made multi-ethnic learning kits for use in their classrooms. Speakers from local ethnic communities participated in this workshop.

IMPLEMENTATION SCHEDULE

A. Institute Implementation Schedule: The summer session of the Institute was conducted from July 6-30 1993. It will continue for at least three years. It has been in operation for five years. The Smithsonian Institution, National Museum of Natural History, and DC Public Schools will provide funding for activities in 1994-96.

C. Follow-up Schedule: The follow-up activities will be conducted from October to June of the Institute calendar year (the Institute calendar year is from July through June). After this period, Institute follow-up activities will be the responsibility if the museum and school system. Teachers leaders will conduct at least four staff development workshops with their peers during this period. The Institute Director (ID) will observe half of the Teacher Leaders instructing their peers, and the other half instructing students in the classroom. Visits to the schools will allow the ID and the Associate Project Directors to collect both qualitative and quantitative data for the evaluation.

COURSE REQUIREMENTS AND ROUTINE PROCEDURES

Course Credit: Teachers received four graduate credit hours from Trinity College, Washington, D.C. Teachers were responsible for all fees. The Institute director provided teachers with the application information.

Attendance:
All classes will began promptly at 9:30 a.m. and end at 3:30 p.m. Teachers arrived on time and to attend every class. In the event of an emergency two excused absences was allowed. Additional absences will disqualified the participant for receiving graduate credit.

Projects and Assignments: Every participant completed a project by the end of July. The project consisted of developing and constructing a hands-on natural science **instructional kit**. Each kit included at least two object based lesson plans, behavioral objectives, materials to use with the lesson plans, a student evaluation form and a list of reference materials that can be used with the kit. Every teacher presented and demonstrated the kit materials to other participants. Each kit was evaluated by the Principal Investigator and the school system's science supervisor.

Class Notebooks: Every participant created a reference notebook that contained in order, notes, assignments, handouts and other information distributed during classes and workshops. Each notebook will be duplicated and placed in the school's teacher resource room.

Materials for Kits: Every teacher received a materials stipend to use for the purchasing of hands-on materials for the kit. Teachers will also receive non-classified museum specimens from the museum research departments. However, every kit contained collected local natural history objects.

Workshop Format: **Every Workshop or Class Instructor** provided **content** and **hands-on instruction** in a specific field of natural and environmental science. Additionally, each presenter had training in ecology and global change. Each candidate will met with the Institute director prior to being selected as a Workshop Instructor. Each Instructor was competent in providing teachers with a wide range of instructional activities that were appropriate for students in grades four through

twelve.

Museum Education Support: The Institute director, museum education specialists, members of the DESERC coalition and project interns provided guidance and support to Institute participants throughout the span of the project(which is projected for three years). This support may include, but is not limited to, at least three follow-up workshops each year, attendance at conferences and Smithsonian training programs, visits to schools, participation of museum staff in school-based science related events, classroom observations, professional staff development, open continuous dialogue about educational programs, and resources like the NMNH annual "Teacher Give-Away".

Culminating Activity: On the final day of the teacher training phase of the Institute, teachers presented their projects. Although one project is required, all teachers produced at least three projects and had at least four resource notebooks that were filled to capacity.

NATIONAL MUSEUM OF NATURAL HISTORY
INSTITUTE

EVALUATION

1. What were your expectations for this institute?

A. *Exposure and introduction to resource available at the Smithsonian Institute
*The opportunity to work with a specialist
*Introduction to new teaching methodology
*Introduction to mentors for students; Intro to human resources

B. Lots of information and materials in many areas of science

C. In order to get "geared up" this institute surpassed my expectations

D. To meet scientist from various science fields and broaden my horizons on knowledge that I do not already have. I anticipated learning a lot about science exhibition. I also expected to find available resources that would be of value to me and my students.

E. To be given intensive amount of scientific information that we would have to digest. However, I also hoped that I would learn new ideas and ways to teach science.

F. To be made aware of the many available places I can take my children throughout the year for learning experiences in the form of fieldtrips, lecturers, and other activities.

G. To kearn more about teaching science - especially "hands on" learning experiences. I expected information, materials, and first hand experiences.

H. To find an institute that would give ideas and materials as hands on that could be used in an education classroom to motivation pupils to want to learn more about science everyday and develop a science workshop and fair.

I. To learn ways to plan science lessons in ways that would be enriching and stimulating to students.

J. To become familiar with the workings of the Smithsonian Institution and science methods.

K. To learn many new ideas that I could use in the classroom.

L. To make many contacts in the science field and to collect things that can be useful in my classroom.

2. Were your expectations met? Were they exceeded?

A. *Expectations exceeded my desires.

*The opportunity to work with specialist was somewhat met.

B. All my expectations was met and more.

C. My expectations were exceeded. I feel able to approach practically any topic in science because of the networking and resources made available.

D. Yes they were met. I was overwhelmed with the various experts from the carious works of science. I enjoyed the day spend at the Smithsonian Center in Edgewater and my field trip to FDA.

E. Now that the course is completed, my expectations were met! In addition, I have been given so much information that I can use in the fall. In this case my expectations were evceeded.

F. My expectations were more than met. I have experienced a wealth of knowledge about fieldtrip possibilities, people to talk to, and activities to do with my children.

G. Yes, my expectations were met and exceeded. I received much more information andd material than I expected. I have never been too comfortable teaching eith " hands on " materials but now, with the experiences I have in the Institute, I will be much more comfortable doing " hands on " projects in my classroom.

H. My expectations were met. The workshops provided knowledge, materials, and ways to present the science ideas, projects, skills and knowledge to the students. It exceeded my expectations because I had never been to a workshop where I learned so many strategies and materials.

I.My expectations were, overall, met. however, I would have liked to review Dr. Geise and Laura's terrific information later on in the course, somehow integrating those skills in other workshops. Otherwise, it was great. A lot of info in a little time - very stimulating. I would, and will, recommend to all teachers I meet. I'm glad that Marsha recommend the Institute to me.

J. My expectations were greatly exceeded. Not only did I become familiar with the Smithsonian, I got an introduction to many science disciplines which were not familiar to me.

K. My expectations were exceeded. I was able to learn innovative new ideas that I will be using during the coming school year. I was familiarized with many resourses that are available for use in the classroom. I also became more enthusiastic about preparing for this next year.

L. My expectations were exceeded. I was introduced to lectures and science sites that I did not expect.

3. Will the information covered in this Institute be useful to you? Describe ways that you plan to integrate it into your classroom.

A. * Definitely, I will be more sensitive and appreciative when handling fossils.
* The opportunity afford me to participate in Nat. Scienc Institute and Chesapeake Bay Found program proved to be quite rewarding.

B. The knowledge and materials I have received will exite my students. I will integrate science limits with reading, math and social studies.

C. The information will most definitely be useful. I plan to build a science center and use the resources made available.

D. Yes they will be useful to me. I learnt methods from the experimental design that I would use in my classroom when we do science experiments and get ready for science fairs.

E. *Yes, I will teach about fresh/salt water ecosystems.
*I also plan to expand my geology and invertebrate science lessons.
*We will take as many trips to provide real life experiences to reinforce science topics covered in the classroom.

F. Absolutely, the information covered in this istitute will be useful to me. I plan to use my lesson on cactus plants which I ordered through this program. I'm excited about the idea of taking my children to the Baltimore aquarium, especially to see the new water show. Since I am an ESL teacher, I have many opportunities for language development through science.

G. Yes, the information covered in thise institute will be very useful. The information and materials received on invertebrates will greatly enhance and expand the science objctive on invertebrates. Thanks to the materials given to me at FDA and the lessons in experimental design, I will be able to incorporate experiments into many lessons. I also plan to use some of the people I met as enrichment resources in the classroom.

H. I plan to integrate the materials into the classroom by Introduvcing the pupils to the materials by making Bulletin Boards using Science in Math, The Success in Reading and Writing Program, making kits, foing on field trips to the Smithsonian using the materials to make hands on materials.

I. Yes, especially Dr. Geise's, Laura McKie's, Cultural Anthropology, and info from NSF. Gave me lots of good ideas for developing on-going lessons, teacher workshops, and materials. I plan on coming up with science fair projects that stress reverence for life using the Experimental design. I'd also like to use the information about adaptations with items necessary to proper pet care.

J. I was fascinated meeting so many scientists and learning what scientists do. I am going to emphasize in my curriculum with young children, What a scientist does and how to use the scientific method.

K. The information will be very useful. I plan to integrate the experimental design concepts as soon as possible. Hopefully, my students will be of a higher quality this year. I also plan to integrate much of the information that is in the handouts we received.

L. Yes, I can use the kit I made and the materials collected in the classroom. I can use contacts made as field trips for my students and ask visitors to the school.

4. What were the sessions greatest stengths?

A. *Field Trips
*Opportunity to interact with researchers
*Awareness of materials and human resources
*The relaxed, but professional education setting

B. The hands on sessions was the most interesting. Shelly was very helpful, but it would have been more relevant if it was given during the time we were ordering our kits.

C. *variety of topics
*variety of activities
*hands-on fieldtrips
*hands-on lab activities
*handouts

D. The greatest strengths were the trips, which gave us first hand information about what is available to us out there. You can plan lessons for the class based on those visits and plan to expose your students to those places. The variety of topics gave us a wide variety of the science field.

E. In my opinion, the sessions that were the stringest are as follows:
*Experimental design
*Invertebrates/Chesepeake Bay Model/Coral Reef
*Environmental Ed. Center
*Backyard Science/St. Leonards

F. The greatest sessions to me were:
*Baltimore Aquarium
*Smithsonian Environmental Research Center
*Debbie Duel's presentation
*Anthropologist presentation (Ferensic Anthro.)
Since each individual had their own areas of interest, perhaps it is safe to say that the fact that so many areas in the science field were covered. There was something to meet everyone's interest.

G. The greatest strengths of the sessions were the wide variety of information and materials presented. Many areas of the natural sciences were covered and most of them will be useful in the classroom. As an elementary classroom teacher I cover a wide range of topics and many of those topics were covered.

H. The sessions greatest strengths: 1) Was the direstor and the planning; 2) THe presenters as Dr. Ronald N. Giese, the computer and science education workshops and others; 3) Field trips to the Bay and others; 4) The Internship Program etc.

I. The diversity of topics. The excellent handouts. The people who participated. Exposure to the resources. NSF Dr. Doman, Mrs. Moses, and Dr. Tolbert.

J. Becoming familiar with so many disciplines and seeing the thread that runs through the sciences.

K. Learning Styles workshop, Experimental Design workshop, Trip to the Smithsonian Environmental Research Center (ALL WERE EX-CELLENT!). The Food and Drug Administration internship was also great.

L. The three days in Experimental design.

5. What were the sessions greatest weaknesses?

A. I wanted to work in conjunction with a research on field scientist.

B. The only two sessions that were disappointing were Toxicology and Backyard Science.
Toxicology was too difficult to use and explain to the children. It would have been useful if the materials not so difficult.
Backyard Science needs to be more focus and spend a little more time on insects, plants and trees, etc. Not all at once.

C. I can honestly state that there were no significant weaknesses.

D. Nothing specific, but it would have helped if an intern or mentor who had done a unit previously demonstrate to us, the very first week of class, what we should be expected to know. Having it the day before the presentation does not help us very much.

E. Toxicology - Interesting but too advanced.
Computers - Not enough time for the presenter to fully develop her presentation.

F. I think that some of the weaknesses were the fact that some of the presentations were geared for the more advanced levels of science.

G. A couple of topics were a little over my head - the information was good but difficult for me to follow because I have a weak background in Physics and Chemistry.

H. The sessions with the greatest weaknesses was the Internship Program, some of the sites didn't produce materials I could use in the classroom. The experiments were too advance at the Beltsville Agricultural Research Center. I would like to have been given something in writing or materials that I could use. I was shown all things that cost $100.00 to $200.00 to buy on my own.

I. Cancellations, - a couple of young, new speakers who were not comfortable with presenting had a good info, but because of their presentation manner did not hold my attention. - Amphibians and Reptiles and Parasites, toxicology, was not relevant or presented in a way relevant to elementary or middle school teachers.

J. I would liked to have more specific material for classroom use. Herpetology and Insect Pests could have been made more interesting. The handouts were not very interesting. The toxicology workshop was too short, I would have liked to hear more about environmental implication.

K. Toxicology - the information was interesting but it was hard to pay attention to Dr. Sperling's lecture for (2 1/2) two and one-half hours.

L. There were no weaknesses.

6. Were the hands-on field trips very helpful? Please explain.

A. *Many of the items discussed in class became quite apparent on the Chesepeake Bay Field trip.
*Very new ideas were generated.

B. All of the hands-on trips were great resoureces and experiences. The information that is given to me will stay with me when it couple with hands-on. I love it!!!

C. The hands-on field trips were helpful because I will know how to prepare my students for the same or similar trips.

D. Yes they were - by taking a walk through the Smithsonian plant at Edgewater. I had a good lesson on trees and plants that were very interesting and revealing. I saw trees that I have heard of but never seen.

E. The hands-on field trips provided information that allowed me to explore new ideas to present to my students. This year I plan to incorporate my field experiences in my science plans. There will be many activities that will provide hands-on activities, and I will change my methods as to better accomodate the needs of my students.

F. The hands-on field trips were very helpful. They were helpful because children learn by doing and hands-on field trips can sometimes be more of a teaching tool than classroom lecturing.

G. The hands_on field trips were very helpful. Field trips with a purpose always make a topic more meaningful. For example, going to the zoo and listening to the experts in their environment made much more sense than having them come to us to talk. When I go someplace and do something, I am better able to guide to meaningful experiences.

H. The hands-on field trips were very helpful. I learned new sites to visitwith my students this school year, how to prepare my students for the trips, and different ways to motivate the pupils with field trips int he neighborhood.

I. The guide during the Edgewater nature tour was wonderful and gave lots of insightful ideas that could be used on any nature walk. The whole Edgewater trip was very helpful. The beach and Anna Maria's tour were both ruined because of the weather. Rae's suggestion of touring related places on or near the water is good. Anna Maria's backyard tour could be improved by focusing on 1 topic rather listening to names of every plant and animal species in the yard.

J. Very enjoyable. The Backyard Aquarium has opened up unseened possibilities for me.

K. Yes. They provided us with hands-on experiences as well as giving us additional resources for our students.

L. Yes, they provided ideas and contacts for our schools.

7. Which sessions did you feel were the most helpful to your age group/teaching situation?

A. Experimental Design Seminar

B. All sessions except for Toxicology

C. Learning Styles because above all, it is important that we reach each and every student as we teach.

D. The sessions to Edgewater, the very second topic on hands on adaptations, how you can look at an object and describe their adaptations.

E. Experimental Design provided a good insight on how to develop a good science project, yet a simple idea could do.

F. *Baltimore Aquarium
*Debbie Duel's session on animal care
*Environmental Research Center
*Smithsonian Animal Insect Zoo
*National Zoo

G. The most useful sessions for my age group were:
*Experimental Design
*Invertebrate Zoology
*Insect Zoo
*field trip to National Zoo
*internship day at FDA
*Debbie Duel's workshop on Humane Society

H. All the sessions were helpful to my age group teaching/situation.

I. Since I teach a limited of lessons, I am bound to fewer presentations. However, the Learning Styles, Adaptations, and Experimental Design are all things that I will use, and refer to my materials ,when planning. Because of Laura's presentation, I have already started reramping some of my regular programs.

J. The Insect Zoo

K. Experimental Design, Humane Education, and National Zoo field trip.

L. Experimental Design

8. Which sessions did you feel provided you with the most valuable informations, hand-outs?

A. All of them

B. All the materals

C. It is really difficult to say!

D. The trip to FDA, I was given materials and science kits that will be very useful to me as we do not have those as teachers in D.C. schools.

E. Invertebrate Zoology and the Baltimore Aquarium provided excellent handouts (Living in Water & The Seaside Naturalist)

F. Most valuable handouts were given by Baltimore Aquarium, Debbie Duel's Animal handouts, and handouts from Dr. Giese.

G. The most valuable information handouts for me were:
*Experimental Design book
*Invertebrate Zoology handouts and book
*Baltimore Aquarium curriculum guide
The other information, handouts will also be useful as I have time to really digest them - can't forget the information and materials from Debbie Duel's /Humane Society.

H.*Dr. Giese
*The Computer and Science Education workshop
*The Baltimore Aquarium
*Washington Humane Society with Debbie Duel
*St. Leonard Maryland
*Invertebrates - Mollusks, Toxicology workshop
*Winning Way (Black's in Gov't)
*Learning to Read Natural History Objects
*Learning Styles Workshop
*Microbiology

J. The seaside book is wonderful!!! Rae's materials are also outstanding. The insect info and the materials that were on hand for us to look at were also very good. I'm sure the computer disk will be a valuable handout for the classroom teachers. Good info in Learing Styles. I could have done Learning Styles for a week and Experimental Design for another week. The info in these are applicable to everything.

K. Our sessions on invertebrates opened up a new world to me. Insect Zoo - I enjoyed reading the materials and I found it very useful.

L. *Experimental Design Textbook
*Invertebrate Zoology textbook
*Humane Education handouts
*National Aquarium curriculum guide
*"Weather or Not" curriculum from the Education Resource Center

9. What is your overall impression of the subject matter presented in this workshop? Can the subject matter be applied to the shcool group that you work with?

A. Very good; I feel re-enervated, revived and excited about teaching science again.

B. The subject matter presented in this workshop was excellent! It can be applied in my school group or adapted if necessary.

C. Yes it can!

D. My overall impression is very good. I found that most of the presenters were motivated, organized, and able to complete convey valuable information to its participants.

E. My overall impression was very good. The subject matter can most certainly be applied to my school group.

F. The subject matter presented was excellent and the presenters were all so knowledgable. Most of the subject matter can be applied to the school group that I work with.

G. The subject matter presented can be applied to my school group. 95% ot the matter can be applied to 4th graders. It was excellent and well presented. The pupils will enjoy looking up some of the terms.

H. While I may not use many of the particular subjects, I will use lots of the techniques with my students and in future workshops.

I. This was a truly memorable and exciting experience. I will always treasure the excitement of this month.

J. One of the Institute's greatest strengths was the wide variety of subject matter presented. It was all very applicable to the students I work with.

K. Almost all of the subject matter can be applied to my students, or may be modified to fit each grade level.

10. Which handouts did you find particularly good?

A. The session dealing with the mollusks, brine shrimp, and marine biology.

B. *Zoology
*National Aquarium
*Air & Space Museum

C. Difficult to say because everything was useful.

D. *FDA handouts
*Computer Software

E. *Invertebrate Zoo
*Baltimore Aquarium

F. *Baltimore Aquarium
*Debbie Duel's animal handouts
*handouts from Dr. Giese

G. *Experimental Design book
*Invertebrate Zoology materials
*Debbie Duel's Humane Society handouts
*The national Zoo materials
*The hands-on material from FDA

H. The kits that were ordered, the books "Students and Research Practical Strategies for Science Classrooms and Competitions, The Seaside Naturalist, "The disc and lesson plans",The specimens given by Mrs. Carmel, Info on Amphibians and Reptiles, and etc.

I. Insect Zoo materials and sea materials from Rae.

J. *Insect Zoo handouts
*Invertebrates
*Paleontology

K. *Learning Styles handouts
*Experimental Design textbook
*National Aquarium curriculum guide

L. Invertebrate Zoology and Experimental Design

11. Which activities did you find paricularly good?

A. Smithsonian Institute Environmental Ed. Program

B. All except for Toxicology

C. The hands-on Science experiment at FDA. The children will be excited about them.

D. *Backyard Science
*St. Leonard's Beach
*Experimental Design: Conducting Experiments and Predisting

E. *Baltimore Aquarium
*Debbie Duel's Session
*Environmental Research Center
*Insect Zoo
*National Zoo

F. *Learning Styles
*Experimental Design
*Inveretebrate Zoology
*Insect Zoo
*Debbie Duel/Humane Society
*Baltimore Aquarium trip
*Internship at FDA
*National Zoo trip

G. All of the activities were wonderful.

H. *Computers
*Learning Styles
*Experimental Design
*Chesapeake Bay Model
*Cultural Anthropology slides and talk, hope Deborah can do a longer presentation next year.

Department of Energy

Evaluation Template

TEMPLATE FOR TEA[illegible]R DEVELOPMENT

JAN[illegible]Y 1993

NAME OF FACILITY OR PROGRAM:

NAME OF PERSON COMPLETING TEMPLATE:

DATE:

Components of Effective Practice	Intended	Actual
1. Program Administration		
a. articulates clear program goals that are understood by all	a. goals appear in brochure, application, stated at "Open House" program, reiterated at first session and others, scientists get info and attend meeting	a. as intended
b. is clearly assigned as the responsibility of one or more persons	b. Carmel Ervin is the program manager, Ingrid Rich is the intern coordinator	b. as intended
c. includes teachers, scientists, educators, and administrators in program design	c. program designed by program manager with input from scientists, teachers and science administrators and professors	c. as intended Ingrid Rich designed intern program wi with input from manager, students and curriculum chairs
d. creates collegial atmosphere	c. staff trets teachers as equals with special consideration, teachersmingle with staff; scientists, interns, mentors in a variety of settings	d. teachers pleased with overall progra atmosphere, participate in lunch talks, fieldtrips and exchanged phone numbers
e. ensures effective pre-program interaction	e. information packets sent ahead of program, special pre-program "Open House" activity to meet all participants	for summer and school year exchanges e. as intended
f. ensures effective program follow-up	f. will include newsletter, school visit, in-service workshops and mentoring	f. not applicable at this time
g. communicates with and reports regularly to DOE	g. quarterly reports to DOE	g.
h. maintains database of participant information	h. participant information collected and stored	h. as intendede
i. establishes relationship with teacher's school/district	i. school district funded original institute in 1990, all programs are designed with school personnel, Ervin plays integral part in systemwide science curriculum development and teacher training principals contacted and personnel invited closing program	i. as intended
2. Program Design reflects a vision of effective curriculum and instruction for the particular grade level/discipline that includes:		
a. teaching practices that inculcate in students deep understanding of major science concepts or principles, development of skills, and "scientific habits of mind"	a. outcomes for students include knowledge of scientific method and experimental design, cause and effect, problem solving, observation and recording, structure and function, habits of mind, organizational skills	a. materials also emphacized vocabular development, mathematics, the inter-disciplinary nature of science, historic components, experimenting and collecting for personal study and reading improvement and comprehension in the content area, and logic and reasoning

Components of Effective Practice	Intended	Actual
b. a "hands-on/minds-on" instructional approach that includes investigation, discovery, and application	b. all activities promote problem solving skills, analysis, synthesis, fieldwork, labs, questioning techniques, research, reporting, collecting, use of community resources, and the development of comprehensive units of study	b. activities based on "Learning Style" models, they take place at various points throughout lesson, open discussions and group activity stressed
c. emphasis on depth (fewer concepts and skills) rather than breadth	c. teachers select one or two specific natural science topics to study in depth and then create instructional units and hands-on science kits to accompany them.	c. as intended
d. balance between science content and process	d. all areas stress process throughout the study of concepts and in investigations	d. as intended
e. ongoing, authentic assessment of important learning outcomes	e. assessment matches content and will be based on teacher made lessons and hands-on science kits	e. no special focus on assessment due special program emphasis on changing teacher attitudes. assessment will be made during follow up and school visits
f. materials, strategies, and perspectives sensitive to diverse cultures, languages, and learning styles	f. entire program developed based on these concerns, special workshops on learning styles and multicultural science education planned, minority role models will instruct students	f. as intended
3. Teacher Development Program Activities		
a. are appropriate for adult learners	a. are designed for adult learners at a professional level, ac tive involvement stressed and individual research activities	g. fieldtrips very popular
b. model teaching principles and strategies that can be transferred to the classroom	b. activities emphacize modeling techniques and instruction with students at various grade levels, activities are relevant to teacher and student needs, fieldtrips accessible to students and families	b. teachers practise effective instruction among peers, discuss special concerns which scientists assist with, teachers given many resource books for solving special problems and locating resources
c. are hands-on, allowing teachers to actively construct knowledge	c. teachers spend first week in teams doing experimental design, learning styles, learning to read objects and hands-on teaching techniques. Mentor teachers making and use of hands-on science kits	c. teachers enjoyed and learned more when objects, fieldtrips and investigations are fully integrated into each workshop or session
d. include the use of tools, methods, and processes of scientists	d. see b and : all workshops include the use of authentic scientific equipment and suggestions on how teachers can get materials or make their own	d. science kits include collected, purchased, constructed and borrowed equipment and supplies
e. immerse teachers in the scientific process	e. see 2B and 3C	e. as intended
f. include actual or simulated problems or challenges of "real world" science	f. fieldtrips and visits to contained ecosystems and simulations provide for "real life" investigations	f. use of films and videos have also been helpful, these experiences provide teachers with a more full appreciation of the integration of the sciences
g. are designed so teachers learn cooperatively in small groups	g. see 3C and teachers work in teams with interns and staff assisting them	g. allows for the free exchange of idea
h. include opportunities to practice new classroom behaviors or strategies		

	Intended	Actual
H.	Teachers lead mini sessions for peers using new techniques	Mixture of grades 4-12 is beneficial because teachers share special strategies that may not be known among the different divisions of precollege teaching. Many times, elementary and secondary teachers work together. This allows teachers to observe one concept taught at various instructional levels.

Components of Effective Practice	Intended	Actual
i. include opportunities for teachers to plan for use of new knowledge and skills in their own classrooms, with their own curriculum	i. develop lesson plans, units of study, projects for new year, stipends given to purchase books and materials, make kits, take additional classes and fieldtrips	i. as intended
j. include opportunities for teachers to work together as they learn and plan for transfer to their individual classrooms	j. Teachers will conduct in-school and city-wide workshops, share institute notebook literature, make mini presentations, and participate in curriculum development for center and schools	j. Teachers planned for cooperative learning activities, peer coaching, sharing lesson plans
4. Uniqueness of the Laboratories	4A. Scientists and museum educators assist with curriculum development, lead workshops and fieldtrips, make suggestions for assessment and follow-up, and are available to help teachers with problems and teaching during school year	a. Teachers will assist museum educato with special museum education initiat around science, especially for minority audiences
Activities take advantage of unique laboratory resources and mission, including:		
a. scientists and technicians • **participate in program design and implementation** • **assist in developing scientific/technical content** • **collaborate with teachers to solve real/simulated problems** • **serve as role models (minorities, women, disabled, senior/retired)** • **scientific/technical facilities and equipment are used for training, immersion, and science experiences**	b. All teacher development activities reflect the range of natural science research and exhibits conducted at or exhibited in Smithsonian museums and local area natural science centers	b. as intended
b. the work being done (frontier science), both in the particular lab and in other DOE facilities, is the focus of teacher development activities	5A/B * Three meetings with teachers over next academic year * Teachers participate in Institution-wide teacher training workshops in the sciences *membership offered in the Center's Science education Roundtable group * Stipends to teachers to do outreach and make local or national workshop presentations * teacher made newsletter * Teachers participate in advanced institute in summer 1994 * Three DCPS teachers (including participants) will develop curriculum projects to share with entire system	
5. Follow-Up		
a. learning activities for teachers include follow-up, and are spread out over time		
b. follow-up activities focus specifically on the use of new knowledge and skills in the classroom		

Components of Effective Practice	Intended	Actual
c. teachers have the opportunity to try out new knowledge and skills in classrooms before follow-up occurs	C. it is standard procedure for teachers who participate in museum based training to have opportunities to try out all or some related activities prior to working with students. This is done in teams.	c. as intended
d. follow-up takes a variety of forms, including additional training, problem-solving or sharing meetings, on-site or telephone consultation, networking through newsletters or telecommunications, training and support of local resource teachers or others to provide on-going assistance	d. see 5A/B Program volunteers (scientists) will visit classrooms and counsel with teachers when needed	d. local resource teachers who have completed institute will be involved in the support of institute graduates by visiting classrooms and informing all teachers about training o opportunities. Teachers may visit and use Naturalist center resources to develop additional study units and and hands-on experiences.
6. Teacher Leadership and Responsibility	6a. See 3J, 5A/B and Mentor Teachers develop programs, resource guides, special units of study and conduct local and national workshops based on institute experiences.	6a. as intended
a. teachers take on leadership responsibilities in aspects such as program development, delivery, implementation, follow-up, and spread to other colleagues	6b. Teachers evaluate workshops and overall institute. The institute is modified based on teacher and supervisory recommendations as well as input from scientists and leaders. To date, the institute has undergone four revisions in four years.	6b. individual workshops evaluated through group and personal discussions.
b. teachers have input and/or involvement in decisions about the content, process, implementation, and/or evaluation of their specific learning experience, such as workshops, course, or field studies		
c. teachers are given support by the Lab for leadership and networking activities, such as sharing information, successful practices, and problems either during the program or in follow-up	c. See sections 5 and 6 For special problems teachers are supported when conducting inservice training, with school and city administrators, with classroom management strategies, proposal writing, lesson plan developmentand teachers are rewarded with the special "teacher award" initiative and with invitations to special science meetings or conferences. There will be material awards when resources are available.	c. as intended

Components of Effective Practice	Intended	Actual
d. there is long-term commitment and support -- including material, moral, logistical, technical, and symbolic -- from the laboratory, or as a result of arrangements made by the laboratory from the school or community	d. Program director and assistants work with teachers for several years (3). New advanced summer institutes will be formed. Teachers will be invited to the annual teacher resource give-away of specimens. Teachers may use the Center collections to teach students in the center or to develop lesson plans.	d. Additionally, teachers will have access to all of human and physical resources which are a part of the community based science alliance under the museum's Access 2000 science education initiative.
7. Program Evaluation		
a. monitoring of participant satisfaction during the program and follow-up activities identifies needed changes, which are made immediately, when appropriate and feasible	7a. Teachers and program manager informally evaluate each workshop (see 6b). They freely discuss with the manager and workshop leaders (openly or privately) success or problems experienced during the program.	7a. as intended
b. ongoing formative and summative evaluation of important program outcomes involves data collection from a variety of sources, with resulting changes in program design	7b. Visits to classrooms will provide both summative and formative data. The D.C. school system has installed a new program evaluation system for students which includes the use of student work samples and photographs. This has been effevtive to date. data will be collected from staff, school administrators teachers and students. To date, the standard evaluation form has been used to evaluate the institute.	7b. as intended

DESCRIPTIVE AND CONTEXT INFORMATION

Program Characteristics

1. **Stated Goals:**

2. **Program Developers** ***(names and roles)*****:**

3. **Amount and distribution of contact time (e.g., two-week summer institute, three one-day follow-up sessions in October, December, February):**

4. **Nature of follow-up:**

5. **Program presenters** ***(e.g., Lab scientists, local teachers)*****:**

6. **Scientific focus of Lab reflected in teacher development program (e.g., nuclear physics, stream ecology, nuclear medicine):**

7. **Special Lab facilities used in program:**

Characteristics of Target Population

1. **Target is primarily**

   ☒ individual teachers (how many? _____)
   ☐ whole school(s) (how many? _____)
   ☐ whole district(s) (how many? _____)
   ☐ other (*specify*: _____)
   (how many? _____)

2. **Approximate percentage of community type in which participating teachers work:**

   100% urban
   _____ suburban
   _____ rural

3. **Approximate percentage of minority students taught by participating teachers:** 95%

4. **Level:**

   ☒ elementary
   ☒ middle/junior high
   ☒ high school

5. **Teaching subject focus (e.g., elementary math, physics, computer science):**

   * Elementary Science Resource Teachers
   * Elementary & Middle School Classroom Teachers
   * Art Teacher
   * Teachers or Program Managers of programs for Homeless children