NASA-CR-202126

7N-30-CR

Status Report
NAGW-4853, Discover Earth
August 28, 1996

Introduction

Discover Earth is a NASA-funded project for teachers of grades 5-12 who want to expand their knowledge of the Earth system, and prepare to become master teachers who promote Earth system science in their own schools, counties, and throughout their state. Participants from the following states are invited to apply: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Washington, DC. Teachers selected for the project participate in a two-week summer workshop conducted at the University of Maryland, College Park; develop classroom-ready materials during the workshop for broad dissemination; conduct a minimum of two peer training activities during the coming school year; and participate in other enrichment/education opportunities as available and desired. Discover Earth is a team effort that utilizes expertise from a range of contributors, and balances science content with hands-on classroom applications.

Planning

To ensure that Discover Earth plans were effective and appropriately focused, the project conducted a one-day Definition Workshop at Goddard Space Flight Center on February 29, 1996. Participants included the Discover Earth team (Ms. Colleen Steele, Project Manager, IGES; Dr. Eric Barron, Director, Earth System Science Center, The Pennsylvania State University; Dr. Robert Hudson, Chairman, Department of Meteorology, University of Maryland, College Park; Mr. John Tillery, Fairfax High School; and Ms. Claudia Dauksys, Administrative Support, IGES) and five pre-college teachers. This session was used to review the project goals and the draft course outline developed by Ms. Steele, discuss effective field and enrichment activities, and consider ways to make the summer experience hands-on and measurable. The Definition Workshop will be conducted annually, to maximize project effectiveness

Application and Selection Process

The Discover Earth project announcement and application were disseminated electronically (NASA Spacelink, Goddard Space Flight Center homepage, Earth System Science Education Notes, EarthRise homepage, and via e-mail) and in print (flyers were distributed at science conferences such as the National Science Teachers Association Area Conference in Baltimore, November 16-17, 1995, and the NSTA National Convention; at Spring meetings such as the ESSE conference and Classroom of the Future planning meeting; via the targeted states' Science Coordinators; in response to requests; and via persons who regularly work with teachers . The announcement (attachment A) and application (attachment B) were designed to entice teachers with a range of experience, expertise, and time in profession. Computer skills were not a selection criteria in order to address the full spectrum of teacher needs and capabilities. Twelve teachers were selected for participation (attachment C), highlights of their interests and accomplishments are listed in attachment D. Eleven teachers participated at the workshop, the twelfth, our Maryland teacher was unable to attend because of a family emergency.

Summer Workshop

The Discover Earth summer workshops (1996-1998) focus on science content (the seven key issues of global climate change) and enhancing Earth system science teaching (through new resources, development of classroom-ready materials, sharing of peer ideas and strategies, and introducing relevant technology/software). Content emphasis for 1996 was on:

- an overview of the Earth system;
- clouds, radiation, water vapor, precipitation;
- greenhouse gases and atmospheric chemistry;
- ozone and stratospheric chemistry;
- sources of information; and
- student investigations/classroom activities.

The course agenda is attachment E.

Science content instructors were Dr. Robert Hudson and Dr. Eric Barron. Ms. Colleen Steele and Mr. John Tillery guided classroom applications and development of educational materials. Additional presenters included:

- Mr. Bill Ryan, UMD, hands-on ozone activities'
- Mr. Bill Bua, UMD, weather/climate activity;
- Dr. Blanche Meeson and Ms. Carla Evans, GSFC DAAC, data resources;
- Dr. Farzad Mahootian, Earth System Science Community, data visualization for the classroom; and
- Mr. John Entwistle, Damascus High School, PowerPoint for classroom use.

Participants received project overview and extensive logistic information prior to the workshop, each person was contacted to determine the preferred/most economical mode of travel to the session. Logistics support included hotel accommodations, breakfast and lunch, per diem money for dinner expenses, travel cost (three participants flew, the balance drove), all materials for the course, and $500 honorarium upon successful completion. Project administration was conducted by Ms. Colleen Steele, IGES with logistical support provided by Ms. Claudia Dauksys, IGES. Participants and staff were encouraged to also eat dinner together each night. Their doing so reflected the comradery of the group, and expedited bonding which is expected to enhance long term sharing and group support.

Materials for the course and those developed by the participants are being organized into modules, enabling users to select a topic and choose from a variety of options. Topics are the Earth System (including NASA's Mission to Planet Earth and modeling), atmosphere (including climate change, clouds and the energy cycle, greenhouse effect, and ozone), biosphere, hydrosphere, geosphere, and additional reference material. Modules are being developed to include information currently available, such as NASA Facts and lithographs, materials developed by participants, and background material--such as content provided by the instructors.

Participants were divided into four working groups (by the grade levels they teach), to develop classroom-ready materials, and present an overview of the materials to guests on the final day of the course. The lessons were then edited by Ms. Steele to ensure they included complete references, provided complete instructions to enable use by many teachers, and were supplemented with graphic materials as needed. All the lessons include Internet options but do not require them for implementation. The lessons were then

returned to the teachers for another review, to be returned by September 11. At that time the materials will be disseminated to participants and requesters (we have compiled & updated a database since project inception), and will be available via Internet (including NASA Spacelink, EarthRise, GSFC homepage, etc.)

Assessment

Participants completed a content assessment test on the first day of the course to identify their levels of knowledge, which guided the instructors in utilizing the available time. Participants completed a course evaluation at the end of day nine (the summary of their responses is attachment F). Their comments are shaping preparations for the 1997 workshop and our overall approach to the project. Additionally, the participating teachers feedback throughout the year and the 1997 Definition Workshop (February) will guide this effort.

Outreach

A variety of activities are planned or begun to ensure that the largest possible audience is aware of the project, a wide range of teachers apply for participation, to obtain guidance and/or support from other relevant education activities, and to share classroom materials and our experience (including successes and aspects needing strengthening). A Discover Earth session is scheduled for the NSTA National Convention in spring, 1997--and will be presented by the Project Manager, Colleen Steele, plus six of the participating teachers, and Dr. Meeson of the GSFC DAAC.

Ms. Steele has been selected to make an oral presentation about Discover Earth at the 1997 American Meteorological Society's annual convention, education seminar. We are also preparing information to be included in mailings to the states' science coordinators and for distribution in education newsletters or distributed at local science teacher conferences.

Upcoming Activities

Dissemination of the Discover Earth classroom-ready materials, and notifying state science coordinators of the 1997 workshop and teacher opportunity are immediate priorities. In September, Ms. Steele will continue planning and begin coordinating the 1997 session with the University of Maryland, College Park, and The Pennsylvania State University. Development of module materials continues.

Discover Earth

attachment A

Objectives:

Expand teachers' knowledge of the Earth system, the key issues of global climate change, and data sources to:

- develop an understanding of the Earth as an integrated system;
- enhance their interdisciplinary approach to science instruction;
- enable them to access, manipulate, and assess current data; and
- assist them in developing classroom materials that focus on the Earth system.

Description:

Discover Earth is a new NASA-sponsored project for exceptional teachers of grades 5-12 who want to expand their knowledge of the Earth system and prepare to become master teachers who promote Earth system science in their own schools, counties, and throughout their state. Participating teachers will work with scientists and other educators to develop materials for their own classrooms and NASA publication. Class work will include the use of datasets and on-line resources

Discover Earth is a collaborative effort of the Institute for Global Environmental Strategies; the Earth System Science Center, The Pennsylvania State University; and the Department of Meteorology, University of Maryland, College Park. Instructors for the course are Dr. Eric Barron, Director of the Earth System Science Center, The Pennsylvania State University, and Dr. Robert Hudson, Chairman of the Department of Meteorology, University of Maryland, College Park.

An annual July (two-week) workshop will be conducted 1996-1998, for twelve participants and up to six NASA Aerospace Education Specialists. Teachers in the following states are invited to apply: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Washington DC. Course and classroom materials, accommodations, and travel costs will be provided. Participants will receive $500 honorarium upon successful completion of the workshop.

Discover Earth sessions focus:

1996

overview of the Earth system
clouds, radiation, water vapor, precipitation
greenhouse gases & atmospheric chemistry
ozone and stratospheric chemistry
sources of information
student investigations/classroom activities

1997

overview of the Earth system
land surface: ecosystems & hydrology
volcanoes, dust storms & climate change
sources of information
student investigations/classroom activities

1998

overview of the Earth system
oceans, circulation, productivity, air-sea exchange
ice sheets, polar & alpine glaciers, seasonal snow
sources of information
student investigations/classroom activities

For additional information contact:

Colleen Steele, Discover Earth Project Manager
Institute for Global Environmental Strategies
1745 Jefferson Davis Highway, Suite 306
Arlington, Virginia 22202
v (703) 415-8673 f (703) 415-8690
colleen_steele@strategies.org

June 3, 1996

Discover Earth

attachment B

application

part 1: personal information

name

social security no.

years teaching

school

school address

city & state

zip

phone # at school ( )

home address

city & state

zip

home phone ( )

e-mail address

emergency contact

daytime phone # ( )

subject areas in which you are certified

courses taught during the last two years,
please place an asterisk before courses you are currently teaching.

course	grade	# students	# sections	comments

applications due by April 1, 1996

applications due by April 1, 1996

part 2: essay questions

Please attach page(s) with your response to the following.

1. Describe your professional goals for improving/enhancing science education.
2. Describe the strategies you use to nurture and motivate students in science.
3. Describe outreach, continuing education, and/or new technology activities you are involved with.
4. Describe Earth system science disciplines or topics you have developed particular interest or expertise in or are working to incorporate in your classes.
5. Describe your expectations for this workshop.
6. Any additional comments you wish to make.

part 3: resume

Please provide an up-to-date resume which includes:

- academic history
- awards/recognition received
- demonstrated leadership ability
- courses taught
- organization membership
- conferences/workshops attended

part 4: letter

Please include a letter of support and recommendation from your principal or other school official (such as science coordinator or department head). This letter should indicate the solid support of your school or organization for:

- your participation in the workshop,
- your efforts to apply new knowledge and activities in the classroom,
- your related outreach activities in your district and state.

part 5: obligation

Please sign the application to indicate that--if selected for participation--during the 96-97 school year you will conduct, using the Discover Earth materials, at least two in-service sessions for other teachers.

signature _____ date

send application

and direct questions to

Discover Earth, attn: C. Steele
1745 Jefferson Davis Highway, Suite 306
Arlington, Virginia 22202
v (703) 415-8670 colleen_steele@strategies.org

Discover Earth

1996 Participants

home	school
Cecilia Fernandez 11208 Bybee Street Silver Spring, Maryland 20902 (301) 754-1369 ceci@circles.org	Cecilia Fernandez Gonzaga College High School 19 Eye Street, NW Washington DC 20001 (202) 336-7157
Patricia (Pat) Fraser 13 Sprague Street Malone, New York 12953 (518) 483-1383 pfraser@slic.com	Patricia (Pat) Fraser Franklin Academy State Street Malone, New York 12953 (518) 483-7807
Roxanne Hosking 114 Wales Road Andover, Connecticut 06232 (203) 742-5953 hoskingr@ecsuc.ctstateu.edu	Roxanne Hosking Eastern Connecticut State U 83 Windham Street Room 135 Media Building Willimantic, Connecticut 06226 (203) 465-5725
Keith McKain 4793 Irish Hill Road Magnolia, Delaware 19962 (302) 335-3144 kmckain@udel.edu	Keith McKain Milford Senior High School 1019 N. Walnut Street Milford, Delaware 19963 (302) 422-1610
Jenifer O'Sullivan 90 South State Street Concord, New Hampshire 03301 (603) 229-8528 Jen.O'Sullivan@rundlett.concord.k12.nh.us	Jenifer O'Sullivan Rundlett Junior High School 144 South Street Concord, New Hampshire 03301 (603) 225-0862
EllaJay Parfitt 342 Logan Court Abingdon, Maryland 21009 (410) 515-1520 eparfitt@umd5.umd.edu	EllaJay Parfitt Southeast Middle School 6820 Fait Avenue Baltimore, Maryland 21224 (410) 396-9192
George (Skip) Price 17 Leonard Street Greenfield, Massachusetts 01301 (413) 774-2117 sprice@k12.oit.umass.edu	George (Skip) Price Frontier Regional School 311 North Main Street South Deerfield, Massachusetts 01373 (413) 665-2118

Discover Earth

1996 Participants

home	school
Jeanne Seeley 7M Village Green Budd Lake, New Jersey 07828 (201) 426-9436 seeley@pilot.njin.net	Jeanne Seeley Randolph High School 507 Millbrook Avenue Randolph, New Jersey 07869 (201) 361-2400
Gail Shears 16 Butternut Circle Fairport, New York 14450 (716) 223-5337 gshears@mail.monroe.edu	Gail Shears Pittsford Middle School Barker Road Pittsford, New York 14534 (716) 381-5074
Richard Taylan 40 Shaker Lane Hyde Park, New York 12538-3116 (914) 229-7810 wanpela@aol.com	Richard Taylan FD Roosevelt High School PO Box 2032 Hyde Park, New York 12538-0736 (914) 229-4020
Ellis Underkoffler 273 Pond Drive Hockessim, Delaware 19707 (302) 239-0535 eunderko@udel.edu	Ellis Underkoffler Springer Middle School 2220 Shipley Road Wilmington, Delaware 19803 (302) 479-1621
John VanLeer 125 W. Miner Street West Chester, Pennsylvania 19382 (610) 436-4680 socrates@voicenet.com	John VanLeer Charles F. Patton Middle School 760 Unionville Road Kennett Square, Pennsylvania 19348 (610) 347-2000

Discover Earth

1996 Participation by State

Connecticut		
	Roxanne Hosking Willimantic, CT	Eastern Connecticut University
Delaware		
	Keith McKain Milford, DE	Milford Senior High School
	Ellis Underkoffler Wilmington, DE	Springer Middle School
District of Columbia		
	Cecilia Fernandez Washington DC	Gonzaga College High School
Maryland		
	EllaJay Parfitt Baltimore, MD	Southeast Middle School
Massachusetts		
	George Price South Deerfield, MA	Frontier Regional School
New Hampshire		
	Jenifer O'Sullivan Concord, NH	Rundlett Junior High School
New Jersey		
	Jeanne Seeley Randolph, NJ	Randolph High School
New York		
	Patricia Fraser Malone, NY	Franklin Academy
	Gail Shears Pittsford, NY	Pittsford Middle School
	Richard Taylan Hyde Park, NY	FD Roosevelt High School
Pennsylvania		
	John VanLeer Kennett Square, PA	Charles F. Patton Middle School

4/17/96

Discover Earth

attachment D

Highlights
1996 Discover Earth Participants

States represented:

Connecticut, Delaware, District of Columbia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania

Highest completed degree

3 Bachelors Degrees
(1 is completing Masters Degree)
9 Masters Degrees
(1 is Doctoral Candidate)

Science focus of highest completed degree

biology
Earth and atmospheric science
Earth Science
environmental Earth science
environmental science
general science
natural sciences, emphasis geology
physical chemistry
physical geography
secondary science

Courses currently being taught (or taught last year) by participants, grade level noted in parenthesis. College courses in addition to K-12 responsibilities.

Sun, Earth, Moon, Sky (1-8)
environmental Science (3-8)
basic research (6)
math and science (6)
health (6-8)
meteorology (6-8)
integrated science (7)
Earth & space science (8)
Earth science (8-12)
environmental biology (9)
science prep (9)
chemistry (10/11)
AP chemistry (11/12)
current science and technology (12)
astronomy (college)
computer-based laboratory interfacing tools--NSF program (college)
Earth sciences (college)
geology (college)
oceanography (college)
Project Learning Tree (post-grad)

7/20/96

Cumulative number of years teaching

198 years
newest teacher completed first year of teaching
most experienced has taught for thirty-one years

Sampling of participants' state and national awards

1 Christa McCauliffe Fellowship Awardee for state
1 Guiseppe Bellanca Award for Excellence in Secondary Education Awardee, Air Force Association
1 Outstanding Earth Science Teacher Awardee for state (recipient honored three separate years)
1 Outstanding Environmental Teacher Awardee for state
1 Outstanding Middle School Teacher Awardee for state
1 Outstanding Science Teacher Awardee for state
3 Outstanding Earth Science Teacher Awardees, National Association of Geology Teachers
1 Presidential Honoree in Math and Science Teaching
2 Tandy Outstanding Teacher Awardees

Participation in other NASA-sponsored or supported programs/projects

3 Globe Teacher/Trainers
1 Globe assistant teacher
1 MAPS-NET participant
3 NEWMAST participants
1 state delegate NASA/US Global Change Education Congress

All of the participants have published articles and/or presented at a variety of workshops. A brief sampling of their additional outreach activities include:

- Helping develop workshops for educators throughout state on how to use geographical information systems in the classroom for environmental education
- Helping develop a university, teacher-training program in environmental education
- Developing the first Aerospace and Environmental education resource center in the state (working with NASA, FAA, Civil Air Patrol, and the state)
- Member of State Advisory Committee on Science and Environmental Education
- Member of state Quest for Excellence in Science Teaching Committee for Improving Science Education
- Served on board writing benchmarks for the National Curriculum in Earth science, American Geological Institute
- Member of the Leadership Team of the Science Framework Commission, State Department of Public Instruction
- Director of the National Association of Geology Teachers Eastern Section Spring Conference (130+ teachers and professors attended)
- Advisory Board member of Science Scope (middle school magazine of the NSTA)
- Founder of the state Science Olympiad Program
- Developed *Volcano Kit* for teachers, available through the Holyoke Children's Museum

- Developed homepage for high school--to enable student research and disseminate data--including data from over $100,000 of grant-obtained photovoltaic equipment installed at school to study weather, light, energy, and electricity.
- Researched and compiled "Winter, Weather, & White-tailed Deer" middle school curriculum guide (students gather data for state's Winter Severity Index)
- Member of teacher committee (NY, Vermont, & Canada) developing educational plans for the Adirondack - Lake Champlain Biosphere

School Setting

- 3 teachers teach in rural schools
  2 of the school are in extremely economically depressed area
- 5 teachers teach in suburban schools
  2 of the schools include the full economic range
  3 of the schools are in affluent areas
- 2 teachers teach in urban schools
  both schools encompass a broad economic range
- 1 teacher conducts outreach education state-wide, encompassing full economic range

Composition of the student population

- 5 of the schools have mixed student populations with up to 50% non-white students
- 4 of the schools are predominately white
- 1 teacher works with the state-wide population

Discover Earth

Week 1
Greenhouse Effect - Global Warming

July 11, 1996

Monday, July 15, 1996

Classroom 2416 (Computer Lab is Room 3426)

8:00 - 9:00	Welcome Discover Earth & Introductions Assessment	Dr. Robert Hudson
9:00 - 11:00	Lecture & exercise Electromagnetic spectrum Energy balance of the Earth system Data sheets: Can you prove that there is a greenhouse effect?	Dr. Eric Barron
11:00 - 11:15	Break	
11:15 - 12:15	Lecture Role of greenhouse gases as selective absorbers Definition of the greenhouse effect	
12:15 - 1:15	Lunch Daily recording of weather observations	Dr. Eric Barron Mr. William Bua
1:15 - 1:45	Discussion Teachers' expectations, classroom applications	Barron, Hudson, Steele, Tillery
1:45-3:45	Exercises Teams discuss and list the possible factors, in addition to greenhouse gases, which may influence climate Calculate the temperature of our planet if: a. the Earth-Sun distance changes b. solar luminosity changes by 1% c. etc., based on morning list and discussion Measurement of incoming solar energy and surface albedos if equipment is available	Dr. Eric Barron
3:45 - 4:00	Break	
4:00 - 5:00	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs Discover Earth classroom materials	All
time TBD	Optional: those wishing to dine together meet in hotel lobby	Ms. Claudia Dauksys

Discover Earth

Week 1
Greenhouse Effect - Global Warming

Tuesday, July 16, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:30	Morning Round-up Questions, previous day follow-up, review of schedule, etc.	Steele, Tillery
8:30 - 10:30	Lecture The climate system and its' components The structure and complexities of the atmosphere and ocean circulation The concepts of equilibrium, stability, and feedbacks Daisyworld as an example	Dr. Eric Barron
10:30 - 10:45	Break	
10:45 - 11:45	Exercises "System" educational tools to illustrate concepts	
11:45 - 12:35	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:35	Depart for Goddard Space Flight Center	
1:00 - 3:00	Tour of Goddard Space Flight Center's Teacher Resource Lab Tour conducted by Ms. Linda Matys, Director of the TRL Time allocated to use the TRL and/or see Visitors Center and Gift Shop Bring supplies if you wish to copy tapes, slides, diskettes	
3:30 - 5:00	Exercises Daisyworld exercise Discussion and list of feedbacks - everyday examples Web sites on climate system	Dr. Eric Barron
time TBD	Those wishing to dine together meet in lobel lobby	

PENNSTATE 1855

Institute for Global Environmental Strategies IGES

UNIVERSITY OF MARYLAND COLLEGE PARK

Discover Earth

Week 1
Greenhouse Effect - Global Warming

Wednesday, July 17, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:30	Morning Round-up Maps & metro tickets distributed	Steele, Tillery
8:30 - 10:15	Lecture/discussion Signs of stability from Earth history Natural variability	Dr. Eric Barron
10:15 - 10:30	Break	
10:30 - 11:30	Lecture/discussion the Earth system is FAR from fully regulated	
11:30	Group photograph	
11:40 - 12:30	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:30 - 1:10	Group work, preliminary lesson plan development	Steele, Tillery
1:15	Depart for Rayburn House Office Building, Minibus, Golden Touch Limousine Service	
3:15 - 4:45	Lecture - Rayburn House Office Building, Room B369 Global change lessons from Earth history: How good are climate models	Dr. Eric Barron Dr. Tom Crowley*
4:45	Reception following presentation	

Metro: Return to University/stay on mall for sightseeing, etc. as desired

* Dr. Crowley, Department of Oceanography, Texas A&M

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UNIVERSITY OF MARYLAND COLLEGE PARK

Discover Earth

Week 1
Greenhouse Effect - Global Warming

Thursday, July 18, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:30	Morning Round-up	Steele, Tillery
8:30 - 10:30	Lecture Human perturbations of the climate system Observations and observing systems Climate models and predictions Uncertainties in model predictions	Dr. Eric Barron
10:30 - 10:45	Break	
10:45 - 11:45	Exercises Are increased greenhouse gas levels inevitable?	
11:45 - 12:30	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:30 - 2:30	Exercises Is there an urban heat island effect? Teams discuss and list the possible factors, in addition to greenhouse gases, which may influence climate.	Dr. Eric Barron
2:30 - 2:45	Break	
2:45 - 5:00	Resources from GSFC Distributed Active Archive Center (DACC) and other sources available for supporting lesson plans	Dr. Blanche Meeson
	Groups work on lesson plans	Steele, Tillery
	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs	All
time TBD	Optional: those wishing to dine together meet in hotel lobby	

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UNIVERSITY OF MARYLAND COLLEGE PARK

Discover Earth

Week 1
Greenhouse Effect - Global Warming

Friday, July 19, 1996

	Hotel checkout for all who are not staying the weekend	
	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:15	Morning Round-up	Steele, Tillery
8:15 - 10:15	Lecture Human responses to climate change Adaptation and mitigation strategies Geo-engineering options Basis for decisions	Dr. Eric Barron
10:15 - 10:30	Break	
10:30 - 11:30	Discussion: human response	
11:30 - 12:15	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:15 - 1:15	Work up of daily observations, class intercomparisons	Dr. Eric Barron
1:15 - 2:15	Web sites for global change reseaerch	
2:15 - 2:30	Break	
2:30 - 3:30	Earth System Visualizer Web Site www/.ecologic.net/pcgi-bin/avesda2	Dr. Farzad Mahootian
3:30 - 4:00	Groups work on lesson plans	
4:00 - 5-00	Recap and discussion on week's activities	Dr. Eric Barron
TBD	Optional: those wishing to dine together meet in hotel lobby	

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Institute for Global Environmental Strategies

UNIVERSITY OF MARYLAND COLLEGE PARK

Discover Earth

Week 2
Ozone Chemistry

Monday, July 22, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:15	Morning Round-up	Steele, Tillery
8:15 - 10:15	Lecture Ozone chemistry	Dr. Robert Hudson
10:15 - 10:30	Break	
10:30 - 11:30	Exercises	
11:30 - 12:15	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:15 - 1:30	Powerpoint use for student presentations	Mr. John Entwistle
1:30 - 1:45	Break	
1:45 - 3:45	Ozone data: accessing, displaying, & plotting using NIH Image NASA GSFC Distributed Active Archive Center (DAAC)	Ms. Carla Evans Ms. Cindy Hall
3:45 - 4:30	Groups work on lesson plans	Steele, Tillery Ms. Carla Evans Ms. Cindy Hall Dr. Farzad Mahootian
4:30 - 5:00	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs	All
TBD	Optional: those wishing to dine together meet in hotel lobby	

University of Maryland College Park

Institute for Global Environmental Strategies IGES

PENNSTATE 1855

Discover Earth

Week 2
Ozone Chemistry

Tuesday, July 23, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:15	Morning Roundup	Steele, Tillery
8:15 10:15	Lecture Ozone chemistry	Dr. Robert Hudson
10:15 - 10:30	Break	
10:30 - 11:30	Exercises	
11:30 - 12:15	Lunch Daily recording of weather observations Daily forecast for tropospheric ozone	 Mr. William Bua Mr. William Ryan
12:15 - 12:30	Groups, planning	
12:30	Depart for Goddard Space Flight Center (meet at Visitors Center)	
1:00 - 4:00	Tour of Goddard Space Flight Center Greg Helms, NASA Teacher on Loan, conducting tour	
	Teachers not going on tour review DAAC education products	Ms. Carla Evans Ms. Cindy Hall
	- Group work on lesson plans if tour concludes early -	
4:30 - 5:00	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs	All
TBD	Optional: those wishing to dine together meet in hotel lobby	

University of Maryland College Park

Institute for Global Environmental Strategies IGES

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Discover Earth

Week 2
Ozone Chemistry

Wednesday, July 24, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:30	Morning Round-up	Steele, Tillery
8:30 - 10:30	Morning Lecture Ozone chemistry	Dr. Robert Hudson
10:30 - 10:45	Break	
10:45 - 11:45	Exercises	
11:45 - 1:15	Daily recording of weather observations Daily forecast for tropospheric ozone	Mr. William Bua Mr. William Ryan
	Lunch Discussion of Data Sources and Professional Application	
	Deputy Director, NASA Goddard DAAC	Dr. Blanche Meeson
	Vice President, ECOlogic Corp., and Gonzaga College HS	Dr. Farzad Mahootian
	Research Scientist, Center for Coastal Physical Oceanography Old Dominion University	Ms. Elizabeth Smith
	Hughes STX, Education Outreach at NASA GSFC DAAC	Ms. Carla Evans
1:15 - 4:30	Groups work on lesson plans Special assistance provided by Elizabeth Smith	Steele, Tillery
4:30 - 5:00	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs	All
6:00	meet in lobby to ride hotel van to optional dinner at the 94th Aerosquadron	

University of Maryland College Park

Institute for Global Environmental Strategies IGES

PENNSTATE 1855

Discover Earth

Week 2
Ozone Chemistry

Thursday, July 25, 1996

	Classroom 2416	(Computer Lab is Room 3426)
8:00 - 8:30	Morning Round-up	Steele, Tillery
8:30 - 10:30	Morning Lecture Ozone chemistry	Dr. Robert Hudson
10:30 - 10:45	Break	
10:45 - 11:30	Summary of ozone forecasts	Dr. Robert Hudson Mr. William Ryan
11:30 - 12:00	Teachers complete course evaluation	
12:00 - 12:45	Lunch	
12:45 -4:00	Groups finish lesson plans	Steele, Tillery
4:00 - 5:00	Open discussion Data resources Utility of the day's exercises in teaching Teacher needs	All
TBD	Optional: those wishing to dine together meet in hotel lobby	

University of Maryland College Park

Institute for Global Environmental Strategies IGES

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Discover Earth

Week 2
Launch

Friday, July 26, 1996

	Hotel Checkout	
8:00 - 9:15	Discussion of course content and assessment test, accuracy of content targeting, brainstorming, etc. Final exam - instructors discretion	All
9:15 - 9:30	Break	
9:30 - 9:45	Computer Lab, Room 3426 Introduction of guests	
9:45 - 11:30	Teachers' presentations of lesson plans	
11:30	Buffet lunch	
12:15	Awards and presentations	
12:45	Adjourn	

University of Maryland College Park

Institute for Global Environmental Strategies

PENNSTATE 1855

Summary of Teachers' Responses
Evaluation of 1996 Discover Earth Course

attachment F

August 1996

The eleven teachers who participated in the 1996 Discover Earth session responded to the following
questions. All questions were essay so responses could be as complex as the individual teachers desired. As a result, many of the responses total more than eleven.

1. What element of the summer session was most valuable to you professionally?

A. Five teachers said working with other teaching professionals.

B. Four teachers said the opportunity to interact with scientists.

C. Three teachers said knowledge/information about the Earth system.

D. Three teachers said Internet use including viewing websites.

E. Two teachers said materials (literature, posters, CD-ROMs, etc.).

F. Two said all the elements.

2. What aspect of the summer session will enhance your classroom teaching most?

A. Five teachers said the materials.

B. Four said the system approach to Earth system science will improve existing/enable new curriculum.

C. Two teachers said new/fresh ides.

D. One said interaction with peers and scientists.

E. One said science content/knowledge.

3. Which element of the session would you like to have pursued further, spent more time on?

A. Four teachers wanted to spend more time on lesson plan development. One additional teacher wanted to spend time brainstorming ideas for lessons that could be developed individually in the future.

B. Three teachers wanted more time at the Teacher Resource Lab.

C. One teacher wanted more computer time.

D. One teacher said access to real data, not just pictures (images).

E. One teacher said management of information, i.e., analyzing NASA photos (meaning images).

F. One teacher said the DAAC (no elaboration included)

G. One teacher wanted more time with the greenhouse effect and global warming.

H. One teacher wanted more time to examine the system concept.

I. One teacher felt the pacing and resources were appropriate and would enable the teacher (and/or their students) to pursue additional study.

4. What element of the summer session was least valuable to you?

A. Two teachers said the tour of Goddard Space Flight was a disappointment, but both said the Colloquium with Shuttle astronauts compensated.

B. Two teachers said the lesson plan development: one attributed that to isolated need (in the workshop) at her grade level, the other teacher felt rushed and preferred to field test first.

C. Two teachers felt the panel discussion served no purpose.

D. Two teachers felt all the elements were worthwhile.

E. Two teacher identified the lectures: one felt the lectures were too technical, one felt ozone chemistry was presented in unnecessary detail.

F. One teacher identified the DAAC tour.

G. One teacher said the presentation on a DAAC tutorial.

H. One teacher did not respond.

5. How well was course content tuned to your level of comprehension? Did the content challenge and inform you, bore you, lose you? If the answers vary by the topics covered, please provide multiple answers.

A. Ten teachers said the content was challenging, good, informative, appropriately targeted for teachers, although several said they would like more time and assistance in assimilating the content and more frequent breaks. One teacher in this group felt there was simply too much lecture, suggesting content should be reduced.

B. One teacher said the content was perfect.

6. Was content presented in a logical sequence?

Eleven teachers said the sequence was logical. (One teacher noted that the ozone chemistry should have included more introductory material).

7. Did you feel engaged/challenged throughout the session?

Eleven teachers said they felt challenged. Two teachers specified that the activities contributed to their being engaged. Two felt the daily reviews of ozone materials were far too lengthy and time consuming.

8. Did we tap your expertise?

A. Seven teachers said yes.

B. Two teachers answered with a qualified yes, citing time limitations.

C. Two teachers didn't respond.

9. Did the schedule and pacing seem about right, excessive, too light?

The teachers felt the schedule averaged out appropriately, but some days were too heavy, short breaks were needed more frequently, more time was needed for lesson development, and a minimum of 1/2 hour lunch break should remain sacred.

10. How valuable was the tour of Goddard Space Flight Center?

A. Five teachers enthused about the Colloquium lead by the crew of STS 77.

B. Four said the tour was a disappointment.

C. Two would like to have met with scientists.

11. How valuable was the time spent in the GSFC Teacher Resource Lab?

All the teachers felt the time spent at the TRL was valuable. Seven teachers noted that they would have liked to spend more time here. One teacher would have preferred to have more information about the lesson plan in order to investigate their topic while here.

12. How effective were the Discover Earth instructors, staff, and resource persons?

All the participants responded in the very good to excellent range, many commented on how helpful all were and how good-humored the session was.

13. How useful in the classroom do you expect the resource materials that you received to be?

All the teachers expect the materials to be very useful. Four of the teachers commented on needing time to really explore and digest what they received.

14. How effectively were the course and resource materials arranged (will the file box enable you to locate topical materials as needed)?

The file boxes were well received and thought very functional.

15. We think Discover Earth has an exceptional group of participants for 1996. Please comment on how important your peers were to your learning during this session.

All the participants felt their peers to be critical to the success and value of the workshop. All commented on the importance of sharing ideas and/or the value in having a range of expertise and experience represented.

16. How effective was the assignment to a group?

A. Seven teachers felt the groups were effective/essential.

B. Two teachers felt the concept was good but the reality of implementation was problematic.

C. Two teachers didn't respond.

17. Were you introduced to resources (people, agencies, services, technology) that are new to you and likely to be of value?

Unanimous yes from all teachers.

18. What do you wish you had known prior to the session?

A. Four teachers would have liked to receive advance information about the lesson plans.

B. Two teachers wished their background in Earth science were stronger prior to the workshop.

C. One teacher wanted more detailed information about course subtopics prior to the session.

D. One teacher was surprised that the course was so content specific.

E. One teacher commented that the advance materials were excellent.

F. One teacher would have prepared differently for travel, had she known how much material she would receive.

G. One teacher would have brought warmer clothing as defense against the aggressive air conditioning in the classroom.

19. How did this session match your expectations?

A. Nine teachers said their expectations had been met or exceeded.

B. One teacher wanted more dialogue with scientists.

C. One teacher thought emphasis was placed on pencil and paper activities.

D. One teacher had hoped to see high-tech equipment for monitoring the atmosphere and investigation in progress, and classroom activities related to those themes.

20. Please describe changes/improvements to the course that you would make.

A. Five teachers commented on scheduling (more frequent breaks, shorter lecture periods, longer lunch break with extended afternoon session to compensate, less time devoted to DAAC, one teacher wanted an afternoon off to sight-see).

B. Three teachers referred to their prior responses (in general).

C. Two teachers requested more time to prepare their lesson plans.

D. One teacher suggested scheduling time for participants to brainstorm as a whole group or in groups other than those assigned for the lesson plans in order to develop a list of ideas & strategies for integrating Earth system science into their classes.

E. Other suggestions were:

- access to a lab where evaluation of a developing lab could be done.
- a resource room where materials brought by participants could be shared.
- lesson on downloading and transferring files and images on the computer.
- 1 hour should be dedicated to materials in the boxes: accessing the material, identifying sources, availability of additional quantities, and other resources.
- less pastry, more healthy snacks.

21. At this moment, do you think yourself likely to apply for the 1997 Discover Earth session?

A. Nine people said yes.

B. Two said possibly.

C. One person said more likely a different person from their district

22. How well did Discover Earth prepare you to conduct peer workshops containing some/all of the summer workshop content?

A. Seven teachers said they were prepared/well prepared to conduct peer workshops.

B. Two teachers said they received the necessary background, but needed time to digest and prepare.

C. One teacher felt not ready.

D. One teacher requested guidelines for presentation content.

23. Any additional comments you have.

A. Eight teachers had additional comments that included gracious expressions of appreciation and/or favorable comments on the way the workshop was conducted.

B. Three teachers had no additional comments.

C. One teacher again suggested time with NASA scientists.

D. One teacher suggested making graduate credit available through the University at cost to the participant.