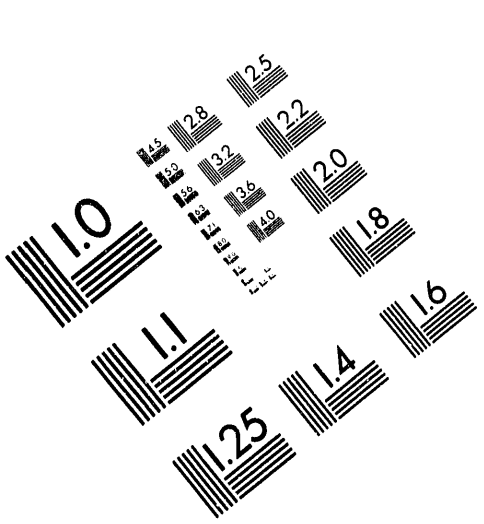

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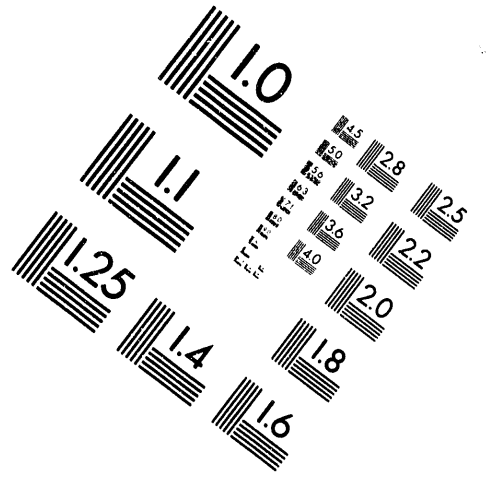

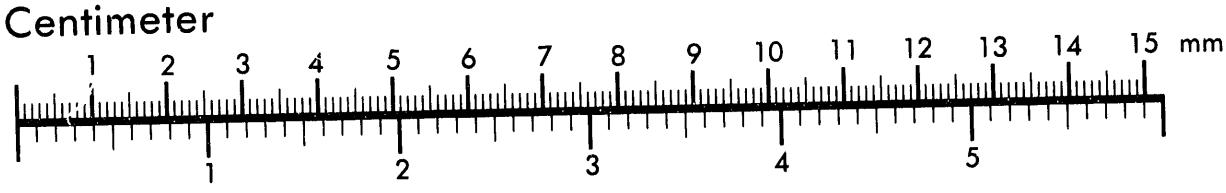

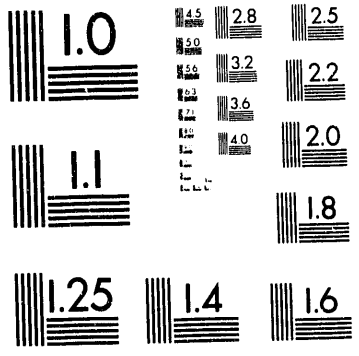

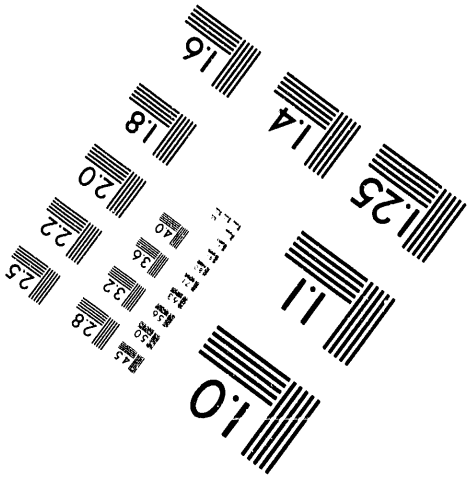

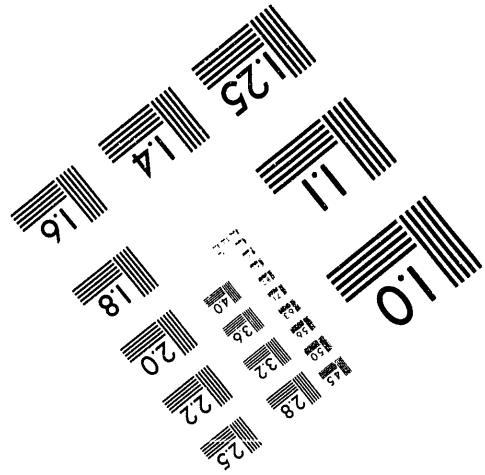

1 of 3

DOE/ER/75730-1

The National Center for Improving Science Education

Evaluation and Capacity Building to Improve Precollege Science and Mathematics Achievement in the U.S.

10 CFR, Part 605

Technical Progress Report: June - December 1992

The NETWORK, Inc.

Technical Progress Report:
June - December 1992

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Impact Assessment Design for Teacher Research Participation Programs

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I. TECHNICAL PROGRESS REPORT

Evaluation and Capacity Building to Improve Precollege Science and Mathematics Achievement in the U.S. 10 CRF, Part 605

Technical Progress Report: June - December 1992

The National Center for Improving Science Education has undertaken three kinds of activity to achieve the evaluation goals for DOE's Precollege Programs. They are to:

1. develop means to determine program quality and determine what works best under which circumstances;

2. develop the means to determine the contribution of DOE precollege programs to both teacher enhancement and student achievement;

3. provide evaluation designs and instruments and reports of program quality and impact; and

4. strengthen both DOE's and the Labs' capacity to do both short-term and long-term planning as well as deliver effective programs and evaluation.

The activities underway to achieve these goals are:

1. program profiling;
2. impact assessment; and
3. technical assistance and networking.

Progress in these activities is described below.

The Center's evaluation project has several features that set it apart from many evaluation design initiatives. First, it uses a collaborative process among the Center, DOE, and the precollege program personnel of the Labs. Second, the project is ongoing in that collaboration among the three constituencies will continue throughout the four years of the program, and the evaluation work itself will be ongoing far beyond the end of the four years. Third, the work is emergent. The uniqueness of the process of collaborative, ongoing evaluation design and capacity-building combined with the unique capacities of the Labs mean that unanticipated issues emerge from time to time that stimulate adjustments to the initial program design. Finally, this is a learning-oriented project, in that it seeks new understandings about effective practice as well as new strategies with which to evaluate it.

Progress during first 6 months

Milestone 1: Classification of Goals and Outcomes

For the project to meet its goals, the variety of Lab precollege programs needed to be grouped into program types, to be treated in sequence over a three-year period rather than simultaneously. Thus during Year 1, 1992-1993, Teacher Research Participation and Teacher Development Programs are the focus of program profiling and impact assessment; in 1993-1994 Systemic Programs and Student Focused Programs and in 1994-1995 Special Programs will be profiled and an impact assessment conducted.

Milestone 2: Profiling Programs

In Year 1 templates based on research and exemplary practice were developed for Teacher Research Participation and Teacher Development programs. The templates were tested during site visits to four Teacher Research Participation programs during July and August 1992 and to five Teacher Development programs between July and December 1992.

Based on the site visits, the Center staff revised the Teacher Research Participation template, wrote summary reports to the individual Labs where site visits occurred, and completed a summary report and Practice Profile of Teacher Research Participation Programs for DOE submitted November 1992 (Appendix B).

A similar process for Teacher Development Programs is almost complete. The template has been revised based on site visits to date and input from the Labs during evaluation/technical assistance meetings. Reports will be submitted to the Labs site-visited and a summary will be submitted to DOE by April 1993.

Draft templates for Systemic and Student Focused programs will be ready by the May evaluation/technical assistance meeting for review (see attached calendar Appendix A).

All Lab staff received training in the purposes of profiling programs and the process of profiling their own programs. A completed draft Teacher Research Participation template was submitted by each Lab in December 1992 and a report from each Lab will be completed by February 6, 1993. A compilation of these profiles, constituting a summary of Teacher Research Participation Programs, will be submitted to DOE 26 March 1993.

A parallel process for Teacher Development Programs will be completed by 1 May 1993.

Milestone 3: Impact Assessment

The design of the Impact Assessment began with the co-development of indicators by Lab and Center staff for Teacher Research Participation programs and continued through the summer of 1992.

Survey instruments, focus group and individual interview protocols, product assessment protocols, anecdotal formats, and case study design are currently all in development in readiness for piloting the impact assessment of Teacher Research Participation programs in 1993-1994 (Appendix C).

A series of anecdotes on Teacher Research Participation programs were compiled in October 1992 (Appendix D).

Consistent with the collaborative, ongoing, learning nature of the overall evaluation project, the impact assessment design has involved Lab precollege program staff throughout its development. The agendas for the technical assistance evaluation reflect this collaboration (Appendix A).

Milestone 4: Product Development

Input into DOE's report to OMB was submitted upon request.

Two program templates have been developed for Teacher Research Participation and Teacher Development Programs (Appendix B).

A Profiling Guide will be in draft form for the March evaluation/technical assistance meeting and the guide will be completed by 1 June 1993. Components of this guide have been developed for evaluation/technical assistance meetings throughout Year 1.

Evaluation instruments and guidelines will be continually developed, drafts submitted for review by the Labs and DOE, and revisions made.

A draft survey of Teacher Research Participation Programs and Impact Assessment Design may be found in Appendix C.

The Center has created a set of viewgraphs intended for use by DOE, the Center, and Labs as we describe and share our work (Appendix F).

Milestone 5: Technical Assistance and Quality Control

Five evaluation/technical assistance and networking meetings have been held. The meeting agendas reflect the content and process of these meetings (Appendix A).

The collaborative development and implementation of the Profiling and Impact Assessment procedures and instruments have focused on Teacher Research Participation and Teacher Development programs during the Year 1 meetings to date.

Lab and DOE staff development has occurred in many arenas. Lab staff have learned the purposes and procedures for profiling programs, collecting anecdotes, conducting focus

groups and open-ended interviews, and conducting case studies. They have had opportunities to ask questions and hear explanations. For example, they learned how to choose the sample size for teacher interviews and the rationale for control groups not being part of the impact assessment. The Survey Group consisting of Lab staff and convened by the Center has assisted in the design of the survey instruments to be used in Teacher Research Participation Programs.

The evaluation/technical assistance meetings have provided opportunities for networking and co-development among the Lab precollege staff, the Center, and DOE. At these meetings individual assistance sessions have been held for Lab staff, as requested, to address implementation and evaluation questions. An important intention of the evaluation/technical assistance meetings is to build a community of inquiry.

Because this is a collaborative endeavor and we are charting new territories, unexpected issues arise. For example, the need to clarify and articulate the goals for Teacher Research Participation programs became evident in the process of profiling programs during our site visits and technical assistance meetings. The experience of resolving this issue collaboratively served as a case study for dealing productively with unanticipated events.

Changes and Adjustments

Undoubtedly one of the strengths of a collaborative, ongoing learning process for developing an evaluation design is that the products, processes, and capacities that result will increase the probability of program improvement. When evaluation design occurs simultaneously with staff development and networking, and when one monitors the learning process of the constituencies, adjustments need to occur in timelines set before the process began.

The attached timeline reflects changes from the original proposal but does not differ from the revised timeline in effect when DOE made its report to OMB. For example, it was decided to develop templates and begin the impact assessment for only two programs, Teacher Research and Teacher Development, in Year One -- a prudent decision in our judgment, now that we have experienced seven months of the process. The development of the template, site visits, revisions, and staff development in the profiling process has resulted in more effective and relevant templates and greater capacity for Lab staff to do their own profiling.

The site visit testing of the practice profiles precipitated a critical discussion of the goals for Teacher Research Participation programs. Discrepant points of view and opinions regarding goals between DOE and the Labs and among the Labs themselves were revealed by the profiling process. Clarification, which occurred over a period of months, had implications for the impact assessment as well as for the design of Teacher Research Participation Programs. A likely outcome of the melding of profiling, impact assessment design, and technical assistance will be clearer goals that are widely shared, program design or redesign that supports these goals, and outcomes that better match goals. In a less collaborative process, new goals mandated from above without technical support or staff development

might have had less beneficial results (e.g., staff dissatisfaction, uneven attention to program design or revision, fewer benefits for teachers and their students).

It became clear that Lab precollege program staff benefitted more from technical assistance when they were "ready" to assimilate specific substance or content. For example, a breakout session on asking open-ended questions was more relevant once the Labs had begun the profiling process and were faced with either interviewing teachers themselves or selecting and training someone else to collect the profiling data.

The Impact Assessment Design for Teacher Research Participation programs required some adjustments as the issue of goals was resolved and as issues that arose in the development of Surveys were dealt with (e.g., can a single survey be used for Teacher Research and Teacher Development programs?). We found ourselves developing a new Teacher Research Participation Survey based on the redefined goals. The survey will require a pilot test, and revisions will be based on the results of the pilot test.

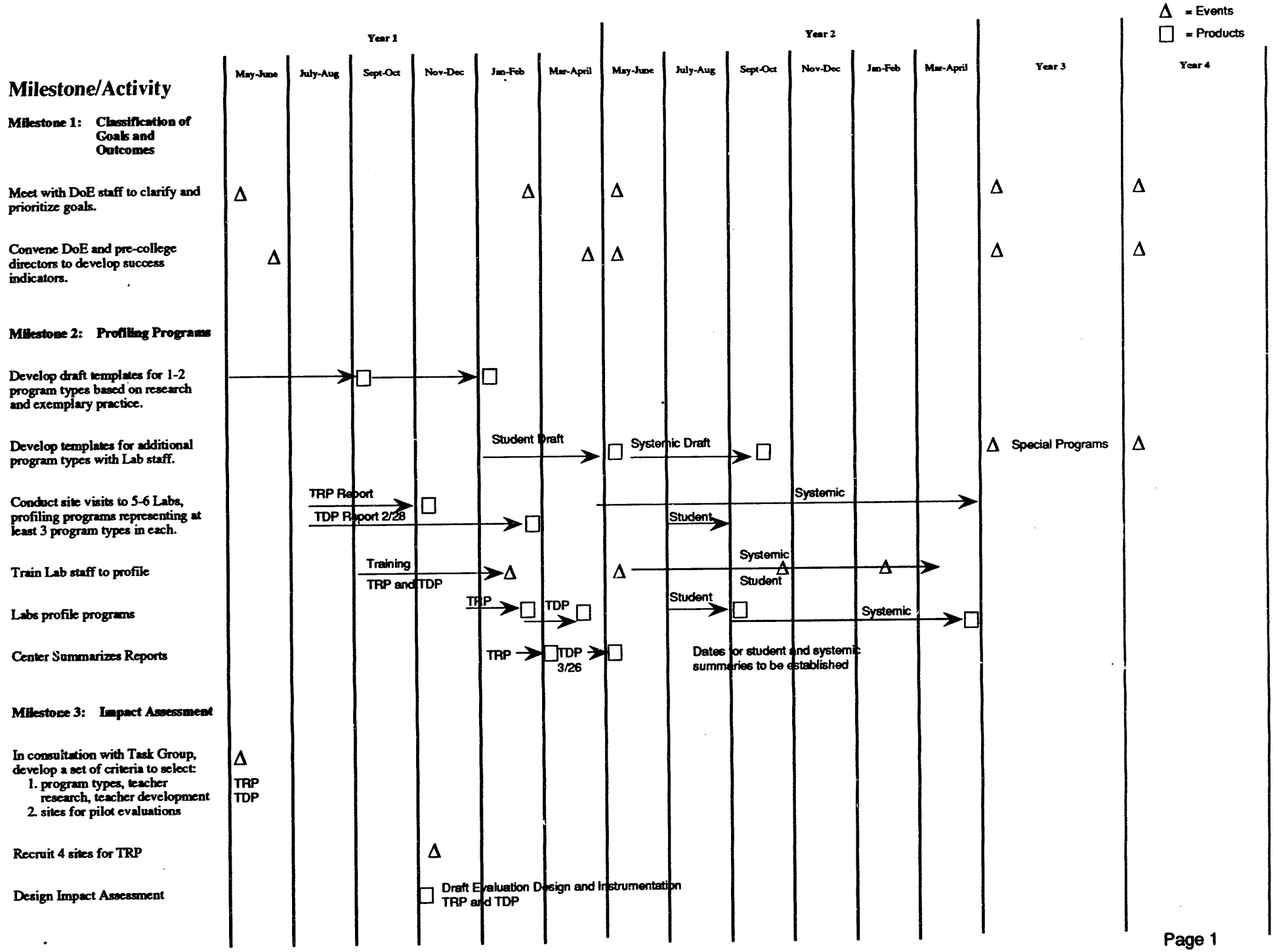
Timelines also have been modified to accommodate schedules of programs. For example, Teacher Research Participation case studies cannot begin until after the spring selection process, and follow-up components cannot be concluded until at least a year later when we revisit the classrooms to note changes that may have resulted from a research experience. Site visits to Teacher Development programs (e.g., TOPS, Chicago Science Explorers) only can occur when the training or programs occur. Many programs that focus on teachers occur during the summer, thus profiling and pieces of impact assessment must await the summer months.

Bimonthly evaluation and technical assistance meetings challenge Center staff and our collaborators to do the between-meeting work which includes producing an agenda book and getting the books out in a timely fashion. Center staff are continuing to address this problem.

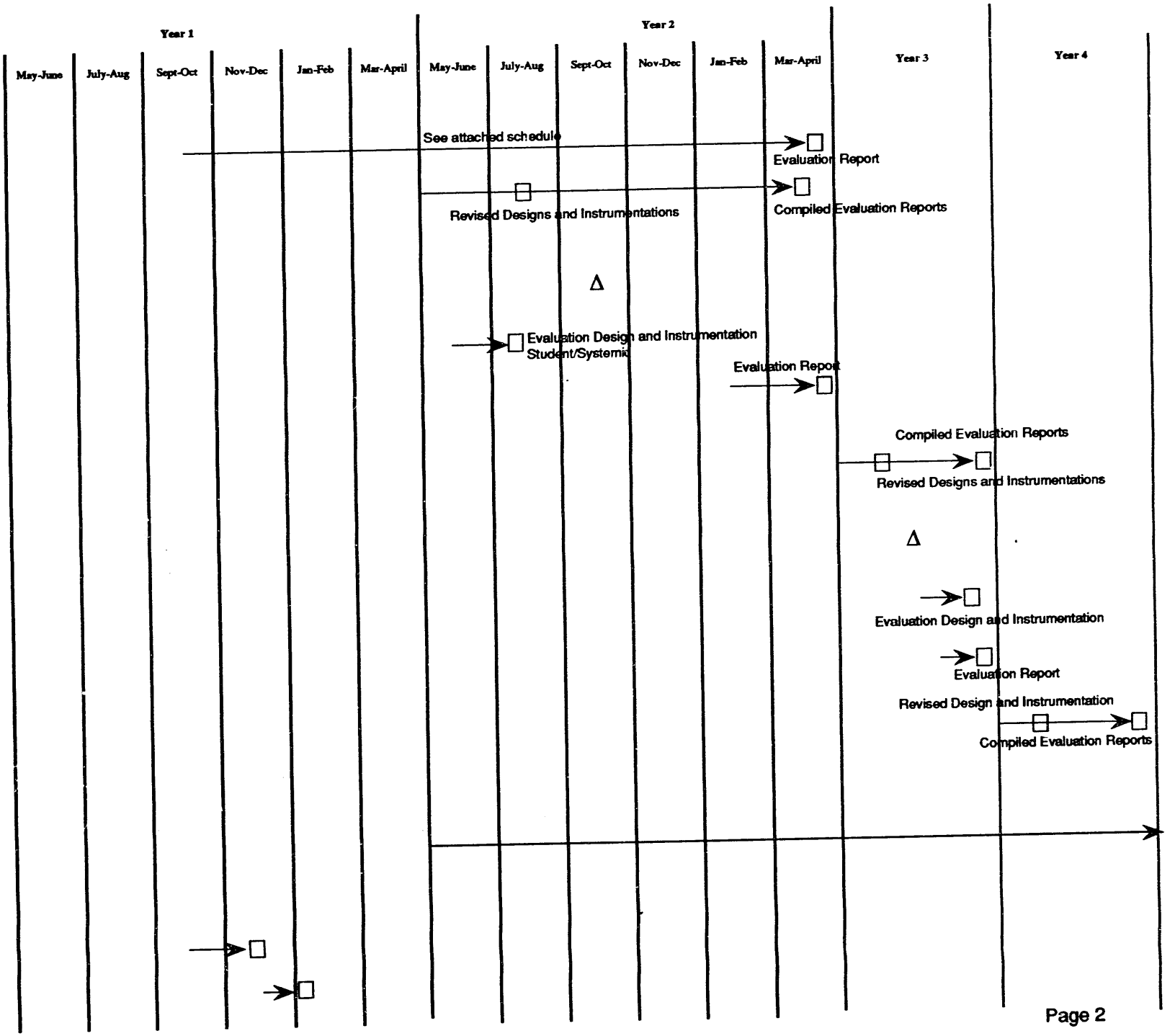
This fascinating and important project in which we are engaged has no end of possibilities. We must keep an eye on what can be envisioned as a transparent and flexible wrapping that defines the volume and shape of our work. We can see through to many possible additional projects or activities that we could enfold -- some small, some large. While our work can adapt in response to our findings to some extent as the project unfolds, we are constrained by definition and by budget. Good communication and clarity will continue to help us define what is enveloped by this research grant and what worthy pursuits will require additional support.

II. TIMELINE

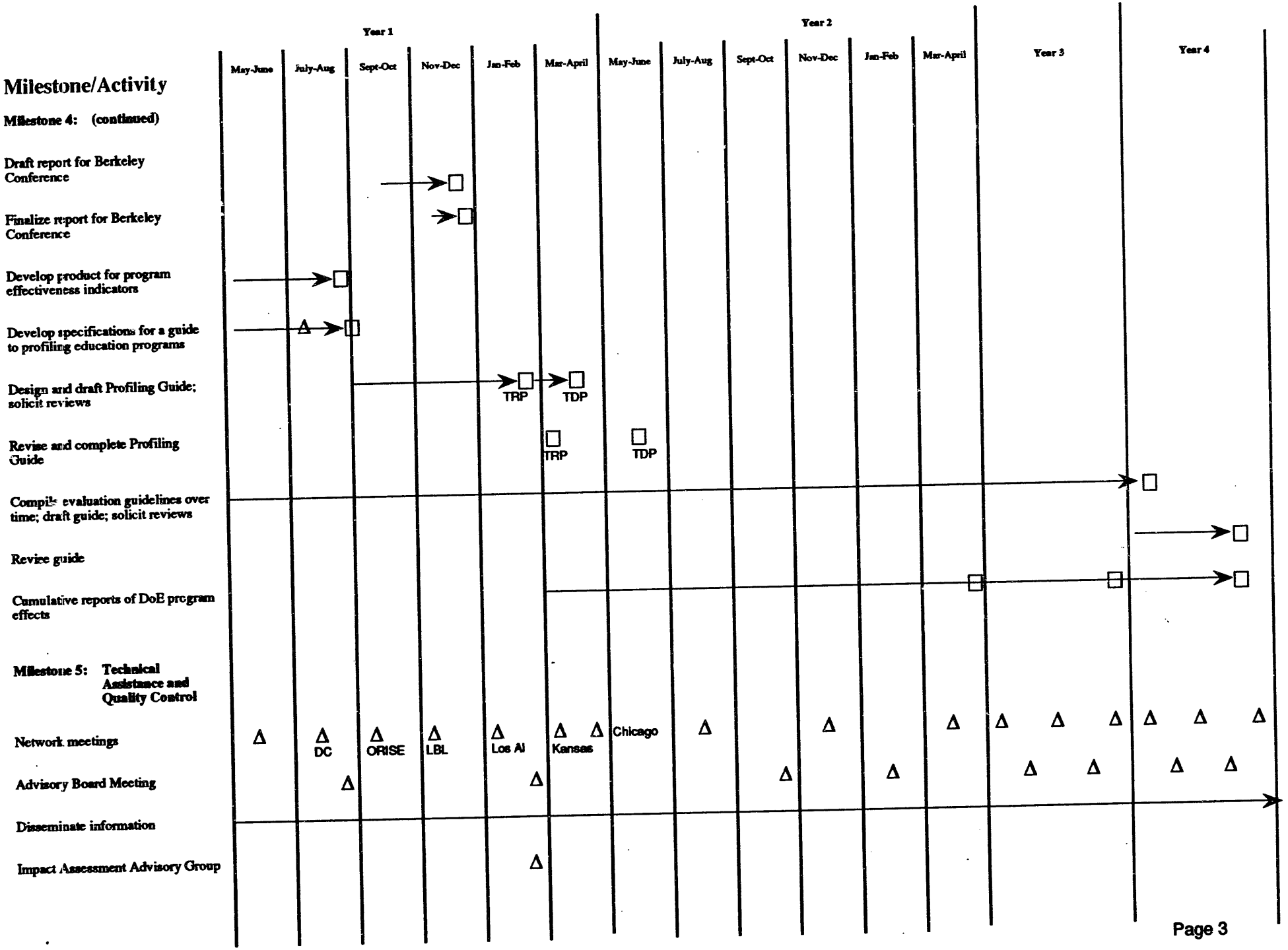
Timeline


Δ = Events
□ = Products
Year 1
Year 2
Year 3
Year 4
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
Milestone/Activity
Milestone 1: Classification of Goals and Outcomes
Meet with DoE staff to clarify and prioritize goals.
Convene DoE and pre-college directors to develop success indicators.
Milestone 2: Profiling Programs
Develop draft templates for 1-2 program types based on research and exemplary practice.
Develop templates for additional program types with Lab staff.
Student Draft
Systemic Draft
Special Programs
Conduct site visits to 5-6 Labs, profiling programs representing at least 3 program types in each.
TRP Report
TDP Report 2/28
Systemic
Student
Train Lab staff to profile
Training
TRP and TDP
Systemic
Student
Labs profile programs
TRP
TDP
Student
Systemic
Center Summarizes Reports
TRP
TDP
3/26
Dates for student and systemic summaries to be established
Milestone 3: Impact Assessment
In consultation with Task Group, develop a set of criteria to select:
1. program types, teacher research, teacher development
2. sites for pilot evaluations
TRP
TDP
Recruit 4 sites for TRP
Design Impact Assessment
Draft Evaluation Design and Instrumentation
TRP and TDP

Timeline


Year 1
Year 2
Year 3
Year 4
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
Milestone/Activity
Milestone 3: (continued)
With Lab staff, conduct pilot evaluations for TRAC at 4 sites.
Revise evaluation instruments and designs used in pilots; work with Lab staff to use them in additional sites.
Select 2 additional program types and 4 sites for each.
Design Impact Assessment
With Lab staff, conduct evaluations of the 8 programs.
Revise evaluation instruments and designs used in Year 2; work with Lab staff to use them in additional sites.
Select 4 sites for remaining program types
Design measures for success indicators
With Lab staff, conduct evaluations of the 4 programs.
Revise evaluation instruments and designs used in Year 3; work with Lab staff to use them in additional sites.
Interface with PARS database
Milestone 4: Product Development
Draft report to OMB
Finalize report to OMB
See attached schedule
Evaluation Report
Revised Designs and Instrumentations
Compiled Evaluation Reports
Evaluation Design and Instrumentation Student/Systemic
Evaluation Report
Compiled Evaluation Reports
Revised Designs and Instrumentations
Evaluation Design and Instrumentation
Evaluation Report
Revised Design and Instrumentation
Compiled Evaluation Reports

Timeline


Year 1
Year 2
Year 3
Year 4
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
May-June
July-Aug
Sept-Oct
Nov-Dec
Jan-Feb
Mar-April
Milestone/Activity
Milestone 4: (continued)
Draft report for Berkeley Conference
Finalize report for Berkeley Conference
Develop product for program effectiveness indicators
Develop specifications for a guide to profiling education programs
Design and draft Profiling Guide; solicit reviews
TRP
TDP
Revise and complete Profiling Guide
TRP
TDP
Compile evaluation guidelines over time; draft guide; solicit reviews
Revise guide
Cumulative reports of DoE program effects
Milestone 5: Technical Assistance and Quality Control
Network meetings
DC
ORISE
LBL
Los Al
Kansas
Chicago
Advisory Board Meeting
Disseminate information
Impact Assessment Advisory Group

TIMELINE: Teacher Research Participation Programs (TRPs) and Teacher Development Programs (TDPs)

	Nov-Dec	1993 Jan-Feb	Mar-Apr	May-June (end yr. 1)	July-Aug	Sept-Oct	Nov-Dec	1994 Jan-Feb	Mar-Apr
TRP Activities	TRAC draft *	Offer out to T's..|			T's at sites				
Make Selections	Select pilot sites (x4) *	Select T's for case studies (x6) .....|							
Impact Assessment for TRPS:	Impact assessment design.....|								
Surveys--Development and Collection	Survey development.	.....|		Entrance Surveys *	Exit surveys *				Follow-up Surveys *
	Develop mentor survey questions *	Develop mentor surveys.....|			Mentor surveys *				
Case Studies	Develop T's questions * Develop criteria for T's program products *	Develop protocols for classroom observations, T's and S's products.....|	Classroom visits (also T's and S's products).....	.....|	Case study interviews & observations (week 5-6); Mentor interviews; T's program products .....|			Classroom visits; T's interviews; T's and S's products; Principal interview (?); Colleague interviews(?)	.....|
Focus Groups	Develop questions *		Develop interview protocol.....	.....|	Focus groups interviews (week 5-6)...|				
Anecdotes	Anecdotal information (previous year).....	.....	.....	.....>	Anecdotal information (current year).....	.....	.....	.....	.....>

TDP Activities		Survey development	.....|	Entrance and exit surveys.. Anecdotal information...	.....|	.....	.....	.....	Follow-up survey * .....|

III. APPENDICES

APPENDIX A:

Evaluation/Technical Assistance Meeting Calendar

Agendas

Attendance Lists

CALENDAR

Evaluation/Technical Assistance Meetings
Year 1

3-4 June 1992	Task Group; Washington DC
25-26 June 1992	Washington, DC
9-10 September 1992	Oak Ridge, Tennessee
10-11 November 1992	Berkeley, California
13-14 January 1993	Santa Fe, New Mexico
31 March 1993	Kansas City, Missouri
25-26 May 1993	Chicago, Illinois

AGENDA

DEPARTMENT OF ENERGY
PRECOLLEGE TASK GROUP MEETING

3–4 June 1992

Wednesday, 3 June

8:30 A.M.	**Welcome and Introduction**	Tab 1
8:45 A.M.	**Agenda and Goals of Meeting** Senta Raizen and Susan Loucks-Horsley	
	Major Features of the Evaluation and Capability Building Effort Senta Raizen and Susan Loucks-Horsley	Tabs 2 & 3
	Discussion	
9:45 A.M.	**Roles and Responsibilities**	
	Discussion	
10:30 A.M.	*Break*	
10:45 A.M.	**Lab Evaluation Goals and Activities** Senta Raizen and Susan Loucks-Horsley Participants	
11:30 A.M.	**DoE/Laboratory Precollege Education: Program Goals and Strategies**	
	Fermi Lab Summary Marjorie Bardeen	Tab 4
	NSTA Work Group Summaries Judith Kaye	Tab 5
12:15 P.M.	*Lunch*	
1:15 P.M.	**Identifying Program Types** **Matching Specific Programs to Program Types** Participants	
2:15 P.M.	**Criteria for Selecting Program Types** Participants	
3:00 P.M.	*Break*	

3:15 P.M. **Preliminary Selection of Programs**
Group A: Teacher Programs
Group B: Student Programs

4:15 P.M. **Reports from Groups A and B**

Discussion

5:15 P.M. **Evaluation of the Day**
Participants

5:30 P.M. *Adjourn*

Thursday, 4 June

8:30 A.M. **Agenda Review**
Senta Raizen

Tab 6

8:45 A.M. **Potential Indicators**

General Discussion

9:15 A.M. **Group A: Indicators for Student Programs**

Group B: Indicators for Teacher Programs

10:15 A.M. *Break*

10:30 A.M. **Reports from Groups A and B**

Discussion

11:30 A.M. *Lunch*

12:30 A.M. **Lab Technical Assistance Needs**
Participants

1:00 P.M. **Technical Assistance and Networking Meetings**
Susan Loucks-Horsley

1:45 P.M. **Planning for June 25-26 Meeting**
Senta Raizen and Participants

2:15 P.M. **Evaluation of Meeting**
Participants

2:30 P.M. *Adjourn*

Precollege Task Group
June 3-4, 1992
DoE Headquarters

Attendance	
Name:	Key:
Marge Bardeen, Fermilab	MB
Sam Bowen, ANL	SB
Dianne Carroll, PPPL	DC
Barbara Darr, NCISE	BD
Marge Dwyer, DoE	MD
Gene Jones, EM/SAIC	GJ
Charlotte Young, EM/ANL	CY
John Whitley, EM/Sandia	JW
Talitha Giffford, DoE	TG
Marvin Gross, Fernald	MG
Irene Hays, PNL	IH
Judith Kaye, LANL	JK
Susan Loucks-Horsley, NCISE	SLH
Joan Miller, AWU	JM
Linda Caln, ORAU/ORISE	LC
John Ortman, DoE	JO
Senta A. Raizen, NCISE	SAR
Observers:	Date:
Cassie Andrews-Wellers, DoE	6/3,4
Cindy Mussick, DoE	6/3,4
Tom Squires, AWU	6/3

AGENDA

DEPARTMENT OF ENERGY
PRECOLLEGE EVALUATION MEETING

25–26 JUNE 1992

Thursday, 25 June

8:30 A.M.	**Welcome and Introduction**	Tab 1
8:45 A.M.	**Agenda and Goals of Meeting** *Senta A. Raizen*	
	Major Features of Evaluation and Capacity Building Effort *Susan Loucks–Horsley*	Tabs 2,3
9:30 A.M.	**The Scientific Approach to Science Education** John Whitley	
10:00 A.M.	**Task Group Recommendations: Program Types and Programs** *Marge Bardeen*	Tab 4,5
	Discussion	
10:45 A.M.	Break	
11:00 A.M.	**Profiling Programs: Overview** *Susan Loucks–Horsley*	Tab 6
11:30 A.M.	**Template Development**	Tab 7
	Group A: Teacher Development Programs	
	Group B: Teacher Research Participation Programs	
12:15 P.M.	Lunch	

Friday, 26 June

8:30 A.M.	**Agenda Review** *Senta Raizen*	
8:45 A.M.	**Indicators and Impact Assessment** *Senta Raizen*	Tab 8
9:00 A.M.	**Task Group Work Regarding Indicators** *Judith Kaye* *Linda Cain*	Tab 9
9:30 A.M.	Group A: Indicators for Teacher Development Programs	
	Group B: Indicators for Teacher Research Participation	
	[Break during Group Work]	
11:00 A.M.	**Reports from Groups A and B**	
	Discussion	
11:45 A.M.	Lunch	
12:30 P.M.	**Topical Discussion Groups** (What we're doing, what we know, what our issues and needs are)	

Group A: Surveys

Group B: Case Studies

Group C: What Works and What Doesn't Work: Programs for elementary school teachers (or participants' choice)

Group D: What Work and What Doesn't Work: Parent and community involvement (or participants' choice)

Group E: Partnerships

1:15 P.M. **Group Work**, Continued

2:15 P.M. **Reports from Groups A and B**

Discussion

3:15 P.M. Break

3:30 P.M. **Topical Discussion Groups**
(What we're doing, what we know, what our issues and needs are)

Group A: Surveys

Group B: Case Studies

Group C: What Works and What Doesn't Work: Programs for elementary school teachers (or participants' choice)

Group D: What Work and What Doesn't Work: Parent and community involvement (or participants' choice)

Group E: Partnerships

4:45 P.M **Reports from Topical Groups**

5:15 P.M. **Evaluation of the Day**

5:30 P.M. Adjournment

1:30 P.M.	**Reports from Topical Groups**	
	Discussion	
2:00 P.M.	**Evaluation/Technical Assistance Meetings**	Tab 10
	Decisions of Task Group	
2:45 P.M.	Break	
3:00 P.M.	**Roles and Responsibilities** *Susan Loucks–Horsley*	Tab 11
3:30 P.M.	**Next Steps for Summer Work**	
4:00 P.M.	**Evaluation of Meeting**	
4:15 P.M.	Adjournment	

Evaluation Technical Assistance Meeting
June 25 and 26, 1992
Washington, DC

Marjorie Bardeen
Program Director
Fermilab
Pine Street and Kirk Road
Batavia, IL 60510
(708)840-2031, FAX (708)840-2500

Linda Cain
Project Director
ORISE
112 Badger Road
Oak Ridge, TN 37831
(615)576-6220, FAX (615)576-0202

Diane Carroll
Head of Science Education
Princeton Plasma Physics Lab
US 1 North, Receiving 3
Princeton, NJ 08543
(609)243-2017, FAX (609)243-2160

Tiajuana Cochnauer
Idaho Field Office
785 DOE Place, MS 1214
Idaho Falls, ID 83403
(208)526-9586, FAX (208)526-8789

Phil Coyle
Principal Laboratory Associate Director
Lawrence Livermore National Laboratory
P.O. Box 808
Livermore, CA 94550
(510)423-3177, FAX

Eileen Engel
Pre-University Program Coord.
Lawrence Berkeley Laboratory
U of CA, Bldg. 90, Room 1070
Berkeley, CA 94720
(510)486-5719, FAX (510)486-6660

Jeff Estes
Science Education Center
Pacific Northwest Laboratory
902 Battelle Blvd. K1-66
Richland, WA 99352
(509)375-2820, FAX (509)375-2576

Renee Flack
Science Education Center
Brookhaven National Laboratory
30 Bell Avenue. Bldg. 490
Upton, NY 11973
(516)282-3316, FAX (516)282-5832

Thomas Gadsen
SSC Education Office
Superconducting Super Collider Lab
2550 Avenue, MS 2071, Bldg. 4
Dallas, TX 75237
(214)708-1091, FAX (214)708-0000

Marvin Gross
Education Programs Development
Fernald Environmental Management
7400 Willey Road
Fernald, OH 45030
(513)738-6995, FAX (513)738-9186

Connie Hargrave
Educational Coordinator
Ames Laboratory
Iowa State Univ., 108 Office & Lab Bldg
Ames, IA 50011
(515)294-5287, FAX (515)294-6206

Beverly Hartline
Project Manager
CEBAF
12000 Jefferson Avenue
Newport News, VA 23606
(804)249-7567, FAX (804)249-7352

Gene Jones
Technical Evaluation Support Team
Science Application International Corp.
1104 Country Hills Drive, Suite 115
Ogden, UT 84403
(801)392-9122, FAX (801)399-4760

Judith Kaye
Precollege Education Programs
Los Alamos National Laboratory
Bikini Road, MS P-278
Los Alamos, NM 87545
(505)667-1919, FAX (505)665-4093

Sam Kivlighn
SSC Education Office
Superconducting Super Collider Lab
2550 Avenue, MS 2071, Bldg. 4
Dallas, TX 75237
(214)708-1091, FAX (214)708-0000

Terry Lashley
Oak Ridge National Laboratory
105 Mitchell Rd., MS 6496
Oak Ridge, TN 37831
(615)574-0689, FAX (615)576-9496

Linda Lung
Education Programs Administrator
National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401
(303)231-7044, FAX (303)231-1997

Donald Metz
Head, Educational Programs
Brookhaven National Laboratory
30 Bell Avenue, Building 490
Upton, NY 11973
(516)282-3054, FAX (516)282-5832

Joan Miller
Associated Western Universities
4190 Highland Drive, Suite 211
Salt Lake City, UT 84124
(801)277-5632, FAX (801)277-5632

Stephen Ortiz
Sandia National Laboratories
1515 Eubank, SE
Alburquerque, NM 87123
(505)845-8098, FAX (505)844-1790

Rita Owen
Education Coordinator for Sci/Engr/Math
Bonneville Power Administration
905 NE 11th
Portland, OR 97232
(503)230-4970, FAX (505)230-4295

Manuel Perry
Director, Education Programs
Lawrence Livermore National Lab
P.O. Box 808
Livermore, CA 94550
(510)423-3177, FAX

Karen Scott
Org. 8526
Sandia, Livermore
P.O. Box 969
Livermore, CA 95440
(510)294-3760, FAX (510)294-1526

Kathryn Strozak
K-12 Science Education Coord.
CEBAF
12000 Jefferson Avenue
Newport News, VA 23606
(804)249-7028, FAX (804)249-7352

Karl Swyler
Precollege Programs
Brookhaven National Laboratory
30 Bell Avenue, Bldg. 490
Upton, NY 11973
(516)282-7171, FAX (516)282-5832

Mary Tang
Org. 0035B
Sandia National Laboratories
1515 Eubank, SE
Alburquerque, NM 87185-5800
(505)845-9885, FAX (505)844-1790

Ann Thompson
Ames Laboratory
N156 Lasomarcino Hall, Iowa State Univ.
Ames, IA 50011
(505)294-5287, FAX (505)294-6206

Frank Vivio
Argonne National Laboratory
9700 South Cass Ave., Bldg. 223
Argonne, IL 60439
(708)252-3373, FAX (708)252-3193

Maretta White
Education Coordinator
Bonneville Power Administration
905 NE 11th
Portland, OR 97232
(503)230-4138, FAX (505)230-4550

John Whitley
Education & New Initiatives, #35
Sandia National Laboratories
1515 Eubank, SE
Albuquerque, NM 87123
(505)845-9763, FAX (505)844-1790

Carol Woodall
Manager, Academic Programs
Idaho National Engineering Laboratory
1955 Freemont Ave., MS 3500
Idaho Falls, ID 83415-3500
(208)526-9221, FAX (208)526-1880

Charlotte Young
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
(708)252-3189, FAX (708)252-3659

DOE/HQ Staff

Marge Dwyer
Talitha Gifford
John Ortman
Donna Prokop
Ginger King
Carol Hanlon
Diana Fox Jackson

The National Center Staff and Consultants

Senta Raizen
Susan Loucks Horsley
Flaminia Mangone
Iris Weiss, Horizons, Inc.

AGENDA

DEPARTMENT OF ENERGY
PRECOLLEGE EVALUATION/TECHNICAL ASSISTANCE MEETING

15-16 SEPTEMBER 1992

Tuesday, 15 September

8:30 A.M.	**Welcome and Introductions**	
8:45 A.M.	**Meeting Goals and Agenda**	Tab 1
	Refresher and Update of Evaluation and Capacity Building Effort	Tab 1
9:00 A.M.	**Training in Profiling of Teacher Research Participation Programs**	Tab 2
12:00 P.M.	**Lunch**	
	Presentation by Staff of ORNL Program	
1:15 P.M.	**Indicators and Impact Assessment of Teacher Research Participation Programs**	Tab 3
1:45 P.M.	**Discussion of Indicators**	
	Group A: Are These the Right Ones?	
	Group B: How Would They Differ for Teacher Development Programs?	
	Group C: Criteria for Selection of Teacher Research Participation Programs	
	Group D: Is the Core Vs. Lab-Specific Distinction Workable?	
2:45 P.M.	**Break**	

3:00 P.M.	**Groups Report Out**	
3:30 P.M.	**Topical Discussion Groups** (Topics of Evaluation Methodology)	Tab 4
	Group A: Survey Work Group	
	Group B: Use of Anecdotes in Evaluation [Each lab should be sure one person attends this group over the course of the two days, since an assignment will accompany the discussion.]	
	Group C: Teachers as Partners in Evaluation	
4:30 P.M.	**Discussion Group Highlights**	
	Evaluation of the Day	
5:00 P.M.	**Adjourn**	
	Individual Consultations	

Wednesday, 16 September

8:00 A.M.	**Optional Presession: Briefing on National Projects**	
8:30 A.M.	**Review of Results from Day 1 Evaluation and Agenda Review**	
	Resource Review	
9:00 A.M.	**Template Development**	Tab 5
	Group A: Systemic Programs	
	Groups B and C: Student-Focused Programs	
10:00 A.M.	**Break**	
10:15 A.M.	**Groups Report Out**	

10:45 A.M.	**Topical Discussion Groups**	Tab 4
	Group A: Use of Anecdotes in Evaluation	
	Group B: Teachers as Partners in Evaluation	
	Group C: Lab Programs as Models for Student Learning Approaches: Elementary	
	Group D: Lab Programs as Models for Student Learning Approaches: Secondary	
11:45 A.M.	**Group Report Out**	
12:00 P.M.	**Lunch**	
	Presentation by Staff of ORISE Program	
1:15 P.M.	**Presentation of Consensus on Roles and Responsibilities**	Tab 6
1:30 P.M.	**Next Steps**	Tab 7
	Review of Schedule for Evaluation/Technical Assistance Meetings	
1:45 P.M.	**Small Group Discussions (with Product) of the Unique DOE Lab Role in Education**	Tab 8
2:30 P.M.	**Groups Report Out**	
2:45 P.M.	**Wrap Up and Evaluation**	
3:00 P.M.	**Adjourn**	
	Individual Consultations	

PARTICIPANT LIST
EVALUATION TECHNICAL ASSISTANCE MEETING
OAK RIDGE, TENNESSEE
15 - 16 SEPTEMBER 1992

Marjorie G. Bardeen
Fermilab MS 777
Box 500
Batavia, IL 60510

Samuel P. Bowen
Program Leader, Precollege
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Linda C. Cain
Project Director
Oak Ridge Institute for Science and Education
(ORISE)
P.O. Box 117
Oak Ridge, TN 37831-0117

Diane Carroll
Head, Science Education Program
Princeton Plasma Physics Laboratory
P.O. Box 451
Princeton, NJ 08543

Sheldon Clark
Oak Ridge Institute for Science and Education
(ORISE)
P.O. Box 117
Oak Ridge, TN 37831-0117

Tiajuana Cochnauer
DOE-ID Academic Programs
785 DOE Place, MS 1214
Idaho Falls, ID 83401

Sally Crissman
The National Center for Improving Science Education
300 Brickstone Square
Suite 900
Andover, MA 01810

Judith Delaney
Roane County Board of Education
100 Bluff Road
Kingston, TN 37763

Marge Dwyer
Office of University and Science Education
U.S. Department of Energy 3F061
ST-511
Washington, DC 20585

Eileen Engel
Pre-University Program Coordinator
Lawrence Berkeley Laboratory
Building 90, Room 1070
Berkeley, CA 94720

Jeff Estes
Science Education Center
Battelle Pacific Northwest Laboratory
P.O. Box 999 (K1-66)
Richland, WA 99352

Yreana-Renée Flack
Science Education Center
Building 438
Brookhaven National Laboratory
Building 438
Upton, NY 11973

Diana Fox Jackson
Waste Policy Institute
EM-522
12850 Middlebrook Road, Suite 108
Germantown, MD 20874-5544

Thomas Gadsden
SSC Education Office
Superconducting Super Collider Lab
2550 Beckleymeade Avenue
MS 2071, Building 4
Dallas, TX 75237

Elizabeth Gebur
Lawrence Livermore National Laboratory
7000 East Avenue, L-560
Building 4525, Room 8020
Livermore, CA 94550

Marvin Gross
Education Programs Development
Fernald Environmental Management Project
P.O. Box 398704
Cincinnati, OH 45239-8704

Connie Hargrave
Educational Coordinator
Ames Laboratory
Iowa State University
108 Office and Lab Building
Ames, IA 50011

Beverly Hartline
Associate Director and Project Manager
Continuous Electron Beam Accelerator
12000 Jefferson Avenue
Newport News, VA 23606

Irene D. Hays
Manager
Science Education Center
Battelle Pacific Northwest Laboratory
P.O. Box 999 (K1-66)
Richland, WA 99352

Dr. Judy Hector
Mathematics Department Head
Walter State Community College
500 South Davy Crockett Parkway
Morristown, TN 37813-6899

Cheryl Hewett
Technical Evaluation Support Team
Science Application International Corp.
1104 Country Hills Drive
Ogden, UT 84403

Dolores Jacobs
Los Alamos National Laboratory
P.O. Box 1663, HRD-5, MS P 278
Los Alamos, NM 87545

Dr. N. Gene Jones
Technical Evaluation Support Team
1104 Country Hills Drive, Suite 115
Ogden, UT 84403

Judith C. Kaye
Precollege Education Programs
Los Alamos National Laboratory
P.O. Box 1663, HRD-5, MS P278
Los Alamos, NM 87545

Peggy King
Oak Ridge Institute for Science and Education
(ORISE)
P.O. Box 117
Oak Ridge, TN 37831-0117

Dr. Carol Kroynta
Oak Ridge Institute for Science and Education
(ORISE)
P.O. Box 117
Oak Ridge, TN 37381-0117

Terry Lashley
Oak Ridge National Laboratory
P.O. Box 2008
105 Mitchell Road, MS 6496
Oak Ridge, TN 37831-6496

Susan Loucks-Horsley
The National Center for Improving Science Education
300 Brickstone Square
Suite 900
Andover, MA 01810

Linda Lung
Educational Programs Administrator
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401

Morgan McArthur
Project Engineer
INEL Office of Academic Programs
P.O. Box 1625 - MS 3500
Idaho Falls, ID 83415

Joan Miller
Associated Western Universities, Inc.
4190 South Highland Drive
Suite 211
Salt Lake City, UT 84124

P. A. Moore
SLAC
P.O. Box 4349, Bin 81
Stanford, CA 94309

Melissa Murray
Deputy Director
University and Science Education Programs
U.S. Department of Energy 3F-061
ST-50
Washington, DC 20585

Vonda Oran
Kingston Elementary School
520 West Cumberland Street
Kingston, TN 37763

John Ortman
Program Manager
U.S. Department of Energy HQ
ST-50
Washington, DC 20585

Rita Owen
Bonneville Power Administration
P.O. Box 3621 (EA)
Portland, OR 97208-3621

Manuel Perry
Director, Education Programs
Lawrence Livermore National Laboratory
P.O. Box 808, L-714
Livermore, CA 94551

Talitha Powell
Office of University and Science Education
U.S. Department of Energy
ST-511
Washington, DC 20585

Senta Raizen
The National Center for Improving Science Education
2000 L Street
Suite 603
Washington, DC 20036

Karen P. Scott
Sandia National Laboratories
Org. 8526
P.O. Box 969
Livermore, CA 94551-0969

Wayne Stevenson
Assistant Chairman, Precollege
Oak Ridge Institute for Science Education
P.O. Box 117
Oak Ridge, TN 37831-0017

Kathryn Strozak
Continuous Electron Beam Accelerator
12000 Jefferson Avenue
Newport News, VA 23606

Karl Swyler
Science Education Center
Building 428
Brookhaven National Laboratory
Upton, NY 11973

Mary Tang
Sandia National Laboratories
Org. 0035B
P.O. Box 5800
Albuquerque, NM 87185-5800

Toni Thibadoux
Tyner High School
6836 Tyner Road
Chattanooga, TN 37409

Ann Thompson
Ames Laboratory
157 North Lagomarcino
Iowa State University
Ames, IA 50011

John Whitley
Education and New Initiatives
Sandia National Laboratories
Org. 35
P.O. Box 5800
Albuquerque, NM 87185-5800

Corwin Witt
7611 Collier Road
Powell, TN 37849

Karen Witt
350 Lookout High Street
Chattanooga, TN 37419

Carol Woodall
Manager
Academic Programs
Idaho National Engineering Laboratory
P.O. Box 1625, MS 3500
Idaho Falls, ID 83415-3500

Charlotte Young
Argonne National Laboratory
Building 900
9700 South Cass Avenue
Argonne, IL 60439

M. Jean Young
The National Center for Improving Science Education
300 Brickstone Square
Suite 900
Andover, MA 010\810

DEPARTMENT OF ENERGY

PP 'COLLEGE EVALUATION/TECHNICAL ASSISTANCE MEETING

15 - 16 September 1992

Oak Ridge, Tennessee

Highlights and Key Decisions

Session I: Profiling of Teacher Research Participation Programs

This session introduced the Teacher Research Participation template and prepared participants to use it to profile their own programs. Using procedures outlined in Agenda Book Tab 2, Labs are to complete draft profiles and send to Susan Loucks-Horsley for feedback by 1 December, and complete the process by 31 January (Guidelines passed out at the meeting outlined "report" required from the Labs).

The template is in final draft form and Labs can proceed with their profiling. However, some key points of the discussion may lead to revision:

(1) As Labs use the Teacher Research Participation template, they should note its:

- flexibility: does the template allow for individual differences among the Labs?
- language: does the language clearly designate responsibility; does the language reflect an attitude of teacher as an active participant in all respects?

(2) National Science Center staff will review the template and consider including:

- teacher selection: what is best practice?
- evaluation as a regular part of any program

(3) Follow-up continues to be a major issue that needs to be addressed by HQ and the Labs. What finally appears in the template will depend upon decisions HQ/Labs make about goals and therefore the design of follow-up activities.

After a presentation of the report of pilot profiling of teacher research participation programs, participants were invited to comment on the written report (Tab 2) to Sally Crissman by 1 October. (See Appendix A for List of Burning Questions and Answers assembled from this session.)

Session II: Indicators of Teacher Research Participation Programs

Four groups discussed different aspects of the indicators recommended for use in the Agenda Book (Tab 3).

Group A: Indicators: Are these the right ones?

Highlights of this group's discussion included the recommendation that outcome goals be used when designing indicators.

Generally agreed upon outcome goals were to include:

1. renew and revitalize teacher participants;
2. increase teachers' awareness and understanding of current science and technology;
3. increase teachers' awareness and knowledge of the research process;
4. enhance teachers' leadership skills in science and math education;
5. maintain connections with scientists;
6. transfer by teachers of their increased knowledge (scientific and technical, research process, career possibilities) to the classroom.

Outcome goals mentioned frequently but without total consensus are:

1. increase teachers' knowledge of DOE and the Lab system;
2. increase teachers' knowledge of career opportunities in technical fields.

Outcome goals of particular interest that remain problematic are:

1. help accomplish a task useful to the mentor's group (outcome goal for some mentors);
2. increase science knowledge and performance of the students of participating teachers (DOE HQ).

On the indicators themselves, the group recommended that rather than dividing indicators into high/med/low, they should either be included or not included. Indicators for teacher research participation programs would be: attitudes toward teaching and science; scientific and technical knowledge; understanding of research process; leadership in science and math education; continued contact with scientists; use of equipment and technology; career awareness; understanding of DOE and the Labs; science content derived from the Lab experience; instructional practices acquired within the eight-week experience; and instructional practices used in the classroom after the eight-week experience.

Group B: Differences in indicators for teacher development programs (See Appendix B)

The group suggested that for the most part indicators be given the same emphasis (high/low); however, definitions are important (e.g., which attitudes are indicators). Teacher research participation programs are aimed at more experienced teachers while teacher development programs include beginners, experts, and those who fall in between. In each case indicators should take into account the stage of the developing teacher. For example, indictor 3, understanding the research process, is an indicator thought to be high in the list of importance for both TRPs and TDPs. However, for the developing teacher, TDPs should focus on using the teaching/learning process that simulates the research process (e.g., the National Science Center's model). If a goal of TDPs is to develop teacher leadership beyond enabling a person to become a confident, capable science teacher, then indicators will reflect this goal.

It was pointed out that indicators of effectiveness involving what happens in the classroom should be looked at for 2-3 years following a DOE program.

Transfer of instructional practices as a medium indicator for TRPs was felt to be "higher than high" for TDPs.

Group C: Criteria for selecting labs for teacher research participation program pilot impact assessment

The main criterion is that the Labs chosen should be as diverse as possible. Specifically, and in rank order of importance, the group recommended:

1. 2 single-purpose sites
   2 multi-purpose sites, one being a large lab, the other a small lab
2. no more than 2 previously visited labs
3. 1 lab with 2 years or less involvement in Teacher Research Participation Programs
   1 lab with 6 years or more involvement
4. 1 lab (at least) in a rural setting
   1 lab (at least) in an urban setting
5. 1 lab with a small number of teacher participants (8-20)
   1 lab with more than 50 teacher participants
6. 1 lab (at least) in high minority geographic area (over 40% minorities)
7. 2 labs with high level of lab investment (lab money plus outside funding beyond national TRAC money)
8. 1 lab with a mature/established amount of follow-up activities
9. 1 lab with biological science programs
10. 1 lab with returning teachers
    1 lab with all new teachers

Group D: **Is the core vs lab-specific distinction workable?**

Yes. However, like Group A, this group wished to do away with the "priority" designations. Most important were:

1. attitudes toward teaching and science
2. scientific and technical knowledge
3. understanding research process
4. instructional strategies
5. (a) leadership and (b) ongoing connection to scientific community

Session III: Topical Discussion Groups

Group A: **Survey Work Group**

This is an ongoing work group whose purpose is to network around the development and use of surveys by individual Labs and by all Labs. A major issue that arose was the TRAC application form and possible duplication of questions on that form and the intake form. The National Science Center has done a crosswalk of these forms and will come up with recommendations. A second question addressed the issue of all-purpose survey instruments or separate instruments for teacher research and teacher development programs. The Center is working on a recommendation here as well.

Group B: **The Use of Anecdotes in Evaluation**

The Labs are asked to document anecdotes of their impact using the Anecdotal Data Report Form (send three to five anecdotes to Senta Raizen by 15 October). There was consensus in the group that the anecdote form be revised.

The reason for collecting anecdotes systematically is two-fold. HQ uses anecdotal evidence as part of their funding presentations. Secondly, anecdotes serve on-going program improvement by exemplifying outcomes and helping one to see emerging patterns. Anecdotes provide a richness and depth to more objective data.

Session IV: Development of Templates for Future Work

Group A: **Systemic Programs**

Labs' participation in systemic efforts to strengthen science and technology education was discussed in several groups. The focus was on defining what we mean by "systemic" and therefore where a Lab program fits in systemic change. See Appendix C.

Group B: Student Programs

Student-focused programs were discussed as one large group that then broke up into two smaller groups. The large group recommended using the following major components for student-focused programs, with the existing template as a model:

- Program Administration
- Student Selection (how do you choose/select?)
- Preparation of students for their course as part of program development
- The program itself -- as it is conducted at the lab
- Follow-up/Tracking
- Program Evaluation

Added Objectives:

- Access for participation of under-represented groups

The large group decided that Program Administration should be the same as in the existing template (for teacher research participation programs). The group highlighted the idea that Labs should provide programs connected to Lab activities (i.e., offer students something they could not get elsewhere). One group (A) focused on Student Selection, Preparation of Students, and The Program Itself. The other group (B) focused on The Program Itself because of its relative importance, Follow-up/Tracking and Program Evaluation. Because of time constraints, neither group was able to discuss categories beyond The Program Itself. See Appendix D for notes on these small-group discussions.

Session V: Topical Discussion Groups

Group D: Lab Programs as models for student learning approaches

The group reviewed the NCISE model describing the nature of acquiring scientific and technical knowledge and the teaching model that flows from it. It was suggested that the graphic be revised to show how explanations and solutions are constantly being tested and the complexity and interrelatedness of each piece of scientific and technological inquiry.

The unresolved issue of whether teacher research participation programs should promote transfer (see goals) or should be accountable for transfer was uppermost in the minds of this group. In either case, it was recommended that materials be put together such as references on cooperative learning, classroom management, effective ways to teach questioning and knowing what questions are testable, and examples of interdisciplinary science and technology curriculum.

Suggestions for ways to promote transfer were:

1. to model "invitations" in meetings or lectures that occur during the summer;
2. use "alumni/ae" to design transfer activities, lead discussions during the summer pointing out applications other peers have made, put together a booklet of their own transfer activities at the end of the teaching year;
3. point out what part of the scientific process (using the NCISE model) they are participating in at any point in the eight weeks (i.e., have participants come to understand and internalize the process and teaching model); and
4. explore ways "alumni/ae" from a region can network regardless of which lab they were part of during the summer.

Session VI: Unique Qualities of Labs: Why should they be involved in education programs?

Participants worked in small groups to generate responses to this question. Three qualities mentioned most in the groups were:

1. Labs are a resource of highly-educated/trained people in the areas of math, science, engineering, technology. These people can act as role models and provide expertise at an applied, practical level.

2. Labs have state-of-the-art facilities and equipment that can act as research and technical resources. Such research and technical resources would never be found in any school setting for a variety of reasons including that some of the technologies involve work that is usually too risky to do in conventional education settings.

3. Labs are engaged in a frontier science and technology. They are a source of new knowledge, not yet available for students and teachers in most educational materials.

In addition,

4. Labs offer an interdisciplinary approach through interdisciplinary teams and through addressing national social issues such as environmental clean up.

5. As a major employer in the areas of science and technology, Labs are a showcase for career opportunities in the represented fields.

6. Labs are often located in underserved areas. This makes them a valuable resource to these communities.

7. The Labs are an in-place, federally-funded network of scientists and engineers whose educational mission (attitude and management) encourages volunteerism.

Session VII: November Evaluation/Technical Assistance Meeting

The next meeting will be 10 - 11 November in Berkeley at the Marriott at the marina. Labs are invited for a special tour and program at the Lawrence Berkeley National Lab on the afternoon of 9 November.

Agenda items generated include:

1. systemic programs -- more thinking about the issues
2. approaches/strategies for transfer in TRP programs
3. survey group?
4. evaluation designs that pick up unintended outcomes
5. push more on templates -- e.g., when intended doesn't work or isn't right
6. technical assistance on conducting open-ended interviews
7. overview of 4 years, how to involve others
8. how to involve Lab staff -- scientists, etc. -- how to carry back information -- develop workshop, overview materials
9. demonstrate how formative data are being used by DOE
10. issue of underrepresented -- how are they served by DOE programs?
11. add to Lexicon

The January 14 - 15 meeting will be held in Santa Fe. Los Alamos Lab will host a half-day program and tour on the afternoon of the 13th.

Addendum: Immediate Next Steps for Participants

1 October 1992	Send to Sally comments on DOE HQ Report
1 October 1992	Fax to Marge Unique Qualities Labs make to SME education
15 October 1992	Send to Senta 3-5 anecdotes on Teacher Research Participation and Teacher Development Programs
1 December 1992	(preferably before) Send to Susan 1 draft profile for Teacher Research Participation Program for feedback
31 January 1993	Send to Susan final profiles for Teacher Research Participation Programs

Appendix A

"BURNING QUESTIONS" ABOUT TRP PROGRAM PROFILING AND HOW WE'LL DEAL WITH THEM

1. Teacher selection: where is it on template? what is best practice? - NCISE will review template and consider revisions.

2. What is good follow-up? How to do it? -NCISE and HQ will consider where to discuss, if it fits in evaluation - needs substantial time to discuss.

3. Is template sufficiently flexible to allow for individual differences? -we hope so, we found it so in pilot - we need labs to try it and tell us.

4. How is the profiling done? - see Guidelines, Tab 2

5. Some components are unclear as to who is expected to do what - NCISE will review template and clarify.

6. Some language in template seems to say teacher can be passive and expect to "receive" - needs to also reflect teacher active participation - NCISE will review template and consider revisions.

7. How can we help the transfer of the research experience into the classroom? - see #2.

8. Should evaluation be part of the profile? Yes - NCISE will add it.

Appendix B
REPORT FROM INDICATOR GROUP B

Difference in Indicators for Teacher Development Program

Teacher Research Participation (TRP)	Teacher Development (TD)
1. Attitudes - High	1. High - define which attitudes
2. Science and Technical Knowledge - High	2. Science, big ideas, skills, concepts, attitudes, habits of mind
3. Understanding Research Process - High	3. Use teaching/learning process that simulates the research process (e.g., NCISE) - High

_____ know the difference between beginners and experts _____

4. Leadership and Connections - High	4. High - develop teacher leadership (step beyond enabling) will *enable* through 1-3 Q: is our goal to create teacher leaders? If yes, indicators will be different
5. Use of Equipment/Technology - getting to know specific equipment he/she works with	5. Use of equipment/technology - target audience - dependent situation/context - dependent
6. High priority - getting people in pipeline	6. High priority

7. Understanding of DoE and labs

on a lab-by-lab basis, depending on DoE efforts at the moment

_____ no difference _____

Most important is what happens in the next 2 - 3 years.

10. Transfer/Instructional Practices - Medium (high) gap: transfer support	10. Higher than high
11. Student Perception of Instructional Practice - Low	11. Low
12. Student Achievement *Low* for research *High* for outcome	12. Short term: attitudes sign-up for courses

Report from Systemic Change Group #1

SYSTEMIC CHANGE

System

(NSF) STATE

(School) SITE BASED

Change

Plan for Change

Plan

Plan to plan

Analyze

Plan

- Goals
- Needs
- Implement
- Evaluate

Institutionalize

Roles of National Labs

- Catalyze Process
- Leverage Resources
- Evaluate for Change
- Disseminate Change Models

NCISE Profile

Appendix C

REPORT FROM SYSTEMIC CHANGE GROUP #2

A "Systemic" Program:

- Affects all parts of the system
- Long lasting
- Widely shared vision of what needs to be happening to kids
- Involves all stakeholders
- Dynamic ed adaptive
- Widely shared vision of needed changes in education and culture
- Strong links between components of the system
- Problem solving mechanism - management of logistics

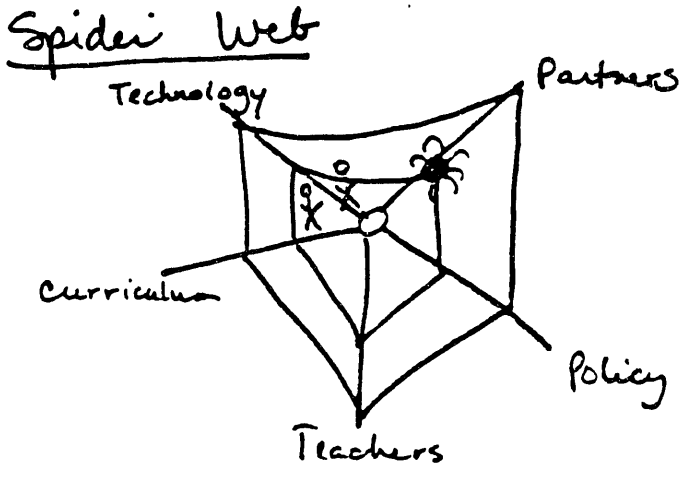
REPORT FROM SYSTEMIC PROGRAM GROUP #3

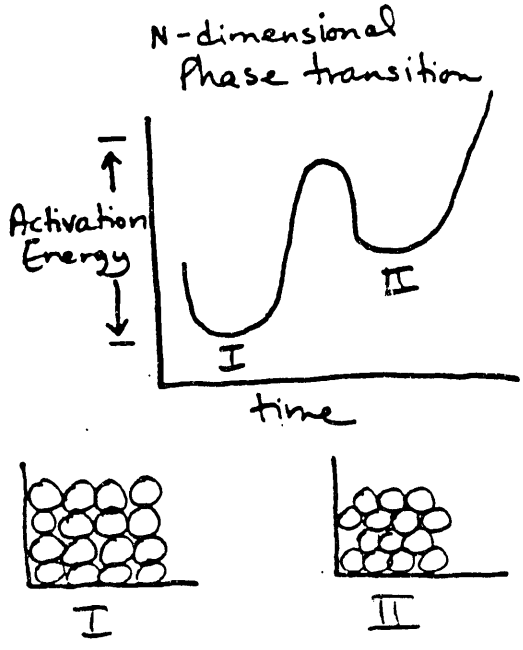
Systemic Definitions:

- acting as resource/technical assistant
- institutionalizing successful programs/practices
- alleviating barriers/promoting benefits at "school" level or higher
- phase transition - needs a known direction (vision)/end point (effectiveness)
- sustainable, evolving/continuous improvement
- interdependency
- cultural/value changes
- integrity of individual parts

"Vision/Plan"

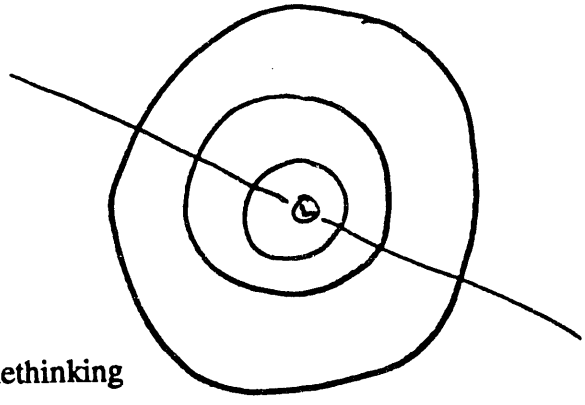
- strategies for instruction - examine options at multiple levels in multiple areas (economy, politics, etc.)
- identification of players
- reallocation of resources - "break" existing system
- rigorous/solid evidence of success/effectiveness





REPORT FROM SYSTEMIC PROGRAM GROUP #4

Education System



Rethinking

Models

- Onions
- Roots - potato model, plant model
- "boutique" programs
- comprehensive
- a collection of boutiques is only a wall
- systemic

Collaboration Among Partners

- all stakeholders, inclusive
- partners: people to people
- teachers: key
- organization to organization; Lab to school
- identified clearly
- sustained involvement
- resources of partners

Effective Networks

- possible mechanisms: meetings, newsletter, electronic
- need-based
- mutually supportive
- long-term

#1 Vision-shared

- plan: based on clear understanding of system in school district, region, state - research/survey/study (the head)
- transformational leadership - J.C. - style (the heart)

Appendix D

REPORT FROM GROUP ON STUDENT PROGRAMS

Major Components:

1. Program Administration
2. Student Selection (how do you choose/select)
3. Preparation of students for their course as a part of program development
4. The Program Itself as it is conducted at the Lab
5. Follow-up/Tracking
6. Program Evaluation

- Objectives:
  - access for/participation of underrepresented groups
- Program Development
  - does it meet the needs of the target student population? (target, level of ability)
  - wherever, whatever it is, program design and implementation must address and be sensitive to cultural issues
- Outcomes
  - knowledge of content
  - understanding of research process
  - greater credibility in classroom
- Outcomes II
  - cognitive and attitudinal changes
  - career awareness
  - use of the lab as a resource - because we have appropriate facilities, mission, resources
    programs should be as close to our lab as possible
  - make the best match however it occurs
  - should be resource effective to some degree
    what you put it relative to outcomes
  - a student program has to have some connection to the lab somehow
    What are the issues?
    - either student go to the facility
    - or the scientist goes to the kids
  - We have to offer student something they could not get elsewhere - e.g., facilities, scientists

- Products
  - results of research (poster, etc.)
  - technical expertise (super computer)
- The Program Itself: Precollege
  - program relates to mission and expertise of lab
  - program connects learners to professional scientists; relates to unique construction; connections to real life
  - connections to what's relevant to students - real-life experience, school curriculum (relevant to grade level and social experience)
  - offer hands-on experiences - experiential learning - junior collaborators
  - collaborative/cooperative learning experiences; team/project work
  - create an atmosphere where students are constructing knowledge, discovering; problem formulation and solving
  - definable end product for student
  - "learning by burning" - see science not as immutable set of facts - valuing unexpected results
  - approaches that recognize cultural/ethnic/demographic/economic diversity served
- Follow-up/Tracking
  - repeat experiences
  - next step of scientific development
  - curriculum development
  - newsletters
  - reinforcing experiences

AGENDA

DEPARTMENT OF ENERGY
PRECOLLEGE EVALUATION/TECHNICAL ASSISTANCE MEETING

9-11 NOVEMBER 1992

Monday, 9 November

1:00 P.M. - 5:00 P.M.	**Optional Visit to Lawrence Berkeley National Lab**	

Tuesday, 10 November

8:00 A.M.	**Continental Breakfast**	
8:30 A.M.	**Welcome and Introductions**	
8:45 A.M.	**Meeting Goals and Agenda**	Tab 1
	Refresher and Update of Evaluation and Capacity Building Effort	
9:00 A.M.	**Profiling Teacher Research Participation Programs:** Progress and Problems	Tab 2
10:00 A.M.	**Break**	
10:15 A.M.	**Training in Profiling of Teacher Development Programs: Template, Process, and Questions**	Tab 3
12:00 P.M.	**Lunch**	
1:00 P.M.	**Training in Profiling of Teacher Development Programs, Cont'd**	
1:30 P.M.	**Further Work on New Template Development**	Tab 6
	Groups A - D: Systemic Programs with BASTEC as an Illustration	

2:45 P.M.	**Break**	
3:00 P.M.	**How DOE is Using Information from the Profiling Activity**	Tab 4
3:45 P.M.	**Concurrent Sessions on Profiling Methodology and Use**	Tab 5
	Session A: Conducting open-ended interviews	
	Session B: Orienting staff back home to the evaluation project and methodologies	
	Session C: Survey work group	
5:00 P.M.	**Evaluation of the Day**	
5:15 P.M.	**Adjourn**	
	Individual Consultations	

Wednesday, 11 November

	Check Out	
8:00 A.M.	**Continental Breakfast**	
	Optional Presession: Update on National Projects	
8:30 A.M.	**Review of Results from Day 1 Evaluation and Agenda Review**	
	Resource Alert	
9:00 A.M.	**Impact Assessment of Teacher Research Participation Programs: Presentation and Discussion of Design for the Pilot**	Tab 7
9:30 A.M.	**Small Group Discussions of Aspects of the Design**	
	Group A: Discussion of Design	
	Group B: Questions for Teacher Interviews	
	Group C: Questions for Teacher Focus Groups	

	Group D: Criteria for Evaluating the Products of Teacher Participation in the Programs	
10:30 A.M.	**Groups Report Out**	
11:00 A.M.	**Break and Snack**	
11:30 A.M.	**Concurrent Sessions**	
	Session A: Conducting open-ended interviews	
	Session B: Orienting staff back home to the evaluation project and methodologies	
	Session C: Questions for Mentors and Principals in Pilot Impact Assessment	
12:45 P.M.	**Groups Report Out**	
1:15 P.M.	**Next Steps**	Tab 8
	Review of Schedule for Evaluation/Technical Assistance Meetings	
	Ideas for Los Alamos Meeting Agenda	
1:45 P.M.	**Wrap Up and Evaluation**	
2:00 P.M.	**Adjourn**	
	Individual Consultations	

AGENDA
Profiling Teacher Development Programs
10 November 1992

10:15 am	Overview Purpose Outcomes Process Introduction to the Template Development Anatomy
10:45 am	Small Group Task
11:15 am	Burning Questions from Groups
11:45 am	How to Conduct Profiling Activity Overview Procedures Assignment
12:00 pm	Lunch
1:00 pm	A Completed Template: Small Group Task

Finalized Attendance List
Lawrence Berkeley National Laboratory
10-11 November 1992
Evaluation/Technical Assistance Meeting

Marge Bardeen
Program Director
Fermi National Accelerator Laboratory
MS-777
P.O. Box 500
Batavia, IL 60510
(708) 840-2031

Linda C. Cain
Project Director
Oak Ridge Institute for Science and Education
P.O. Box 117, 120 Badger Road
Oak Ridge, TN 34830-0117
(615) 576-6220

Diane Carroll
Head of Science Education
Princeton Plasma Physics Laboratory
James Forrestal Campus
P.O. Box 451
Princeton, NJ 60439
(609) 243-2017

Tiajuana Cochnauer
Department of Energy
Idaho Field Office
785 DOE Place, MS 1214
Idaho Falls, ID 83401-1562
(208) 526-9586

Sally Crissman
Associate Director
The National Center for Improving Science Education
300 Brickstone Square, Suite 900
Andover, MA 01810
(508) 470-1080

Sharon Dogruel
Los Alamos National Laboratoroy
Educational Outreach
P.O. Box 1663, HRD-5, MS P278
Los Alamos, NM 87545
(505) 667-1919

Marge Dwyer
Office of University and Science Education
U.S. Department of Energy/HQ
ST-511, 3F-061
Washington, DC 20585
(202) 586-8951

Eileen Engel
Pre-University Program Coordinator
Lawrence Berkeley Laboratory
University of California, Building 90, Room 1070
Berkeley, CA 94720
(510) 486-5719

Jeff Estes
Science Education Center
Battelle Pacific Northwest Laboratory
P.O. Box 999 (K1-66)
Richland, WA 99352
(509) 375-2820

Y. Renée Flack
Science Education Center
Brookhaven National Laboratory
Building 438
Upton, NY 11973-5000

Thomas Gadsden
SSC Education Office
Superconducting Super Collider Laboratory
2550 Beckleymeade Avenue, MS 2071, Building 4
Dallas, TX 75237
(214) 708-1163

Marvin C. Gross
Education Programs Development
Fernald Environmental Management Project
P.O. Box 398704
Cincinnati, OH 45239
(513) 738-6995

Connie P. Hargrave
Educational Coordinator
Ames Laboratory
Iowa State University
108 Office & Lab Building
Ames, IA 50011
(515) 294-1478

Beverly Hartline
Associate Director and Project Manager
Continuous Electron Beam Accelerator
12000 Jefferson Avenue
Newport News, VA 23606
(804) 249-7567

Irene E. Hays
Science Education Center
Battelle Pacific Northwest Laboratory
P.o. Box 999 (K1-66)
Richland, WA 99352
(509) 375-2576

Judith C. Kaye
Los Alamos National Laboratory
P.O. Box 1663, HRD-5, MS P278
Los Alamos, NM 87545
(505) 667-1919

Terry Lashley
Oak Ridge National Laboratory
P.O. Box 2008
105 Mitchell Road, MS 6496
Oak Ridge, TN 37831-6496
(615) 574-0689

Susan Loucks-Horsley
The National Center for Improving Science Education
300 Brickstone Square, Suite 900
Andover, MA 01810
(508) 470-1080

Linda Lung
Education Programs Administrator
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401
(303) 231-7044

Morgan McArthur
Idaho National Engineering Laboratory
P.O. Box 1625
Idaho Falls, ID 83415-3500
(208) 526-9221

P.A. Moore
SLAC
Box 4349, MS 81
Stanford, CA 94309
(415) 926-3826

Cindy Musick
Department of Energy HQ
1000 Independence Avenue, SW
ST-512
Washington, DC 20585
(202) 586-0987

Steve Ortiz
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185
(505) 845-8098

Roland Otto
Director
Center for Science and Engineering Education
University of California, Building 90, Room 1070
Berkeley, CA 94720
(510) 486-5719

Rita L. Owen
Education Coordinator for Science/Engineering/Math
Bonneville Power Administration (EA)
P.O. Box 3621
Portland, OR 97208-3621
(503) 230-4970

Manuel Perry
Director, Education Programs
Lawrence Livermore National Laboratory
P.O. Box 808, L-793
Livermore, CA 94551
(510) 424-0554

Talitha Powell
Office of University and Science Education
U.S. Department of Energy/HQ
ST-511, 3F-061
Washington, DC 20585
(202) 586-7360

Senta Raizen
The National Center for Improving Science Education
2000 L Street, N.W.
Suite 603
Washington, DC 20036
(202) 467-0652

Karen Scott
Education Outreach, Org. 8526
Sandia National Laboratories
7011 East Avenue
P.O. Box 969
Livermore, CA 94551
(510) 294-3760

Janice Shaheen
U.S. Department of Energy
DP-4.2
Washington, DC 20585

Mary Tang
Sandia National Laboratories
Organization 35B
P.O. Box 5800
Albuquerque, NM 87185
(505) 845-9885

Ann Thompson
Ames Laboratory
157 North Lagomarcino Hall
Iowa State University
Ames, IA 50011

John Whitley
Sandia National Laboratories
Org. 0035
P.O. Box 5800
Albuquerque, NM 87185-5800
(505) 845-9763

Susan Wiebe
Lawrence Livermore National Laboratory
P.O. Box 808, L-561
Livermore, CA 94550
(510) 423-9394

Marva Wilkins
Lawrence Berkeley Laboratory
University of California
Building 90, Room 1070
Berkeley, CA 94720
(510) 486-5640

Carol Woodall
Manager, Academic Programs
Idaho National Engineering Laboratory
P.O. Box 1625
Idaho Falls, ID 83415-3500
(208) 526-9221

Charlotte Young
Argonne National Laboratory, Building 900
9700 South Cass Avenue
Argonne, IL 60439
(708) 252-3189

Jean Young
The National Center for Improving Science Education
300 Brickstone Square, Suite 900
Andover, MA 01810
(508) 470-1080

Updated: 26 October 1992

DoE Precollege Technical Assistance/Evaluation Meeting
Berkeley, 10-11 November 1992
Meeting Notes

The meeting was held at Berkeley Marina Marriott and attended by 38 people. An optional tour of Lawrence Berkeley Laboratory took place on 9 November.

Profiling Teacher Research Participation Programs: Progress and Problems

We discussed progress participants had made in profiling their programs and generated the following questions (with answers):

1. Q: Should information be gathered from teachers and mentors from more than one year?
   A: You want to profile your program as it is right now, so include only those who participated last year.

2. Q: Who should actually conduct the interviews? What skills are needed?
   A: The person who collects the data should know the program, be able to grasp the complexity of the program, but can distill all the information and then construct a snapshot. The interviewer should be able to ask good questions, take good notes with attention to detail, be friendly, patient, and comfortable talking with lots of different kinds of people. The program coordinator could be an interviewer, but should not be the only one.

3. Q: How do we deal with the issue of follow-up since it isn't built into our programs right now, yet it's in the template?
   A: Follow-up is part of the template and so we need to have it as part of your profiles. In the spirit of this methodology, recognize that we know the importance of follow-up from the literature and best practice. We know it's important to the goals of teacher development. Here is where the unclarity of goals is hanging us up, and so we need to make this part of our research questions. That means we need to know the extent of follow-up in all the programs (we learn this through your profiling) and the impact assessment will pick up the influence of any follow-up that is done on the achievement of the program's goals.

4. Q: There are so many components and items on the template, won't some of the most important ones get lost?
   A: It is the role of the interviewer to be sure that doesn't happen. In an open-ended interview, the interviewer knows the items of importance, uses open-ended questions to get at as many of them as possible. In the profiling interviews, highlight items of importance, be flexible in the interviewing process, keep your eye on the template, and fill in the missing pieces as the interview proceeds.

5. Q: Is there going to be a further revision of the Teacher Research Participation template?
   A: Not this year!

6. Q: What is DoE's intention about how frequently we do profiling?
   A: A program would be profiled as it is being developed, to see if what's actually happening is as it is intended, or when changes are made. Otherwise there is no need to profile every year. Perhaps you would have a cycle for profiling programs regularly over a period of time, e.g., every five years, just to check on whether things are as they should be.

7. Q: There is no component about the "stuff" that teachers take back with them.
   A: Not specifically, but it's imbedded in items 5d and 6e. Be sure you capture it there if not elsewhere, and suggest in your report if you think it should be a more specific component or subcomponent on the checklist.

8. Q: What is the status of the TRAC goals?
   A: Not yet finalized. HQ has taken suggestions from earlier TA meetings and is working on consensus. John Ortman, TRAC program manager, will announce any changes to the goals.

Reminder:

1 December:	Draft completed template due to Susan L-H
31 January:	Report due to Susan L-H (for outline, see Tab 3, "Guidelines for Program Profiling")

Training in Profiling Teacher Development Programs

We examined the current draft of the teacher development template and gathered suggestions for changes. The following questions were identified (with answers):

1. Q: What is a teacher development program?
   A: See definition under Tab 3, "Guidelines for Program Profiling, Addendum, 1 November 1992"

2. Q: What is meant by "vision" in #1? how do #1 and #2 link?
   A: #1 is meant to depict what the program hopes the teacher will be doing in the classroom as a result of participation in the program; it is a "vision" for good science teaching and learning. #2 depicts how the teacher learns in the program, a vision of good science teacher development. The two should be parallel.

Recommendations for revisions in the template will be used for another version, to be completed and shared by mid December. An attempt will be made to make the structure of the template similar to the one for teacher research participation programs.

We discussed guidelines for profiling and reporting (see Tab 3).

Reminder:

1 February:	One completed draft template due to Susan L-H
15 March:	Report due to Susan L-H

Further Work on Template Development

Three participants from the BASTEC program were invited by LBL to participate with small groups and discuss BASTEC as an illustration of a systemic program.

DoE's Use of Profiling Activity

Marge Dwyer listed the following expectations for the Labs:

What are labs accountable for? (1) high quality, effective programs; (2) achievement in student knowledge and ability -- there is no DoE role in education without these.

When should labs do profiling? (1) when goals change; (2) to assure quality; (3) when you want to fix something; and (4) to assure that you have fixed something

Profiling does not need to be done every year for every program.

What DoE is doing should always be formative.

The labs, as good scientists, always experimenting, pushing the edge of quality.

Expect rigorous and candid evaluations; honesty on what is not effective and what is; transfer of evaluation to staff and education partners.

Resource Alert

The following resources were identified as useful and copies made available to participants:

1. "Improving Science Teaching in Multicultural Settings: A qualitative Study." Johnson and Kean, Journal of Science Education and Technology, 1(4), 1992.

2. Madaus et al. report on NSF study of the impact of testing on school districts

3. National Research Council -- discussion paper for the National Science Standards

Impact Assessment of Teacher Research Participation Programs

An overview of the pilot evaluation design was followed by discussion and feedback. A key point made by DoE and the National Center was that the pilot was structured to examine the goals and objectives of the programs as well as the evaluation questions and methodologies.

Future Evaluation/Technical Assistance Meetings

Next is in Santa Fe, 14-15 January, with an optional visit to Los Alamos National Lab the afternoon of 13 January, 1:00 pm.

Other meetings:

30-31 March (one day Precollege meeting, one day Evaluation/Technical Assistance), Kansas City at NSTA

25-26 May -- Chicago

Ideas for Los Alamos Agenda:

1. Session on science standards -- invite Elizabeth Stage

2. The change process -- what we're into

3. Continue template development

4. Profiling activity: problems and progress

5. New Mexico initiatives -- small groups -- working in multicultural settings

6. Goals for teacher development programs

7. "Dissemination" activities for collaborative evaluation and research: discuss articles, presentations, other avenues

8. Reports from DoE and Lab staff on "transfer" of profiling/evaluation in their other work

AGENDA

DEPARTMENT OF ENERGY
PRECOLLEGE EVALUATION/TECHNICAL ASSISTANCE MEETING

12-14 January 1993

Tuesday, 12 January

1:00 P.M. - 5:00 P.M.	**Optional Visit to Los Alamos National Lab**	

Wednesday, 13 January

8:00 A.M.	**Continental Breakfast**	
8:30 A.M.	**Welcome and Introductions**	
8:45 A.M.	**Meeting Goals and Agenda**	Tab 1
	Refresher and Update of Evaluation and Capacity Building Effort	
9:00 A.M.	**Profiling Teacher Research Participation Programs: Update, Observations, and Implications for Program Improvement**	Tab 2
10:00 A.M.	**Break**	
10:15 A.M.	**Profiling Teacher Development Programs: Progress and Problems**	Tab 2
11:15 A.M.	**Further Work on New Template Development: Consensus Building Using the Pyramidal Process**	Tab 3
	Group A: Systemic Programs Group B: Student Programs	
12:15 P.M.	**Lunch**	

1:15 P.M.	**Report Out on New Template Development**	
1:45 P.M.	**Critique and Consensus Building for New Science Standards**	Tab 4
3:15 P.M.	**Concurrent Sessions**	
	Session A: The change process: What we're going through and how that knowledge can help us in our work	Tab 5
	Session B: (1) Articulating and disseminating our learning: What articles, presentations, etc. can we do? (2) Other uses for the methodologies and tools from the evaluation project	
	Session C: Review Teacher Development Program Goals	
4:30 P.M.	**Evaluation of the Day**	
	Meeting of Pilot Impact Assessment Sites	
	Individual Consultations	

Thursday, 14 January

8:00 A.M.	**Continental Breakfast**	
	Optional Presession: Update on National Projects	
8:30 A.M.	**Review of Results from Day 1 Evaluation, Agenda Review, and Resource Alert**	
8:45 A.M.	**Review of Impact Assessment of Teacher Development Programs: Issues and Questions**	Tab 6
9:15 A.M.	**Small Group Discussions of the Goals**	
10:00 A.M.	**Groups Report Out**	
10:15 A.M.	**Break**	
10:30 A.M.	**Small Group Roundtables with New Mexico Initiatives**	
11:15 A.M.	**Round 2, New Mexico Roundtables**	

12:00 P.M. **Break, Check-Out, Get Lunch**

12:30 P.M. **Working Lunch: Next Steps** Tab 7
Future Meetings, Ideas for Kansas City Agenda

1:00 P.M. **Repeat of Concurrent Sessions**

Session A: The change process: What we're going through and how that knowledge can help us in our work

Session B: (1) Articulating and disseminating our learning: What articles, presentations, etc. can we do?
(2) Other uses for the methodologies and tools from the evaluation project

Session C: Review Teacher Development Program Goals

1:50 P.M. **Wrap Up and Evaluation**

2:00 P.M. **Adjourn**

PARTICIPANT ADDRESS LIST

Evaluation/Technical Assistance Meeting
Picacho Plaza Hotel
January 12, 1993 - January 14, 1993

Printed January 27, 1993

Marjorie Bardeen
Fermilab/SSC
P.O. Box 500
MS 777
Batavia, IL 60510
708-840-2031
FAX: 708-840-2500

David Bice
ITRI
P.O. Box 5890
Albuquerque, NM 87685
505-845-1019
FAX: 505-845-1250

Linda Cain
ORISE
P.O. Box 117
Oak Ridge, TN 37831
615-576-6220
FAX: 615-576-0202

Kristin Ciesemier
Fermilab
P.O. Box 500
MS 226
Batavia, IL 60510
708-840-3007
FAX: 708-840-8248

Tiajuana Cochnauer
U.S. DOE-ID
785 DOE Place
MS 1214
Idaho Falls, ID 83401
208-526-9586
FAX: 208-526-8789

David Colton
University of New Mexico
Bureau of Educational & Develop
College of Education
Albuquerque, NM 87131
505-277-1999
FAX: 505-277-7601

L. "Sally" Crissman
NCISE
300 Brickstone Square
Suite 900
Andover, MA 01810
508-470-1080
FAX: 508-475-9220

Lillian Cunningham
U.S. DOE
Bonneville Power Administration
905 NE 11th Avenue
Portland, OR 97232
503-230-4970
FAX: 503-230-4295

Sharon Dogruel
Los Alamos Nat'l Lab.
P.O. Box 1663
HRD-5, MS P278
Los Alamos, NM 87545
505-667-1919
FAX: 505-665-4093

Margaret Dwyer
U.S. DOE
ST-511, 3F-061
Washington, DC 20585
202-586-8951
FAX: 202-586-0019

PARTICIPANT ADDRESS LIST

Evaluation/Technical Assistance Meeting
Picacho Plaza Hotel
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Printed January 27, 1993

Eileen Engel
Lawrence Berkeley Lab.
MS 90-1070
Berkeley, CA 94720
510-486-5719
FAX: 510-486-6660

Jeff Estes
PNL
P.O. Box 999
MS K1-66
Richland, WA 99352

Thomas Gadsden Jr.
SSC Laboratory
2550 Beckleymeade Avenue
Dallas, TX 75237
214-708-1163
FAX: 214-708-0000

William Gamble Jr.
Los Alamos Nat'l Lab.
P.O. Box 1663
MS P370
Los Alamos, NM 87545
505-665-7692
FAX 505-665-5596

Carol Hanlon
U.S. DOE
Office of Civilian Radioactive W
Forrestal Building, SA051
Washington, DC 20585
202-586-2284
FAX: 202-586-7259

Loretta Helling
Office of External Affairs
Education Outreach
P.O. Box 98518
Las Vegas, NV 89193-8518
702-295-1846
FAX: 702-295-0154

Michael Hodges
Westinghouse Savannah River Co.
Bldg. 773-42A
P.O. Box 616
Aiken, SC 29802
803-725-5328
FAX: 803-725-4704

Clare Intress
University of New Mexico
c/o Bureau of Educational & Dev
College of Education
Albuquerque, NM 87131-1231
505-277-1999
FAX: 505-277-7601

Dolores Jacobs
Los Alamos Nat'l Lab.
P.O. Box 1663
HRD-5, MS P278
Los Alamos, NM 87545
505-667-1919
FAX: 505-665-4093

Stanka Jovanovic
Fermi Nat'l Accelerator Lab.
P.O. Box 500
MS 226
Batavia, IL 60510
708-840-3092
FAX: 708-840-8248

PARTICIPANT ADDRESS LIST

Evaluation/Technical Assistance Meeting
Picacho Plaza Hotel
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Printed January 27, 1993

Judith Kaye
Los Alamos Nat'l Lab.
P.O. Box 1663
HRD-5, MS P278
Los Alamos, NM 87545
505-667-1919
FAX: 505-665-4093

Sherrie Kivlighn
SSC Laboratory
2550 Beckleymeade Avenue
Dallas, TX 75237
214-708-1066
FAX: 214-708-0000

Terry Lashley
Oak Ridge National Lab.
105 Mitchell Road
P.O. Box 2008, MS 6496
Oak Ridge, TN 37831-6496
615-574-0689
FAX: 615-576-9496

Susan Loucks-Horsley
NCISE
300 Brickstone Square
Suite 900
Andover, MA 01810
508-470-1080
FAX: 508-475-9220

Linda Lung
Nat'l Renewable Energy Laborator
1617 Cole Boulevard
Golden, CO 80401
303-231-7044
FAX: 303-231-1997

Morgan McArthur
EG & G Idaho
INEL Office of Academic Program
P.O. Box 1625
Idaho Falls, ID 83402
208-526-1780
FAX: 208-526-1880

Jeff Miller
National 4-H Council
7100 Connecticut Avenue
Chevy Chase, MD 20815
301-961-2975
FAX: 301-961-2974

Joan Miller
Associated Western Universities
4190 S. Highland Drive
Suite 211
Salt Lake City, UT 84124
801-278-0799
FAX: 801-277-5632

Patricia Moore
Stanford Linear Accelerator
P.O. Box 4349
MS 81
Stanford, CA 94309
415-926-3826
FAX: 415-926-4500

Chris Nelson
University of New Mexico
c/o Bureau of Educational & Dev
College of Education
Albuquerque, NM 87131-1231
505-277-1999
FAX: 505-277-7601

PARTICIPANT ADDRESS LIST

Evaluation/Technical Assistance Meeting
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Printed January 27, 1993

Rita Owen
U.S. DOE
Bonneville Power Administration
905 NE 11th Avenue
Portland, OR 97232
503-230-4970
FAX: 503-230-4295

Talitha Powell
U.S. DOE
ST-511, 3F-061
Washington, DC 20585
202-586-7360
FAX: 202-586-0019

Karen Scott
Sandia National Laboratories
P.O. Box 969
8526
Livermore, CA 94550
510-294-3760
FAX: 510-294-2355

Janie Shaheen
U.S. DOE
DP 4.2
1000 Independence Ave. SW
Washington, DC 20585
202-586-2287
FAX: 202-586-1057

Joseph Skenadore
SIPI
P.O. Box 10146
Albuquerque, NM 87184
505-897-5398
FAX: 505-897-5381

Roberta Smith
University of New Mexico
c/o Bureau of Educational & Dev
College of Education
Albuquerque, NM 87131-1231
505-277-1999
FAX: 505-277-7601

Kathryn Strozak
CEBAF
12000 Jefferson Avenue
Newport News, VA 23606
804-249-7028
FAX: 804-249-7352

Karl Swyler
Brookhaven National Laboratory
Science Education Center
Upton, NY 11973
516-282-7171
FAX: 516-282-5832

Mary Tang
Sandia National Laboratories
P.O. Box 5800
Org. 35
Albuquerque, NM 87185-5800
505-845-9085
FAX: 505-844-1790

Sandra Thibodeau
NCISE
300 Brickstone Square
Suite 900
Andover, MA 01810
508-470-1080
FAX: 508-475-9220

PARTICIPANT ADDRESS LIST

Evaluation/Technical Assistance Meeting
Picacho Plaza Hotel
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Dennis Vargo
SIPI
P.O. Box 10146
Albuquerque, NM 87184
505-897-5398
FAX: 505-897-5381

Susan Walpole
FERMCO
P.O. Box 398704
Cincinnati, OH 45239-8704
513-738-9314
FAX: 513-738-9186

John Whitley
Sandia National Laboratories
P.O. Box 5800
Org. 6905
Albuquerque, NM 87185-5800
505-845-9763
FAX: 505-844-1790

Susan Wiebe
LLNL
P.O. Box 5509
7000 East Avenue
Livermore, CA 94550
510-423-9394
FAX: 510-423-5951

Karen Wieda
Battelle
Pacific Northwest Laboratory
P.O. Box 999
Richland, WA 99352
509-375-2584
FAX: 509-375-2576

M. Jean Young
NCISE, The Network
300 Brickstone Square
Suite 900
Andover, MA 01810
508-470-1080
FAX: 508-475-9220

TOTAL: 46

APPENDIX B:

Profiling
Teacher Research Participation
And
Teacher Development Programs

PROFILING TEACHER RESEARCH PARTICIPATION PROGRAMS
A PILOT STUDY

During the months of July and August, 1992, staff from the National Center for Improving Science Education profiled four teacher research participation programs taking place in DOE national laboratories. The purpose was to pilot a methodology for determining the extent to which such programs reflect what research and best practice find to be effective, and to highlight issues for consideration by the labs and by DOE.

The process of profiling involved the use of a "template" delineating components of effective practice that could be used to describe and compare the program's design with actual practice. (See Attachment A.) The template was in draft form at the beginning of the pilot and refined throughout. Later in the year it will be used by labs with teacher research participation programs other than those participating in the pilot as a way of profiling and subsequently considering their own program improvements.

The four laboratories that participated in the pilot were Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Princeton Plasma Physics Laboratory, and Brookhaven National Laboratory.

Observations from the Profiling Process

This report follows the outline of the template.

1. Goals and Objectives

The goals and objectives of teacher research programs were not entirely shared across participants and sponsors. Those stated in the brochure for national teacher research participation programs, TRAC, are:

> To provide outstanding 7th through 12th grade science and mathematics teachers (those whose primary responsibility is to teach science and mathematics) with

professional scientific and engineering experience through summer research at Department of Energy National Laboratories and Energy Technology Centers.

To enhance the leadership skills of science and mathematics teachers.

To increase science and mathematics teachers' awareness and understanding of current science and technology.

To promote the transfer of this knowledge to the classroom.

To offer science and math teachers the opportunity for renewal, revitalization, recognition, and financial reward.

A goal for research experience stated in the DOE 1992 Education Programs Catalog is "to enhance the knowledge and teaching capability of the experienced teacher ."

In addition, laboratories have their own goals. For example, LBL's education center, CSEE, includes in its goals: the promotion of equal access to scientific and technical careers for all students; improving the quality of science and engineering teaching by supporting increased classroom emphasis on the scientific process and frontier science and technology; increasing the number of U.S. students and engineers; and promoting scientific literacy.

The goals of a teacher research participation experience as understood by individual mentors varied widely as well, and thus strongly influence the nature of the project a mentor designs for the participating teacher.

2. Administration

The responsibility for administering teacher research participation programs in most cases lies in the labs' education departments. In three of the four labs the primary responsibility for overseeing the selection of teachers, developing a mentor pool, and assigning of teachers to mentors was done by one person. It was the general pattern that the administrator responsible for the teacher/mentor match also planned pre-program and induction activities and was responsible for monitoring each teacher's experience, helping to make mid-course corrections when necessary, designing regular program interactions such as lecture series or weekly participant group meetings, overseeing presentations and designing follow-up. In one

lab, selection took place at the Associated Western Universities' draft after the responsible person received input from the lab research staff as to which projects would be available. A different person, from human services, took on responsibility once teachers had been chosen and assigned. In laboratories where research participation teachers came under several auspices (national programs, local affiliations such as BASTEC, NYU, or Trenton public schools), all teachers were considered part of a single program no matter what the source of support for their participation in the research experience.

Support for the administration of these programs varied from one laboratory where funds from several sources more than doubled the amount from DOE /HQ, to one where there were virtually no additional funds and therefore little time for an administrator to do more than minimal program oversight.

Some of the laboratories taking part in this pilot study have had teacher participation research programs in place for a number of years (LBL since 1983) and for some this is a relatively new program (LLNL in its third year). Program size ranged from over forty participants to one with nine. The range in experience with teacher research participation programs over time and the number of participants in the pilot reflect the variety throughout the labs as a whole.

3. Assignment

The matching of teacher to mentor is a pivotal piece of the teacher research experience. In some but not all cases it was done by someone with a science background. In all cases a real effort was made to consider the teacher's interests and background in science and/or mathematics when deliberating on available research assignments. The research participation administrator in one lab aimed to assemble a diverse group of research participation teachers and then worked to find promising assignments. In other cases specific research slots guided teacher selection. Assembling a pool of mentors who have time, interest, and ability to talk to teachers at an appropriate level, and who could carve out an eight week piece of research work for a teacher is a challenging job in all laboratories, and one on which hangs much of the

success of a teacher research participation program overall.

There were a range of mentor/teacher ratios and arrangements. While most programs are designed for one-on-one relationships, in one lab a mentor was working with six teachers and in another case three teachers were assigned to work in a single mentor's lab group. For a variety of reasons discussed below, the assigned mentor did not do the primary mentoring but someone else in the lab group took on this role once the summer work began.

4. Preparation

Preparation for the teacher to begin his/her research experience was uneven and ranged from nothing beyond an announcement of the assignment, to several visits by the teacher to the mentor's lab, communication by phone, prelab reading, and development of computer skills that would be needed. Preparation for logistics such as housing also varied and ranged from "fantastic" to "unsatisfactory". In some cases "on campus" housing was available for teachers; at one site there was no laboratory housing for anyone at any time of year, but the Housing Office was well-prepared to help teachers find lodging. In another case, the first year program struggled with having to house teachers.

Despite their best efforts, labs expect that some mismatches will occur. All programs monitor placements and make mid-course adjustments. The generally predictable "shape" of the eight week experience produces something of a dilemma for those in charge of placements; this will be discussed under "Issues for Consideration."

5. The Research Experience

The teacher research experience is intended to include teachers in the work of a mentor's laboratory. For these programs, teachers' awareness of the process by which scientific knowledge is generated is of great importance. This was the emphasis in most programs observed. Aspects of the research process such as working with unknown outcomes, dealing with uncertainties, false starts, new technologies, becoming part of a research team, and

using original literature characterized a teacher's experience with research. The eight week project sometimes limited direct experience with each of these aspects of the research process. Nonetheless, participants who took on a discrete piece of work, the testing of a piece of equipment essential for a larger experiment, for example, were aware of the place of their project in the larger research enterprise.

However, there were other kinds of situations. In one case a mentor helped a teacher design a laboratory exercise for the teacher's classroom at the teacher's request. Another mentor supported a teacher to develop curricular materials in which a scientific concept was described so that youngsters could understand it.

A frequently mentioned outcome of a teacher's research experience was an increased knowledge of career opportunities in technical fields. Teachers were very excited about finding so many applications for the mathematics and science skills they teach.

6. Broader Lab-related Experiences

The teacher research programs exposed participants to multiple aspects of the work of the laboratories. Opportunities ranged from weekly lab-group meetings in which working groups reported to each other for the purpose of sharing the pieces of the whole, a seminar or lecture series, to visits to various labs. Many teachers expressed their desire to stay as close to their research experience as possible. While they valued scientific lectures and seminars, they stated that they did not want to be pulled away from their research to discuss teaching while they were at the lab.

7. Follow-up

Time after time research program participants said they wished they could return to their laboratory for a second year. This is not possible for the majority of teachers, although some do return to "their" lab under different sponsors and funding sources.

Some follow-up activities are in place. For example, LBL's Quarterly Report is sent to all participants, mentor-teacher relationships are often sustained, mentors may visit a teacher's school or classroom during the year, and teachers take courses, attend lectures, use the library, and bring their students to visit the laboratory. Obviously many of these follow-up activities are only accessible to teachers who live and work near the laboratory site. For those teachers who live in other parts of the country and distant from any research facility, generally such possibilities do not exist.

In 1992 a follow on award of $250 to extend the work of the summer to the classroom was available to each TRAC teacher who submitted an application. These projects have anticipated outcomes and will be measured.

The nature and extent of follow-up is, of course, dependent on goals. It appears that goals that focus on teacher knowledge up-dating and revitalization may well be able to be achieved through a one-time research experience, more so perhaps than goals dealing with classroom change and student impact. At present teacher research participation programs overall lack specific components designed explicitly to carefully bridge the teachers' experiences to those of students in their classrooms, although in some cases discussions of transfer took place during weekly meeting times toward the end of the eight week experience. Decisions about goals will influence the design of follow-up activities.

Issues for Consideration

This section of the report highlights issues concerning teacher research participation programs that need to be addressed by the labs and by DOE/HQ.

1. In order to conduct a valid and useful evaluation of DOE programs, the issue of goals needs to be addressed first. Goals for teacher research participation programs are multiple and continue to lack clarity :
   - between HQ and the labs
   - among the different labs

- among different mentors within the same lab.

Evaluation of DOE's teacher research participation programs depends greatly on the degree of agreement about goals. There are three options: (1) the goals are explicitly the same for every institution and individual; (2) individual teacher research programs are evaluated individually according to their own idiosyncratic goals; or (3) there are some core goals shared across all labs with divergent ancillary goals that vary from site to site and among the participants. A choice among these three alternatives must be made by DOE/HQ and the labs; evaluators cannot make this choice.

2. The administration of teacher research participation programs influences the quality of the experience for teachers. This pilot study suggested that when the program is housed primarily in the education department and was in the hands of one person or office, the experience of participants was a better one overall. When DOE resources were augmented by additional funds and when teacher research participation programs were part of the overall education efforts of a lab, the quality of the program benefitted. Where there were no resources to support a person who could attend to teachers on a day-to-day basis by organizing weekly get-togethers or monitoring the progress of the research placements, participants experienced more isolation and problems with their research experiences.

3. Staff from the labs reported that there is a fairly predictable pattern to the eight-week teacher research experience. It begins with a period of induction to the research laboratory and process which participants describe as "scary", "overwhelming", "frustrating". Mentors report that teachers assigned to them often lack computer skills, and scientific and mathematical background essential for work in their labs. A considerable amount of time is spent equipping teachers for the work, often two or three of the eight weeks, and up to six or seven weeks. In the worst cases, the induction period is prolonged by such logistical problems as the lack of availability of computers or manuals for use of computers or laboratory instruments.

Some of the anxiety and frustration is inevitable and many teachers reported that one of the

best parts of the experience was facing the challenge and successfully meeting it. However, the time it takes for a teacher to gear up for work can be shortened when preplanning and preparation include conversations between mentor and teacher, when necessary skills are described in time for a teacher to review Fortran, for example, or to read articles relevant to the work of the lab, and when mentors can design a research problem with a teacher's interests and skills in mind. Perhaps greater awareness by all participants of the "developmental process" itself would stimulate both mentor and teacher to seek ways to expedite the induction into the research.

4. Mentor preparation for the assignment varied greatly. There were mentors who understood well the factors that contributed to a successful research participation experience for a teacher, and who insured that these conditions were met. Some assigned mentors were not prepared at all. In the worst cases a teacher was left on his/her own to find help somewhere in the lab and the helpful person was entirely unprepared as well.

Mentors took on the role for many reasons, including "it's my patriotic duty", "I believe each of us should do something to improve education and this is what I can do", "I am paid to do it, it's my job", or "it's a good way to get free help." Mentors acquire their roles in various ways. In many cases it is a post-doctoral student or technician in a lab who actually spends the most time with a teacher. Frequently these surrogate mentors, although earnest and helpful, are not sure what the goals of the experience are. In one case a mentor believed his job was to help the teacher design a laboratory that could be used in his high school biology course and this became the research agenda. When assigned mentors must be away, a frequent occurrence during the summer, teachers may be left to fend for themselves (this was reported to happen in one case). A better outcome occurred with careful planning between mentor and teacher, and assignment and preparation of a surrogate. A high quality experience for all cannot be assured unless mentor preparation occurs, and mentor/teacher communication is monitored before and after the arrival of the teacher at a lab.

5. We discovered three types of research assignments: a piece of the on-going research of the mentor; a project outside of the mentor's primary research but of interest to the mentor;

and an assignment designed for the purpose of taking something back to the classroom. The latter type approaches a curriculum design program rather than providing professional scientific and engineering experience through research, and so should be considered outside the range of appropriateness. Whether or not the other two types are equally acceptable needs to be discussed and established by either individual labs or across all labs. Research scientist mentors play an important role in such discussions. Connection of a teacher's research assignment to the specific work of a particular lab would capitalize on the unique qualities national research labs have to offer teacher research participants.

The issue of whether teachers work singly or in groups in a lab is less important than the nature of the work that they do. We saw teachers having equally good experiences in one-to-one assignments and in situations where several teachers were assigned to the same lab group.

6. The promotion of transfer of a teacher's renewed awareness and understanding of current science and technology back to the classroom is a stated objective of teacher research participation experiences. If programs are intended to promote this transfer and not leave it in the hands of each teacher to make happen, there are issues for the design of the summer experience. A reinvigorated teacher with renewed zest for teaching science and mathematics is a boon to any classroom; research summers can be instrumental in keeping some of the country's best science and mathematics teachers in schools (which certainly translates into benefits for students).

However, it is also important that current science, math and engineering content of the research also reaches students. Materials such as slides, overhead transparencies, readings, photographs and first-hand accounts of the work of researchers can improve instruction for students, by giving them a feeling for the application of science to real world questions and problems and the current "cutting edge" of the knowledge base.

But the *content* of a teacher's research experience is only one piece to transfer. More lasting, perhaps, than pieces of research information is a classroom that a teacher transforms

so that the work students do reflects the process of developing scientific knowledge. We observed that while many teachers could vividly describe exactly what had engaged them in the research agenda so forcefully, they were unable to see in the short term how they could provide a classroom where similar kinds of teaching and learning could occur.

Several teachers recognized that if students were to learn by making mistakes, it would take more time and "I will have to do fewer labs." The press of assessments, syllabi, course topic requirements, lack of equipment and support for change from their supervisors and colleagues left teachers not knowing how they would solve the "less is more" dilemma.

> "The curriculum is so crowded that I will have to tell them. My students don't have time figure it out for themselves."

However, teachers we interviewed who managed to return for a second or third summer could document the history of instituting changes in their teaching. Examples of processes that they had introduced in their classrooms are: the use of teamwork in solving problems, repetition of procedures for verification, learning to live with uncertainty, deciding when enough data has been accrued for decision-making, time given for trial and error, asking questions where the answer is unknown, and designing and building instruments that do not ordinarily exist in the classroom.

> "My students now work in teams. One thing I learned from my research team at the lab is the contribution of the divergent thinker. In my class I value everyone's comments more and my students are more willing and more comfortable to hazard a guess".

> "My ideas have melded together over a while. I have been injecting my ideas into my courses. Now I do things like have four students work on a lab together and hand in one report with four names on it. Or I give three identical exams and one answer sheet to a group of three students."

> "I am no longer a textbook teacher. I cut [illegible]se of textbooks by 50% and replaced it with articles and real, hands-on experien[illegible] students. We do group projects without a textbook at all. The kids do actual research; they go down to the river to study water quality and incubate and hatch eggs, for example."

Explicit bridges should be designed for teachers to incorporate their "life-changing"

experience into programs and practice that allow their students the very same possibility for life-change in science and mathematics classes. These bridges can be introduced and encouraged during the teachers' time at the lab, yet veteran DOE staff and participant "alumni/ae" agree that few teachers are ready or interested in addressing how the summer experience can be incorporated into their classrooms while they are involved in their research. This usually changes when they have completed their research and returned to their schools. This gives follow-up a particular significance.

"Best practice" says that to capitalize on the summer's experience for the purpose of sustaining gains in knowledge, revitalization, or expanded research skills, follow-up is necessary.

Recent reports and recommendations from organizations such as American Association for the Advancement of Science, the National Center for Improving Science Education, the National Science Teachers Association, and the National Council for Teachers of Mathematics urge that teaching and learning as it occurs in many if not most classrooms be transformed. Programs aimed at strengthening teachers imply that their students will study in changed classrooms aimed at higher achievement and increased participation in the world of science and technology. Teachers with a research participation experience should be more likely to teach in a way that models the process of acquiring scientific and mathematical knowledge. Their students should be exposed to, taught and allowed to practice practical laboratory skills, scientific thinking skills, generic thinking skills and habits of mind that undergird science and mathematics. A single research experience, albeit eight weeks in length, in most, if not all cases, requires follow up if a teacher is to dramatically change his or her classroom.

Many teachers report that a major impact of research participation is the realization that science as practiced in the lab is multidisciplinary and calls upon and integrates knowledge from many content fields. Knowing how to create a computer model by itself is not useful, but as a way of understanding how matter behaves in a reactor, it becomes valuable. A good, if unintended, outcome from experience in research labs could be teachers who are more

receptive and ready to use new curricula and to present science in an interdisciplinary way when they return to their schools.

As research participation programs now exist and as their goals and objectives are stated and understood, accountability for the content and pedagogy of participating teachers in their classrooms lies outside of the laboratories. This is not to say that education department staff who work with teacher research participants should not care about and address transfer of knowledge. Indeed, they should and they do. By all accounts eight weeks is just-sufficient time to complete a teacher's research agenda. If DOE/HQ and the labs agree that transfer of content knowledge and the research process is a required outcome of teacher research participation programs, then program redesign must occur to meet this responsibility. Implicit in programmatic redesign would be additional support for such an initiative, as well as consideration of factors beyond the control of the laboratory that may inhibit success.

7. Follow-up is an area that all labs agree needs to occur to sustain the revitalized, recharged, reeducated teachers and to give the probability of transfer a better shot. Follow-up, of course, depends on goals. If it is an explicit goal of the teacher research participation programs to make a difference in the participating teacher's classroom, then some means of follow-up is required. This is clear from both research and practice.

The availability of $250 to buy or make equipment, computer programs, or to link their research to their classrooms is a way all teachers can build on their research experiences. With these extra resources teachers can develop labs or introduce some tools of research for student use.

Interviews with both mentors and teachers indicated that teachers who live close to "their" lab benefitted from and took advantage of possibilities for follow-up during the year. Many stay connected to their mentor, take courses, bring their students to the lab for lectures and use of the library. A greater investment in regional or local teachers would facilitate follow-up, but at a cost to those who live far from labs or other research facilities. Several teachers from rural areas lacking proximity to a research facility sought ways they might communicate

long-distance via technology. It was suggested that follow up might occur on a regional basis even for national teacher research participants.

Many teachers and mentors advocated for a second summer in the research laboratory, expecting that the teacher could pick up where he/she left off and be productive from the outset. When asked whether they would repeat the experience, a majority of teachers answered in the affirmative. Most mentors said they would do it again, with some reservations. Whether to invest more heavily in fewer teachers is a big question, one that is dependent on program goals and objectives as well as the laboratories and DOE's stated educational missions.

TEMPLATE FOR
TEACHER RESEARCH PARTICIPATION PROGRAMS

Development Facilitated by
The National Center for Improving Science Education

With a Grant from
The United States Department of Energy

January 1993

Purpose

Significant investments of time, energy, and resources are currently being made in a wide variety of programs whose aim is to improve education. The Department of Energy is one such investor, with the mission of improving student learning in mathematics, science, and engineering technology through the enhancement of teacher knowledge and skills. A wide variety of programs are currently being funded by DOE that target precollege education, providing unique learning opportunities for both students and teachers. How good are these programs? Is the funding being invested wisely? What adjustments could be made to better use the available resources and, as resources shrink, where should the cuts be made?

In order to address these important impact questions, a prior question must be answered: What is actually happening in the programs? Without the answer to this question, it is impossible to know what it is that is causing either positive or negative learning outcomes. Likewise, it is impossible to know what to change for the purposes of improvement. The following template was developed as a tool to help answer this question.

The template has an additional purpose as well. Instead of allowing only for the description of a program, it also allows for comparison of that program to best practice. The template identifies what research and experience identify "what works" -- elements that, when part of a program's design, should enhance its effectiveness. Therefore, the template can also help answer another important question about the program: To what extent does it reflect best practice? Addressing this question helps program developers and managers identify components of their programs that could be the focus of improvement.

The template is thus a formative evaluation tool, as well as one of several instruments needed to evaluate the impact of a program. It is the key tool used in the first phase of evaluation of Department of Energy precollege education programs -- called Program Profiling -- and one of several data collection tools used in the second phase -- Impact Assessment.

Anatomy of a Template

The template provides a format for profiling a program as it reflects best practice. It is formatted in three columns. The first column lists Components of Effective Practice, as determined by its developers from research and experience. The components are concisely worded, as appropriate to this kind of a tool, and some may find they need clarification and/or elaboration. For this purpose, an annotated reference list is attached to the template, and the components are footnoted as to which reference provides the supporting information.

The second column provides the opportunity to describe the program as it is designed to work, i.e., the Intended Program. The third column, then, is used to describe what actually happens when the program is functioning, the Actual Program.

Information from these columns can be used to address the following questions:

1. What is best practice for these types of programs?

2. To what extent is the program designed to reflect what is most effective?

3. To what extent does the program in place reflect best practice?

4. To what extent is the program's design actually carried out?

5. Where are the gaps? What can be improved? What is beyond our control?

The last page of the template provides the opportunity to describe additional characteristics of the program and of its participants that may have an impact on its effectiveness. For example, certain program characteristics may work differently with different teachers (e.g., elementary vs. secondary, experienced vs. novice, teachers of advanced classes vs. general classes), or with different Lab characteristics (e.g., hands-on vs. theoretical, highly technology-based vs. limited technology).

Particularly important for the Department of Energy programs is the description of the unique competencies, facilities, personnel, and other attributes that each program offers to its participants. This is critical to DOE's acceptance, and, indeed, welcome, as an important player in the education of young people in the areas of science, mathematics, and engineering technology. The competencies and capabilities listed here can then be cross-referenced with other parts of the template where they are mentioned. For example, for Teacher Research Participation programs, the question can be asked as to whether teachers' research assignments are truly taking advantage of the Lab's facilities or are really part of the "frontier science" being conducted at the Lab.

Development of Templates

The templates for Department of Energy programs have been developed collaboratively, with the National Center for Improving Science Education playing a lead role, but with full participation from precollege education program managers and staff from DOE national laboratories and other facilities. Early in the collaboration, it was determined that there was such a variety of programs that more than one template would be necessary to capture their important features. Several program types were identified in the first discussion -- teacher research participation programs, teacher development programs, student programs, systemic programs, and special programs -- and it was decided that over the course of three years, a template would be developed for each.

Template development begins with searching and reading the literature on each program type, focusing particularly on what research and practice indicate to be components necessary for such programs to be effective. During meetings of DOE and Lab staff, readings (mainly syntheses) selected by the Center were discussed and components of effective practice identified through small group work. Center staff combined the work of groups into a draft template and circulated it for review.

It is important to note that some of the program types have not been studied carefully to date, and so some components on the templates are there based largely on the experience of program staff. This is viewed as an opportunity to add to the knowledge base on effective practice; the components listed are being tested for their effectiveness during the evaluation effort.

Once drafted, the template was piloted as the primary tool for profiling DOE programs across the Labs. The first template developed and piloted was for Teacher Research Participation programs. Four Labs where such programs were being conducted were selected for the pilot study using a set of criteria developed collaboratively. Center staff read descriptive material about each Lab's Teacher Research Participation programs and made site visits during which program staff, teachers, and mentors were interviewed and observed. A template was filled out profiling each Lab program; at the same time, refinements were made in the template.

Based on learnings from the pilot of how best to use the template to profile programs, the final draft of the template was then used by all Labs to profile their own Teacher Research Participation Programs. A summary of the profiles will be compiled by the Center once that profiling is completed.

This same process will be used to develop, pilot, and then put to use the template for each program type.

Guidelines for Use of the Template

There are many ways that profiling can be done, depending on the situation. The more people involved, the more this activity can resemble a staff development activity. For example, staff and participants in a program might be asked to complete the template and form discussion groups to share their observations, experiences, and impressions. Or a smaller group of those involved might do the same.

Another option is for program managers to select and interview people; a better option would be for program managers to form a small evaluation team representative of the different roles who then select and do the interviews. A final option is to have someone from outside the program do the profiling.

It is important that data be gathered from people in every role (e.g., program staff, teacher participants, other key participants) and from more than one person in each role. The more people, the fuller the picture.

There is no structured protocol (e.g., 20 questions) for use by those doing the profiling. They must instead be guided by the information they know they need to acquire for completion of the template. Interviews, observations, and document analysis should be approached in such a way as to achieve this.

Here are some guidelines Lab staff are given for gathering information to complete the template:

1. Review all program materials carefully. There are places in the template that ask for goals, for a description of materials sent to participants, for specific follow-up activities, etc. These artifacts are important pieces of information.

2. A general note about interviewing: Try to use open-ended questions whenever possible. When you interview you want the interviewee to do as much of the talking as possible;

3. Interview program developers and managers, with a special emphasis on how they have designed the program. Whet key elements do they think are important? How have those played out? What's actually happening? What's been particularly successful and what less so? How have they changed the elements over the years and why? If they don't mention the specific components from the template, ask them. Be sure to get the descriptive and context information listed on the last page.

4. Interview program participants (teachers, mentors, etc.) to learn what their experiences have been. What seems to be the most important elements of the program? What hasn't worked? How does this kind of experience differ from other

professional development programs they've been involved in? If they don't mention the specific components from the template, ask them.

5. Observe whenever possible to get a sense of the environment, the people, the work, the interactions, the facilities,and stories. Ask people about what you observe to enhance the quality and quantity of information.

Summary of the Profiling Process

Analyze and synthesize the data about your program in a way that is most useful for considering program improvements. At minimum, complete a template that reflects your program as it is intended and as it actually occurs. Where data conflict, e.g., reports of a given component vary, depending on the interviewee, consider that useful information. Ask the questions, in comparing columns on the template:

- to what extent does the design of our program reflect best practice?
- to what extent are the components of our program actually implemented?
- to what extent does what is happening in our program reflect best practice?
- to what extent does our program take full advantage of the unique capabilities of our lab?
- should we consider any changes in our program, given our goals and constraints?

TEMPLATE FOR TEACHER DEVELOPMENT

JANUARY 1993

NAME OF FACILITY OR PROGRAM:

NAME OF PERSON COMPLETING TEMPLATE:

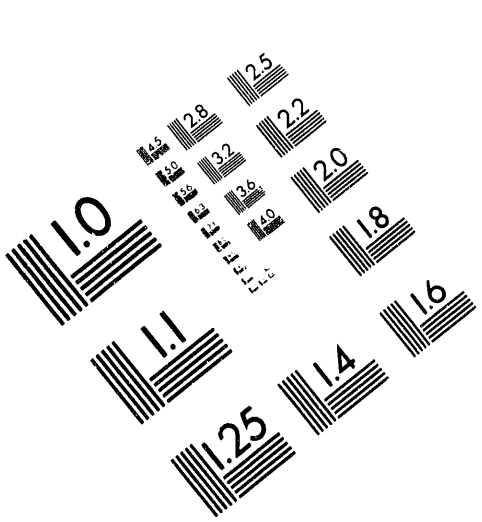
DATE:

Components of Effective Practice	Intended	Actual
1. Program Administration		
a. articulates clear program goals that are understood by all		
b. is clearly assigned as the responsibility of one or more persons		
c. includes teachers, scientists, educators, and administrators in program design		
d. creates collegial atmosphere		
e. ensures effective pre-program interaction		
f. ensures effective program follow-up		
g. communicates with and reports regularly to DOE		
h. maintains database of participant information		
i. establishes relationship with teacher's school/district		
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"		

Components of Effective Practice	Planned	Actual
b. a "hands-on/minds-on" instructional approach that includes investigation, discovery, and application		
c. emphasis on depth (fewer concepts and skills) rather than breadth		
d. balance between science content and process		
e. ongoing, authentic assessment of important learning outcomes		
f. materials, strategies, and perspectives sensitive to diverse cultures, languages, and learning styles		
3. Teacher Development Program Activities		
a. are appropriate for adult learners		
b. model teaching principles and strategies that can be transferred to the classroom		
c. are hands-on, allowing teachers to actively construct knowledge		
d. include the use of tools, methods, and processes of scientists		
e. immerse teachers in the scientific process		
f. include actual or simulated problems or challenges of "real world" science		
g. are designed so teachers learn cooperatively in small groups		
h. include opportunities to practice new classroom behaviors or strategies		

Components of Effective Practice	Planned	Actual
i. include opportunities for teachers to plan for use of new knowledge and skills in their own classrooms, with their own curriculum		
j. include opportunities for teachers to work together as they learn and plan for transfer to their individual classrooms		
4. Uniqueness of the Laboratories 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. the work being done (frontier science), both in the particular lab and in other DOE facilities, is the focus of teacher development activities		
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		
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		
6. Teacher Leadership and Responsibility		
a. teachers take on leadership responsibilities in aspects such as program development, delivery, implementation, follow-up, and spread to other colleagues		
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		



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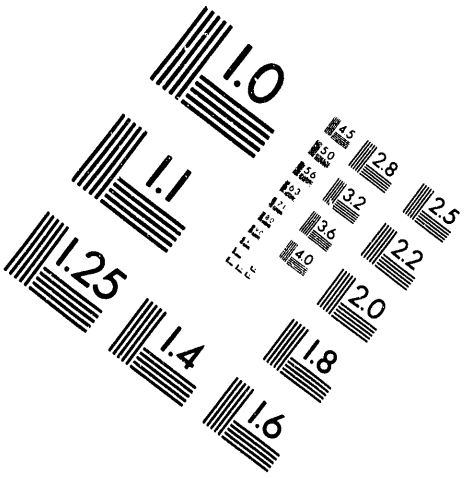

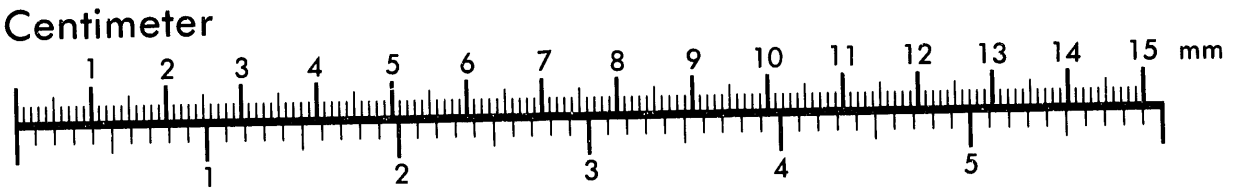

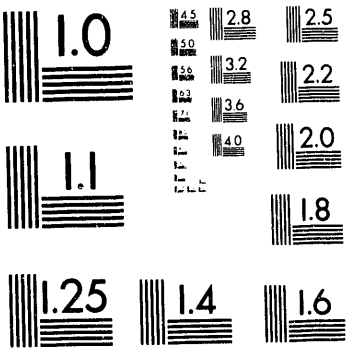

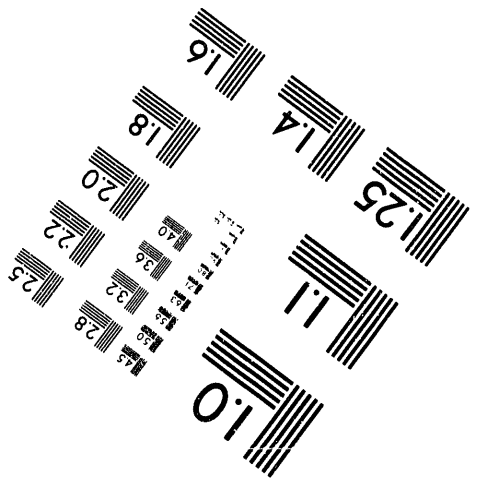

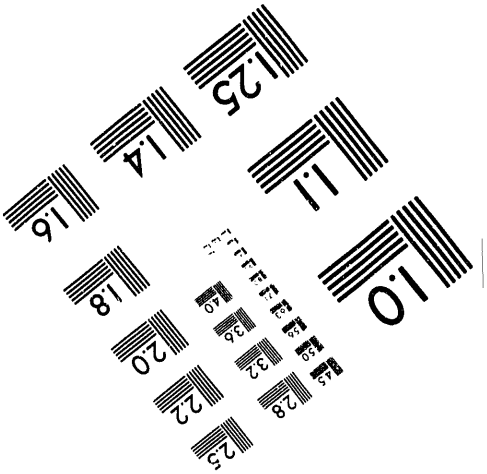

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Components of Effective Practice	Intended	Actual
d. there is long-term commitment and support -- including material, moral, logistical, technical, and symbolic -- from the laboratory, or as a result of arrangements made by the laboratory from the school or community		
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		
b. ongoing formative and summative evaluation of important program outcomes involves data collection from a variety of sources, with resulting changes in program design		

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:

   _____ urban
   _____ suburban
   _____ rural

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

4. Level:

   ☐ elementary
   ☐ middle/junior high
   ☐ high school

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

TEMPLATE FOR TEACHER RESEARCH PARTICIPATION PROGRAMS

JANUARY 1993

NAME OF FACILITY OR PROGRAM:

NAME OF PERSON COMPLETING TEMPLATE:

DATE:

Components of Effective Practice	Intended	Actual
1. Program Administration		
a. program goals are clearly stated and understood by all		
b. clear assignment of responsibility for program administration		
c. trouble-shooting mechanism ensures careful monitoring of mentor/teacher relationship[1,2]		
d. encourages applications of teachers from groups underrepresented in science, math, and technology fields		
e. creates collegial atmosphere[2,3]		
f. ensures pre-program interaction of Lab and mentors with participants[1]		
g. plans carefully for housing and other logistics (e.g., transportation, information about the community)		
h. ensures effective program follow-up[1,2,3]		
i. communicates with and reports regularly to HQ		
j. maintains database of participant and mentor information		
k. selects teachers for compatibility with Lab mission and mentor specialization and work style		

Components of Effective Practice	Intended	Actual
2. Teacher Assignments		
a. done by individual(s) with science background		
b. relate directly to the core competencies and ongoing work of the Lab		
c. match backgrounds and research interests of the teacher		
d. mentors are carefully selected to have time, interest, ability to talk to teachers at appropriate level[2,3]		
e. mentors are inducted into the role and supported throughout the experience[2]		
f. mentors are available or arrange for equally or more suitable substitute(s)[1]		
g. mentors are involved in a mentor/teacher ratio that allows daily interaction and support[1]		
h. there is early correction of mismatches		
3. Preparation		
a. teachers are oriented to their role and the Lab's working environment[2], and to the Department of Energy/Lab mission and competencies		
b. teachers have clear expectations of what the experience will involve[1,3]		
c. mutual expectations are established in advance through mentor/teacher direct contact[1]		

Components of Effective Practice	Intended	Actual
d. mentors suggest readings and other pre-work accessible to teachers before arrival		
e. facilities and working conditions required by teacher to do the assigned research are identified and are prepared in advance		
f. teachers receive advance communication about housing and other logistics		
4. The Teacher's Research Experience[1]		
a. the research relates to the Lab's mission, unique capabilities, and core competencies, including • applied and basic technologies • integration activities • product realization		
b. is integral to, or a spin-off of, mentor's ongoing research		
c. research has an unknown outcome, but the experience has a definable end point or output for the teacher		
d. has been carefully designed for success with respect to teacher capabilities, time constraints, technology capability		
e. includes elements of the research process, such as designing experiments, creating mathematical models, collecting, analyzing, and synthesizing data[3]		
f. incorporates the research process, with uncertainties, false starts, loose ends[3]		

Components of Effective Practice	Intended	Actual
g. involves technologies new to the teacher		
h. involves the original literature		
i. involves presentation of results to peers (scientists and teachers)		
j. makes the teacher part of the research team, modeling the interdependence of team members		
k. provides opportunities for updating their knowledge and skills[2]		
l. allows them to be treated as research colleagues[2]		
5. Broader Lab-Related Experiences		
a. broad exposure to multi-disciplinary scientific topics central to the mission of the Lab[3]		
b. regular participant meetings/have opportunities to interact with other teachers and scientists[1,2]		
c. exposure to a variety of scientific and technical careers		
d. receive specific assistance and suggestions for transferring both the process and content of the research experience to the classroom[1,3]		

Components of Effective Practice	Intended	Actual
6. Follow-up a. create mechanisms to encourage teachers to continue to communicate with Lab, mentor, and scientific and academic communities after the experience; teachers have continued access to resources and information b. receive appropriate recognition from Lab and program administration[2] c. Lab encourages recognition of teacher by school and district[2] d. receive advice and support for external presentation of research results[1] e. receive advice and encouragement for sharing Lab experience and educational spin-offs with educators and community, and for encouraging other teachers to apply[1] f. receive advice and support for assuming leadership positions in district/ professional associations[1,3] g. receive support for extending experience to the classroom during school year[1,2,3]		

Components of Effective Practice	Intended	Actual
7. Program Evaluation a. monitoring during research experience, which may include someone assigned the responsibility, group discussions of "how it's going", regular contact by program administrators with teachers and mentors individually[1,2] b. opportunities for structured input by teachers and mentors during and after the experience, which may include regular survey questionnaires, ongoing evaluation team of administrators and selected teachers and mentors, participant interviews, written report of strengths and weaknesses of the program at completion and of impact at half, one, and two-year intervals[1,2] c. attention by program administrators to results of evaluation, with demonstration of resulting changes made in program[1]		

DESCRIPTIVE AND CONTEXT INFORMATION

Program Characteristics

1. Stated goals:

2. Number of teachers (national/regional/local):

3. Number of years teacher can participate:

4. Nature of academic year follow-up:

5. Remuneration received by teachers:

6. Major content focus of teacher research projects (e.g., biotechnology, high energy physics, nuclear medicine):

Lab Characteristics

1. Special facilities:

2. Unique capabilities or attributes:

3. Core SMET competencies (i.e., applied and basic technologies, integration activities, product realization):

Teacher Characteristics (give breakdown across programs)

1. Education in scientific discipline (major degrees)

2. Gender

3. Race, ethnicity

4. Years of teaching experience

5. Research experience

6. Computer knowledge/experience

7. Courses currently teaching

8. Student ability level

9. Community type (urban/suburban/rural)

10. Community wealth (high/middle/low SES)

11. Non-public vs. public school

12. Percent minority [high (80%+)/mid/low(20%)]

References to Research and Best Practice
for
Teacher Research Participation Template

1. Gottfried, S. Brown, C., Markovits, and Changar, J. (Undated) "Scientific Work Experience Programs for Teachers: A Focus on Research-Related Internships." Unpublished Manuscript.

   Found five factors related to effective implementation of a research internship program: (1) mentors, project staff, and teachers share goals and expectations, have open, frequent communication; (2) teachers have articulated project or research assignment; (3) curriculum development component facilitated by expert, focus on process rather than product; (4) follow-through with implementation and dissemination at regional, national, and local levels; and (5) multiple methods of ongoing evaluation.

2. Loucks-Horsley, S., Harding, C., Arbuckle, M., Murray, L., Dubea, C., and Williams, M. (1987) Continuing to Learn: A Guidebook for Teacher Development. Andover, MA: The Regional Laboratory for Educational Improvement of the Northeast and Islands.

   A synthesis of research and best practice on teacher development (especially Chapter 2), this book includes a rationale for the importance of (1) understanding the process of engaging in a new experience and sensitivity to teachers' concerns and needs; (2) recognition; (3) explicit connections to use of new ideas and materials in the classroom; and (4) the unfolding of an experience over time and the key role of follow-up.

3. National Center for Improving Science Education (1989, 1990, 1992) Developing and Supporting Teachers for Elementary School Science Education, Developing and Supporting Teachers for Middle Grades Science Education, and The High Stakes of High School Science. Andover, MA: Author.

   These three books draw from research and best practice to directly address attributes of programs which focus on improving the knowledge, skills, and teaching strategies of science teachers.

APPENDIX C:

Teacher Surveys
("Entry", "Exit" and "Follow-Up")
12/21/92 Draft

Impact Assessment Design for
Teacher Research Participation Programs

Participant Information Sheet

Last four digits of your social security number __ __ __ __

[This question addresses the issue of anonymity. According to Weiss (personal communication), using the SS# preserves some measure of anonymity while allowing for more in-depth analysis, especially statistical analyses. In addition, the literature on surveys suggests that unless the questions are extremely controversial it is likely respondents will answer truthfully (e.g. see Borg and Gall, 1983).

Which facility offered your program? _____

[Track what, if any, outcomes are facility-related e.g. offer specific transfer seminars or activities.]

Date _____ _____ _____
month day year

[For tracking purposes.]

1. Which best describes the location of your school? (Circle one)

Rural
Urban, but not inner city
Urban, inner city
Suburban

[This addresses the question of which population is being served.]

2. Is this school: (circle one)

public private

[Same as above.]

3. What is the approximate ethnic composition of your school?

American indian or Alaskan native	____%
Asian or Pacific Islander	____%
Hispanic (regardless of race)	____%
Black (not of Hispanic origin)	____%
White (not of Hispanic origin)	____%
Total	100%

[Same as on the Weiss version--we can compare to the national survey. This question addresses Goal 9.]

4. What is the approximate socio-economic composition of your school?

At or below the poverty level	____%
Low income	____%
Middle income	____%
Upper-middle income	____%
High income	____%

[This question addresses Goal 9.]

5. What grade level(s) do you currently teach? (Circle all that apply.)

K 1 2 3 4 5 6 7 8 9 10 11 12

[Shortened version of questions on other surveys--purpose is to get information on participant demographics]

6. How many of the following classes do you teach each day? (Fill in blanks or each subject taught.)

	Number of Classes	Total Number of Students
Science classes	_____	_____
Mathematics classes	_____	_____
Technical/vocational classes	_____	_____
Other subject classes (subject _____)	_____	_____

[Demographics. Note: it is unclear to us the extent to which technical/vocational teachers are participants in the TRAC program. Many technical/vocational-type classes are springing up all over the country. For example, in New York State "shop" is now "Technical Education" which is not just a name change but a change in focus.]

7. How many years have you taught the following? (Fill in the blank for all that apply.)

All levels, all subjects _____

Science _____

Mathematics _____

Vocational/technology _____

[Demographics. It is unclear to what extent this will have anything to do with anything. The literature varies all over the place on the effects of teaching experience on teaching practice.]

8. Which of the following best describes the ability of the students in your classes? (Indicate how many classes you teach in each category.)

Fairly homogeneous and low in ability _____ classes

Fairly homogeneous and average in ability _____ classes

Fairly homogeneous and high in ability _____ classes

Heterogeneous, with a mixture of two or more ability levels _____ classes

[May affect the extent to which teachers can implement research practices in the classroom. Is exactly like an item on the new Weiss survey so can use for comparisons.

[These questions--9 through 11--are best used for the Application Questionnaire. They will be used in this questionnaire for the Evaluation Pilot Study.]

9. What is the highest level of education you have earned? (Circle one degree and number of credits you have earned beyond that degree where applicable.)

B.S. B.A. B.Ed. +30 +45 +60

M.S. M.A. M.Ed. +30 +45 +60

Ed.D. Ph.D. Other, please specify _____

[Demographics.]

10. In what field(s) did you have a major or minor at the undergraduate level? (Check all that apply.)

	Major	Minor
Mathematics	____	____
Computer Science	____	____
Physical Sciences	____	____
Chemistry	____	____
Biological Sciences	____	____
Earth/Space Sciences	____	____
Education	____	____

Other, please specify _____

[Demographics--after the new Weiss survey so can compare with national demographics. This question is different than on the Weiss survey in that it doesn't delineate the different types of education degrees.]

11. In what field(s) did you have a major or minor at the graduate level? (Check all that apply.)

	Major	Minor
Mathematics	____	____
Computer Science	____	____
Physical Sciences	____	____
Chemistry	____	____
Biological Sciences	____	____
Earth/Space Sciences	____	____
Education	____	____

Other, please specify _____ (Circle One: Major Minor)

12. Rate each of the following in terms of its importance for effective science/mathematics/technology teaching. Answer for the subject (science, mathematics, technology) you spend the most time teaching.

(Circle one on each line.)

		Should definitely not be included.....		Makes no difference		Should definitely be .....included
a	integration of science/math/technology	1	2	3	4	5
b	application of science/math/technology in daily life	1	2	3	4	5
c	societal issues related to science/math/ technology	1	2	3	4	5
d	collaborative/cooperative learning	1	2	3	4	5
e	use of computers as an integral part of instruction	1	2	3	4	5
f	discussions of careers	1	2	3	4	5
g	writing about science/math/technology	1	2	3	4	5
h	use of (scientific equipment/instruments)	1	2	3	4	5
i	students conduct independent research projects	1	2	3	4	5
j	study of the nature of science and scientific inquiry	1	2	3	4	5
k	emphasis on mathematical reasoning	1	2	3	4	5
l	emphasis on fewer concepts (depth versus breadth)	1	2	3	4	5
m	concrete experiences before abstract treatments	1	2	3	4	5

[This set of questions is directly related to the redefined goals and outcomes for Teacher Research Participation (TRP) programs. Several items are repeats of items on the new Weiss survey to use in comparison with the national survey. Many are from the DoE '90-'91 survey. All are related to best science practice and what can be expected as outcomes from TRP programs as described in the NCISE report on these programs. The purpose of this question is to try to understand teachers' beliefs about these practices. According to latest research on teacher beliefs, Pajares (1992), individuals' beliefs strongly affect their behavior. Therefore, these questions may give us a good idea of the likelihood that teachers will actually engage in these practices.]

Comments per item:

a--Outcome .10; Question 20D. of DoE "Entry" survey (Ques 20 asks about how often teachers use the techniques listed.)

b--Outcome .13; new Weiss survey

c--Outcome .13; (societal issues as well as relevance , such as "daily life" in the above question, are stressed in the science education standards)

d--Outcome .10; Weiss has "cooperative" learning but since "cooperative learning" is a specific kind of group work, it seems important to also refer to collaborative learning since we want to know about the broader issue not specifically cooperative learning.
e--Outcome .9; computer use is an important aspect of many participant's experiences in the programs.
f--Goal 8; DoE Question 20G but the question specifically refers to counseling students in careers.
g--Outcome .7; similar to DoE Question 20C.
h--Outcome .9; attempts to go beyond "hands-on" to ask specifically about the role of equipment.
i--Outcome .7; of questions 14 to 19 on the DoE "Entry" survey, a question about how many students completed independent research projects was the only one with a difference in means between the entry and follow-up. This could prove to be an important question, i.e., if beliefs or attitudes about including independent research projects changes even if from 3 to 5.
j.--Outcome .7; has to do with appreciating scientific endeavor as a topic in itself versus always related to a specific topic.
k--Outcome .10; part of NCTM standards and part of Horizon survey
l--Outcome .10; perhaps more than anything else "depth versus breadth" is the hallmark of curriculum reform in science
m--Outcome .7; basic philosophy for new instructional/learning models recently developed

What else do you think is especially important to include that is not listed above?

13. How often do you require your students to participate in each of the following? Answer for the subject (science, mathematics, technology) you spend the most time teaching.

1=Never, 2= Rarely (perhaps once or twice a semester), 3=Occasionally (perhaps once a month), 4= Frequently (perhaps once a week or so), 5=Often (almost every day)

		(Circle one on each line.)				
		Never	Rarely	Occasionally	Frequently	Often
a	work in groups	1	2	3	4	5
b	complete joint or group projects	1	2	3	4	5
c	complete individual projects	1	2	3	4	5
d	do library research	1	2	3	4	5
e	listen and take notes during presentation by the teacher	1	2	3	4	5
f	give oral reports or presentations on their work	1	2	3	4	5
g	use a science/mathematics textbook to do assignments in class	1	2	3	4	5
h	engage in out-of-class activities (including fieldtrips)	1	2	3	4	5
i	watch a teacher-lead demonstration of a science/math/technology principle	1	2	3	4	5
j	do hands-on activities	1	2	3	4	5
k	use a computer or computer-based technologies (e.g. interactive video, telecommunications)	1	2	3	4	5

What else do your students participate in *frequently* that is not listed above?

[These questions are related to those items in Question 12--differences between what they believe and what they actually do may have to do with constraints, which are addressed in Question 15, below. These questions are similar to DoE items and Horizon survey items. Again, all these items have to do with best practice and ways the teachers' experiences may transfer to the classroom (are likely outcomes).

Comments about each item:

a--Related to 12D; DoE 20B

b--Related to several Ques. 12 items; tries to get at ways the research experience may transfer to the classroom

c--Related to 12I; an important finding from DoE '90-'91 survey

d--Related to several Question 12 items; again tries to get at transfer

e--Is an example of nonexemplary practice

f--Related to 12M; DoE 20E

g--Is an example of nonexemplary practice

h--Somewhat related to 12B and to DoE 20H

i--Is neither exemplary nor nonexemplary practice;DoE survey showed that teachers actually do fewer demonstrations at entry (mean=11.2) versus for follow-up (mean=13.9 for science and 14.43 for math),

although these differences are unlikely to be statistically significant.
j--relates somewhat to 12H; DoE 20F.
k--relates to 12E; it would be interesting to find if these teachers become more "technologically-literate" so use more and different kinds of computer-based technologies.

[Note: originally there was a question here about confidence. The DoE survey had several items on confidence. The '90-'91 report showed no difference in means between the entry and follow-up surveys. It may be that these teachers are already confident and will not achieve substantively higher confidence as a result of participation. It would be helpful to know if any differences have been seen in years before '90-'91.]

14. Indicate your expectations in regard to each of the following (either during the program or as a result of your participation).

		(Circle one on each line.) I do not expect this will occur	I am not sure this will occur	I expect this will occur
a.	interact daily with Laboratory staff	1	2	3
b.	observe scientific research in the laboratory	1	2	3
c.	participate in actual research in the laboratory	1	2	3
d.	contribute to ongoing research in the Laboratory	1	2	3
e.	increase my science/mathematics/technology content knowledge	1	2	3
f.	increase my knowledge of applications in science/mathematics/technology	1	2	3
g.	increase my knowledge of how to present content knowledge to my students	1	2	3
h.	gain new perspectives on how science/mathematics/technology should best be taught	1	2	3
i.	learn about activities I can use in my classroom	1	2	3
j.	develop activities I can use in my classroom	1	2	3
k.	use computers	1	2	3
l.	work in a specialty related to courses I teach	1	2	3
m.	be able to significantly influence my assignments and activities to serve my needs	1	2	3

Other expectations not listed above:

[It is unclear whether this question should be included or not. These items were part of the version done by Horizon based on DoE surveys. Of course expectations may greatly affect participant's satisfaction with the program. Wayne Stevenson pointed out they have not had "much success" with these items so it would be helpful to know more about that. More research and discussions should go on before a decision is made to include to exclude this question.]

15. How much does each of the following influence what you teach in your science/math/technology class? Answer for the subject you spend the most time teaching.

(Circle one on each line)

		No Influence			Extensive Influence	Not Applicable
a.	State-developed curriculum guide or framework	1	2	3	4	9
b.	District-developed curriculum guide or framework	1	2	3	4	9
c.	State test	1	2	3	4	9
d.	District or department test	1	2	3	4	9
e.	Textbook program (commercially developed)	1	2	3	4	9
f.	Self-developed curriculum or course	1	2	3	4	9
g.	Available laboratory facilities, equipment and supplies	1	2	3	4	9
h.	Parents/community	1	2	3	4	9
i.	My own interests and experience	1	2	3	4	9

What other strong influence(s) would you like to mention?

[This question addresses constraints that may influence the extent to which teachers can implement new ideas and practices learned or encouraged through the TRPs, in the classroom. These items were co-developed with members of the survey group and research on teacher constraints.]

16. Which of the following resources do you use to help you decide the following: (Circle the one you use MOST.)

	Curriculum Guide	Textbook Program	Other Teachers	Personal Experience	Department
topics to teach	a	b	c	d	e
sequence of topics	a	b	c	d	e
goals and objectives	a	b	c	d	e
teaching strategies	a	b	c	d	e
student activities	a	b	c	d	e
quizzes, tests, exams	a	b	c	d	e
materials and resources	a	b	c	d	e

[These questions include further constraints. The items are from research on teachers' decision-making.]

Program Evaluation Form

Last four digits of your social security number: _ _ _ _

Which facility offered your program? _____

What grade level(s) do you teach? (Circle all that apply.)

K 1 2 3 4 5 6 7 8 9 10 11 12

Date _____ _____ _____
month day year

[The above are the same items as previous, "entry" survey.]

1. Give your opinion about the program with regard to each of the following statements:

		(Circle one on each line.) Strongly Agree.....		Neither Agree nor Disagree		.....Strongly Disagree	Not Applicable
a.	The program staff made me feel welcome	1	2	3	4	5	9
b.	The program staff responded effectively to my questions	1	2	3	4	5	9
c.	The program staff was receptive to my suggestions for program improvement	1	2	3	4	5	9
d.	The materials that were provided will be of use in the classroom	1	2	3	4	5	9
e.	The program provided ideas for ways to present content to my students	1	2	3	4	5	9
f.	Objectives of the program were met	1	2	3	4	5	9
g.	My research/task had a definable output or end point	1	2	3	4	5	9
h.	My research/task was meaningful to me	1	2	3	4	5	9
i.	The presentations during the program were well-organized	1	2	3	4	5	9
j.	I was well-matched with my task/ research assignment	1	2	3	4	5	9
k.	I had significant opportunity to influence my summer experience to meet my needs	1	2	3	4	5	9

[These items are verbatim from the version given NCISE from Horizon, except for item k. which was submitted by a member of our "survey group." This question is formative evaluation. Formative evaluation questions of the DoE survey are not similar.]

[The above question, Question 1, can include items about specific presentations and aspects of the program such as weekly meetings of all participants in the program.]

2. Indicate the extent to which you agree with each of the following statements about what occurred during your participation in the program.

(Circle one on each line.)

		Strongly Agree		Neither Agree nor Disagree		Strongly Disagree
a.	I interacted daily with Laboratory staff	1	2	3	4	5
b.	I observed scientific research in the laboratory	1	2	3	4	5
c.	I participated in actual research in the laboratory	1	2	3	4	5
d.	I contributed to ongoing research in the laboratory	1	2	3	4	5
e.	I increased my science/mathematics/ technology content knowledge	1	2	3	4	5
f.	I increased my knowledge of applications in science/mathematics/technology	1	2	3	4	5
g.	I increased my knowledge of how to present content knowledge to my students	1	2	3	4	5
h.	I gained new perspectives on how science/ mathematics/technology should best be taught	1	2	3	4	5
i.	I learned about activities I can use in my classroom	1	2	3	4	5
j.	I developed activities I can use in my classroom	1	2	3	4	5

[Items are from Horizon version verbatim. These formative evaluation items are related to the expectations from the "Entry" survey. In addition, these items address Goal 1.]

Others not listed above:

3. Rate the following aspects of the program.

(Circle one on each line.)

		Poor	Fair	Good	Very Good	Excellent
a.	Program administrations	1	2	3	4	5
b.	Advance communication	1	2	3	4	5
c.	Orientation	1	2	3	4	5
d.	Availability of resources	1	2	3	4	5
e.	Assistance provided by program staff	1	2	3	4	5
f.	Workshop leaders	1	2	3	4	5
g.	Relationship with mentor	1	2	3	4	5
h.	Part of research team	1	2	3	4	5
i.	Interact with other teachers	1	2	3	4	5
j.	Interact with Lab scientists	1	2	3	4	5
k.	Advice and support for sharing experience	1	2	3	4	5
l.	Support for extending experience to the classroom	1	2	3	4	5

[These items are from both the DoE and Horizon versions. This question is formative evaluation. They also help interpret why connections are maintained or not maintained and address some aspects of goals 1 and 4.]

List any specific strengths and weaknesses you would like the program staff to know about:

4. Rate each of the following in terms of its importance for effective science/mathematics/technology teaching. Answer for the subject (science, mathematics, technology) you spend the most time teaching.

(Circle one on each line.)

		Should definitely not be included.....		Makes no difference		Should definitely be .....included
a	integration of science/math/technology	1	2	3	4	5
b	application of science/math/technology in daily life	1	2	3	4	5
c	societal issues related to science/math/ technology	1	2	3	4	5
d	collaborative/cooperative learning	1	2	3	4	5
e	use of computers as an integral part of instruction	1	2	3	4	5
f	discussions of careers	1	2	3	4	5
g	writing about science/math/technology	1	2	3	4	5
h	use of (scientific equipment/instruments)	1	2	3	4	5
i	students conduct independent research projects	1	2	3	4	5
j	study of the nature of science and scientific inquiry	1	2	3	4	5
k	emphasis on mathematical reasoning	1	2	3	4	5
l	emphasis on fewer concepts (depth versus breadth)	1	2	3	4	5
m	concrete experiences before abstract treatments	1	2	3	4	5

[Same as question 12 on the "Entry" survey. It addresses how teachers' beliefs may have changed after the intervention (the TRP program).]

What else do you think is especially important to include that is not listed above?

7. For you (personally and/or professionally) what is the most important thing you gained from your program experience?

Participant Follow-Up Questionnaire

Last four digits of your social security number __ __ __ __

Which facility offered your program? _____

What grade level(s) do you teach? (Circle all that apply.)

K 1 2 3 4 5 6 7 8 9 10 11 12

Date _____ _____ _____
month day year

1. How many of the following classes do you teach each day? (Fill in blanks for each subject taught.)

	Number of Classes	Total Number of Students
Science classes	_____	_____
Mathematics classes	_____	_____
Technical/vocational classes	_____	_____
Other subject classes (subject _____)	_____	_____

[Same as question 6 on the "Entry" survey. This question is used to determine if teaching assignments are comparable to preprogram assignments.]

2. Rate each of the following in terms of its importance for effective science/mathematics/technology teaching. Answer for the subject (science, mathematics, technology) you spend the most time teaching.

(Circle one on each line.)

		Should definitely not be included.....		Makes no difference		Should definitely be .....included
a	integration of science/math/technology	1	2	3	4	5
b	application of science/math/technology in daily life	1	2	3	4	5
c	societal issues related to science/math/ technology	1	2	3	4	5
d	collaborative/cooperative learning	1	2	3	4	5
e	use of computers as an integral part of instruction	1	2	3	4	5
f	discussions of careers	1	2	3	4	5
g	writing about science/math/technology	1	2	3	4	5
h	use of (scientific equipment/instruments)	1	2	3	4	5
i	students conduct independent research projects	1	2	3	4	5
j	study of the nature of science and scientific inquiry	1	2	3	4	5
k	emphasis on mathematical reasoning	1	2	3	4	5
l	emphasis on fewer concepts (depth versus breadth)	1	2	3	4	5
m	concrete experiences before abstract treatments	1	2	3	4	5

[This question is the same as Ques. 12 on the "Entry" and 4 on the "Exit" surveys. It is used to determine the extent to which the changes in beliefs, if any, are lasting.]

What else do you think is especially important to include that is not listed above?

3. How often do you require your students to participate in each of the following? Answer for the subject (science, mathematics, technology) you spend the most time teaching.

1=Never, 2= Rarely (perhaps once or twice a semester), 3=Occasionally (perhaps once a month), 4= Frequently (perhaps once a week or so), 5=Often (almost every day)

		(Circle one on each line.)				
		Never	Rarely	Occasionally	Frequently	Often
a	work in groups	1	2	3	4	5
b	complete joint or group projects	1	2	3	4	5
c	complete individual projects	1	2	3	4	5
d	do library research	1	2	3	4	5
e	listen and take notes during presentation by the teacher	1	2	3	4	5
f	give oral reports or presentations on their work	1	2	3	4	5
g	use a science/mathematics textbook to do assignments in class	1	2	3	4	5
h	engage in out-of-class activities (including fieldtrips)	1	2	3	4	5
i	watch a teacher-lead demonstration of a science/math/technology principle	1	2	3	4	5
j	do hands-on activities	1	2	3	4	5
k	use a computer or computer-based technologies (e.g. interactive video, telecommunications)	1	2	3	4	5

[These items are the same as Ques. 13 on the "Entry" survey. This question is meant to find out if actual practice changes after the intervention--TRP program.]

What else do your students participate in *frequently* that is not listed above?

4. To what extent you agree with each of the following statements about what has occurred since your participation in the program.

(Circle one on each line.)

		Strongly Agree		Neither Agree nor Disagree		Strongly Disagree
a.	I have drawn on my program experiences for explanations and examples in my teaching.	1	2	3	4	5
b.	I have drawn on my program experiences for ideas for student independent research projects.	1	2	3	4	5
c.	I have made curriculum changes based on what I learned in the Lab program.	1	2	3	4	5
d.	I have developed new materials for the course(s) I teach.	1	2	3	4	5
e.	I have shared my experiences/knowledge from the program with colleagues informally.	1	2	3	4	5
f.	I have been responsible for conducting inservice or workshop activities using ideas from the Lab program.	1	2	3	4	5
g.	I have made presentations to professional groups using ideas from my program experiences.	1	2	3	4	5
h.	I have recommended the program to other teachers.	1	2	3	4	5
i.	I have interacted with Laboratory scientists.	1	2	3	4	5
j.	I have interacted with other program participants.	1	2	3	4	5
k.	I have continued to seek Lab help in gaining access to resources and information.	1	2	3	4	5
l.	I have used my Lab connection to obtain materials or resources.	1	2	3	4	5
m.	I have a renewed interest and enthusiasm in continuing to be a teacher.	1	2	3	4	5
n.	I have enrolled in coursework for academic credit that will strengthen my teaching ability	1	2	3	4	5

o. I have left teaching, new occupation _____

[These items relate directly to several goals and outcomes. Many items are from the DoE "Follow-up" survey.

Comments per item:

a. Goal 4; DoE question verbatim but response on DoE survey calls for "Yes/No" answer.

f. Goal 5; DoE survey verbatim
g. Goal 5; DoE survey verbatim
h. Formative evaluation; DoE survey verbatim
i. Goal 6; Horizon version
j. Goal 6; Horizon version
k. Goal 6; suggestions from Survey Group
l. Goal 6; Survey Group suggestion
m. Goal 1
n. Goal 1; survey Group suggestion
o. Suggestion from survey Group--maybe this item should go at the beginning of this "Follow-up" survey?

Please indicate here anything else you would like to add in regard to how participation in the program has affected your teaching and professional life.

5. How much does each of the following influence what you teach in your science/math/technology class? Answer for the subject you spend the most time teaching.

(Circle one on each line)

		No Influence			Extensive Influence	Not Applicable
a.	State-developed curriculum guide or framework	1	2	3	4	9
b.	District-developed curriculum guide or framework	1	2	3	4	9
c.	State test	1	2	3	4	9
d.	District or department test	1	2	3	4	9
e.	Textbook program (commercially developed)	1	2	3	4	9
f.	Self-developed curriculum or course	1	2	3	4	9
g.	Available laboratory facilities, equipment and supplies	1	2	3	4	9
h.	Parents/community	1	2	3	4	9
i.	My own interests and experience	1	2	3	4	9

What other strong influence(s) would you like to mention?

[Same as Question 15 on the "Entry" survey. The purpose is to find out if the teacher is operating under similar constraints and/or operating under constraints that would disallow teachers to implement their beliefs about what/how to transfer to the classroom.]

6. Which of the following resources do you use to help you decide the following: (Circle the one you use MOST.)

	Curriculum Guide	Textbook Program	Other Teachers	Personal Experience	Department
topics to teach	a	b	c	d	e
sequence of topics	a	b	c	d	e
goals and objectives	a	b	c	d	e
teaching strategies	a	b	c	d	e
student activities	a	b	c	d	e
quizzes, tests, exams	a	b	c	d	e
materials and resources	a	b	c	d	e

[Same as Question 16 on the "Entry" survey; same purpose as Question 5, above.]

7. How are your students this year engaged in ways of doing and thinking about science that were not evident in your students before you participated in the teacher research program?

[This question is intended to find out if the teacher can detect changes in how their students might act or think differently when their teacher has had the teacher research participation experience. This question may lead to future items on follow-up surveys.]

IMPACT ASSESSMENT: QUESTIONS AND SUBQUESTIONS

I. Have the program goals and objectives been met?
   A. Are teachers revitalized as they:
      1. connect to the science community and to real science;
      2. maintain those connections; and
      3. feel positive about returning to their science/math/technology classroom?
   B. Do teachers have increased knowledge of:
      1. research processes;
      2. science content (update i.e., cutting edge);
      3. technology and equipment use, techniques;
      4. careers;
      5. DoE research program priorities; and
      6. the learning of science?
   C. Can teachers relate to the classroom what they have learned concerning:
      1. research processes;
      2. science content (update i.e., cutting edge);
      3. technology and equipment use, techniques;
      4. careers; and
      5. the learning of science?
   D. Have teachers' leadership skills been enhanced as they are more:
      1. active in their school, district; and
      2. active in the science education community?
   E. Is (are) the program(s) serving underrepresented groups?

II. How can the program(s) be improved?
   A. What are the effects for the various participant populations which include:
      1. potential leaders in science and math education;
      2.. teachers who serve minority and urban populations; and/or
      3. other groups of interest e.g., teachers who have no previous research experience?

B. How did participants feel about the program in the following areas:
   1. if it was effective and helpful;
   2. it's strengths and weaknesses;
   3. if it had adequate orientation and pre-program interactions; and
   4. if the teachers' expectations were met?

III. Are the Labs' expectations being met by the program(s)? [Subquestions in this category can be addressed on a Lab-by-Lab basis.]

INFORMATION COLLECTION

QUESTION(S) ADDRESSED	COLLECTION PROCEDURES	FORMATIVE/ SUMMATIVE
Have the program goals and objectives been met? **Goals 1,5:Teachers (T's) revitalized--0.1, 0.2, 0.3**	Two T's are selected as case studies to study an expected outcome: • T interviews • observations of T's at work • mentor interviews.	Summative: • during prog. • exit • follow-up (one year)
Goals 2, 3, 7, 8: T's have increased knowledge--0.4, 0.5, 0.6; 0.13, 0.14.	T's attributes determined "pre" through: • case studies (classroom observations, T and student products, interviews--T's) • entrance survey • application form. T's attributes determined during through: • case studies (interviews, observations at work) • focus group (4-6 T's chosen at random from group--closed format interview once during participation). T's attributes determined "post" through: • case studies (classroom observations, T and student products, interviews--T's, colleagues, principal) • mentor survey • lab products (products such as presentations developed during participation) • surveys--exit and follow-up • principal survey (?) • anecdotal information.	Summative: • pre-program • during prog. • exit • follow-up (one year)

QUESTION(S) ADDRESSED	COLLECTION PROCEDURES	FORMATIVE/ SUMMATIVE
G 4: T's have enhanced leadership skills--0.7, 0.8	T's leadership skills assessed "pre" through: • application form T's leadership skills assessed "post" through: • follow-up survey • anecdotal information • case studies (interviews--T's, colleagues, principals)	Summative: • follow-up (one year)
G6: T's relate what they have learned to classroom-- 0.9, 0.10, 0.11, 0.12, 0.15	• Case studies (classroom observations, interviews-T's, colleagues, principal). • Follow-up survey • Anecdotal information	Summative: • follow-up (one year)
G9: Program(s) serve underrepresented populations 0.16	• Application forms • Entrance survey	Summative: • pre-program
What are the effects for the various participant populations?	Information to identify populations taken from: • Application form • Entrance survey	Summative and Formative
How did participants feel about the program?	• Focus group • Case studies (T interviews) • Exit survey	Formative: • during prog. • exit
Are the Labs' expectations being met by the program(s)?	• Mentor survey • Anecdotal information	Formative: • during prog. • exit

TIMELINE: Teacher Research Participation Programs

	1993 Nov-Dec	Jan-Feb	Mar-Apr	May-June (end yr. 1)	July-Aug	Sept-Oct	Nov-Dec	1994 Jan-Feb	Mar-Apr
TRP Activities	TRAC draft *	Offer out to T's..|			T's at sites				
Make Selections	Select pilot sites (x4) *	Select T's for case studies (x6) .....|							
Impact Assessment for TRPS:	Impact assessment design.....|								
Surveys--Development and Collection	Survey development.	.....|		Entrance Surveys *	Exit surveys *				Follow-up Surveys *
	Develop mentor survey questions *	Develop mentor surveys.....|			Mentor surveys *				
Case Studies	Develop T's questions *	Develop protocols for classroom observations, T's and S's products.....|	Classroom visits (also T's and S's products).....	.....|	Case study interviews & observations (week 5-6); Mentor interviews; T's program products .....|			Classroom visits; T's interviews; T's and S's products; Principal interview (?); Colleague interviews(?)	.....|
	Develop criteria for T's program products *								
Focus Groups	Develop questions *		Develop interview protocol.....	.....|	Focus groups interviews (week 5-6)...|				
Anecdotes	Anecdotal information (previous year).....	.....	.....	.....>	Anecdotal information (current year).....	.....	.....	.....	.....>

IMPACT ASSESSMENT: Teacher Research Participation Programs

PROGRAM GOALS: Priority One		INTENDED OUTCOMES
G1 - Renew and revitalize teacher participants.		Teachers become revitalized as they:
	->	0.1 strengthen their interest and enthusiasm for teaching science/technology/math;
	->	0.2 confirm their part in the science/math/ technology community as classroom teachers; and
	->	0.3 embrace the challenge of providing classrooms in which their students engage in authentic science and math investigations.
G2 - Increase teachers' awareness and understanding of the current state of scientific and technological research.		Teachers' knowledge and understanding increased in each of the following:
	->	0.4 cutting edge science/math/technology content;
	->	0.5 equipment use and techniques; and
G3 - Increase teachers' awareness and knowledge of the scientific research process.	->	0.6 research processes.
G4 (formerly G6) - Transfer by teachers of their increased knowledge to their students and to other teachers.		Teachers relate to the classroom what they have learned concerning:
	->	0.7 research processes;
	->	0.8 science/math/technology content ;
	->	0.9 equipment use and techniques; and
	->	0.10 the learning of science.
G5 (formerly G4) - Enhance leadership in science and math education.		Teachers' leadership enhanced as they become more:
	->	0.11 active in their school, district; and
	->	0.12 active in the science education community.

PROGRAM GOALS: Priority Two		ADDITIONAL DESIRABLE OUTCOMES
G6 (formerly G5) - Develop and sustain personal connections with scientists.		Teachers develop and sustain personal connections with scientists as they:
	->	0.13 connect to the science community and to real science; and
	->	0.14 maintain those connections.
G7 - Increase teacher's knowledge of DoE research and program priorities.		Teachers' knowledge and understanding increased in:
	->	0.15 DoE and Lab research, priorites, and operations.
G8 - Increase teachers' knowledge of career opportunities in technical fields.		Teachers' knowledge and understanding increased in the area of:
	->	0.16 technical careers; and
	->	0.17 transfer of that knowledge to the classroom.
G9 - Increase participation of underrepresented and minority teachers and of teachers who serve uinderrepresented populations in teacher research participation programs. (Explicit goal for DoE but not specifically for TRAC.)		Population served by program(s) includes:
	->	0.18 more teachers who serve underrepresented populations (for TRPS).

Evaluation Question: Have the program goals and objectives been met?

Goal	Instrument	Collection Procedure	Analysis Procedure
Renew and revitalize	a. Teacher surveys	a. "Exit" and "Follow-up"	a. Means, percentages; compare differences
	b. Focus groups	b. During program interviews (using semi-open format)	b. Content analysis of responses; identify unintended outcomes
	c. Case studies -Interviews (semi-open format)	c. - Pre - During - Post	c. Content analysis; note differences in pre, during, and post; identify unintended outcomes
	d. Principal and colleague interviews (semi-open format)	d. Post	d. Content analysis; compare to answers teachers gave in surveys; identify unintended outcomes
	e. Anecdotal information	e. Continuous process to collect and record (using anecodotal information forms)	e. Content analysis, then classify according to outcome (including unintended outcomes)

Goal	Instrument	Collection Procedure	Analysis Procedure
Teachers' awareness and understanding content	a. Case studies: - Interviews	a. - Pre and post	a. - Content analysis; compare differences; compare to mentors' perceptions; identify unintended outcomes
	- Teacher products	- Pre and post	- Compare pre and post
	- Classroom observations	- Pre and post (using classroom observation checklist)	- Compare pre and post
	-Mentor interviews (semi-open format)	- During program	- Compare teachers' to mentors' perceptions
	b. Mentor survey	b. At teacher "exit"	b. Means, percentages
Teachers' awareness/ knowledge process	a. Case studies (as above)	a. (as above)	a. (as above)
	b. Mentor survey (as above)	b. (as above)	b. (as above)
	c. Teacher surveys	c. "Exit" and "Follow-up"	c. Means, percentages; compare differences

Goal	Instrument	Collection Procedure	Analysis Procedure
Transfer to the classroom	a. Teacher surveys	a. "Entry," "Exit," and "Follow-up"	a. Means, percentages; compare differences
	b. Case studies:	b.	b.
	- Teacher Interviews	- Pre and post	- Content analysis; for post, compare to observations; identify unintended outcomes
	-Classroom observations	- Pre and post	- Compare differences
	-Principal and colleague interviews	- Post	- Compare to teachers' interviews; identify unintended outcomes
	- Teacher products	- Pre and post	- Compare differences
	- Student products	- Pre and post	- Compare differences
	c. Anecdotal information	c. Continuing process	c. Content analysis, then classify according to outcome
Leadership	a. Teacher surveys	a. "Entry" and "Follow-up"	a. Means, percentages; compare differences
	b. Case studies:	b.	b. Content analysis;
	- principal and colleague interviews	- Post	compare to teachers' interviews; identify unintended outcomes
	c. Anecdotal information	c. Continuing process	c. Content analysis, then classify according to outcome

Goal	Instrument	Collection Procedure	Analysis Procedure
Careers	a. Teacher surveys	a. "Exit" and "Follow-up"	a. Means, percentages; compare differences
	b. Case studies: - Teacher products - Teacher interviews	b. - Pre and post - Pre and post	b. - Compare differences - Compare differences; identify unintended outcomes
	c. Anecdotal information	c. Contining process	c. Content analysis, then classify according to outcome
Personal connections	a. Teacher survey	a. "Follow-up"	a. Means, percentages
	b. Focus groups	b. Interview during program (especially--connections to science community and real science)	b. Content analysis; identify unintended outcomes
	c. Case studies: - Teacher interviews	c. - Post	c. Content analysis; identify unintended outcomes
	d. Anecdotal information	d. Continuing process	d. Content analysis, then classify according to outcome

Goal	Instrument	Collection Procedure	Analysis Procedure
Teachers' knowledge of DoE	a. Focus groups	a. During program	a. Content analysis; identify unintended outcomes
	b. Case studies	b.	b.
	- Teacher Interviews	- During and post	- Content analysis; compare to mentors' answers; identify unintended outcomes
	- Mentor interviews	- During and post	- Compare to teachers' answers
	c. Mentor survey	c. At teachers "exit"	c. Means, percentages
Increase participation-underrepresented	a. Application b. Teacher survey	a. Pre-program b. "Entry"	a. Percentages b. Percentages

APPENDIX D:

Teacher Research Participation Programs Anecdotes from Eight Labs

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project — how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

   1989 Rhode Island Superkid uses National Education Supercomputer for high resolution images of a beating heart.

2. Give as much detail about the situation as possible:

   Peter Daly was the 1989 representative from Rhode Island to the Superkids program. He is currently attending the University of Rhode Island majoring in electrical engineering. In October of 1991, Peter requested time on the National Education Supercomputer to do research in the area of medical imaging involving three-dimensional reconstruction of certain cardiac organs.

   The following is an excerpt from his letter of request for Cray time: "Specifically, my colleagues and I get volunteers to submit themselves to MRI scans of the heart. We take "pictures" of different areas of the heart, and save these to pictures on magnetic tape. The tape is taken to our computers at URI, where it is downloaded to out UNIX workstations (suns, mips, dec risc, etc.). From there, we can re-arrange the images and show two-dimensional "movies" of a beating heart."

   "From there, we take the two dimensional "slices" of a person's heart and re-construct them to form a three-dimensional object. When complete, the pictures form a "movie" of a three dimensional beating heart (well, the left and right ventricles of the heart)."

   "I used to do "cheap" rendering techniques in the three-dimensional reconstruction (gourand shading). However, after taking a numerical methods class, I decided to try and get better quality three-dimensional pictures. A two-step approach was taken; use of cubic spline interpolation (to make the heart look a little less choppy) and ray-tracing (to make it look a little more realistic). The ray-tracing program I use (MTV - public domain) takes an eon to run through just one frame (512 x 512 pixels), Multiply that by an 80 frame movie, and things start going a little slow - even on a DEC-5000/200."

"Also, I have a little time constraint. I am scheduled to give a paper on this stuff November 1st, at an IEEE Engineering in Medicine and Biology Conference. . . . "

"Do you think I have a chance at getting some Cray time on the NES Cray? I would like to use it to run the MTV raytracer. Of course, NERSC can have the pictures, as well as the X-based "movie" programs which I use to view the images. On a DEC-5000/200, I can get up to 35 frames/sec, and on a Sparc 1+ I can run movies at roughly 25 frames/sec."

"I realize this is a total shot in the dark, but I figured I would give it a try. Thanks for reading this message, and please let me know that you think. . . ."

The Cray time was allowed and Peter's results were very exciting. He was able to develop a cardiac "movie" loop. This generated a 3D reconstruction of the heart at nine different intervals, moved ahead one point in time, and shifted the view by 10 degrees in each pass. The end effect is 36 "frames", with the heart "beating" one complete cycle every nine frames. By repeating the 36 frames over and over, the heart appears to "beat" continuously, with the viewer walking around it.

Because Peter was an "ex-Superkid" we invited him to be one of our expert speakers at the 1992 High School Science Student Honors Program. He was very well received, presented his subject with a high degree of knowledge and enthusiasm, and related very well to the students. He demonstrated what can be done by being allowed access to National Education Supercomputer.

3. Any "quotable quotes"?

"Thanks again for the Cray time on the NES. Without the services NERSC provides, I would not have been able to produce images of this quality. The NES is a unique tool which serves its purpose very well."
Peter Daly

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Peter Daly
   1989 Rhode Island Superkid
   Senior - University of Rhode Island
   Department of Electrical Engineering

2. Date information was reported:

   June 19, 1992

3. Dates(s) of program or project:

   October 1991 through January 1992

   Sponsor(s):

   Department of Energy
   National Education Supercomputer Program
   University of Rhode Island

   Nature of activity:

   Utilized National Education Supercomputer for realistic animated renderings of the beating heart.

4. In some cases, it may be appropriate to follow up on information provided by your sources(s). Please list here pertinent details about referrals, such as names and phone number of people/projects/organizations to contact, document to review, and so on.

   Peter Daly
   URI Department of Electrical Engineering
   Kelly Hall Annex A-218
   Kingston, RI 02881
   (401) 789-0654 Voice
   (401) 782-1066 Fax

Poster created by Peter Daly attached.

Your name: **Susan Wiebe**

Position: **National Energy Research Supercomputer Center Education Program Administrator**

Organization: **Lawrence Livermore National Laboratory**

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project — how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

   Utilizes National Education Supercomputer in his classroom and teachers other teachers.

2. Give as much detail about the situation as possible:

   Richard Enderton received his National Education Supercomputer training in June, 1991. He participated in 1991 Superkids program and learned about the Cray X-MP and how to build curricula around this machine and introduce it into his classroom. His participation was funded by StorageTek, an industrial partner to the NESP effort.

   During August 1991, Rich conducted his first workshop for teachers in his area. With this success, Rich has gone on to conduct additional teacher workshops, including one during his last Spring break for the Richland, Washington school district.

   Because of his work, Rich was received "Educator of the Year" from *Electronic Learning* magazine. (Article attached.)

   In addition to the recognition Rich has received from *Electronic Learning*, the program has received good publicity also. We have received letters from people who have read the article requesting information about the program.

   Rich Enderton is one of our best examples of our "master" teacher concept. NESP staff provides training to teachers, who in turn present workshops in their local area. This concept is the foundation and the future of the National Education Supercomputer Program.

3. Any "quotables quotes"?

   Richard Enderton: "You don't have to be a whiz on computers. You just have to have the interest."

   ". . . technology is best used in simulations; it gives students a feel for

what's going on. It used to be theory and experiment was all there was [in science teaching]; now there's a third leg--simulation. That's what science is becoming, and this [program] exposes kids."

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Richard Enderton
   Teacher, Minnehaha Academy, Minneapolis, MN

2. Date information was reported:

   Originally reported by Mr. Enderton in June 1992. Article published in September 1992 issue of Electronic Learning.

3. Dates(s) of program or project:

   Summer 1991 - ongoing

   Sponsor(s):

   U. S. Department of Energy
   National Education Supercomputer Program
   Lawrence Livermore National Laboratory
   Minnehaha Academy
   StorageTek

   Nature of activity:

   Utilizes National Education Supercomputer in his classroom and teachers other teachers.

4. In some cases, it may be appropriate to follow up on information provided by your sources(s). Please list hre pertinent details about referrals, such as names and phone number of people/projects/organizations to contact, document to review, and so on.

   Richard Enderton
   Minnehaha Academy
   3107 47th Avenue, South
   Minneapolis, MN 55406 (612) 729-8321

September 1992 *Electronic Learning* article on Richard Enderton.

Your name: **Susan Wiebe**

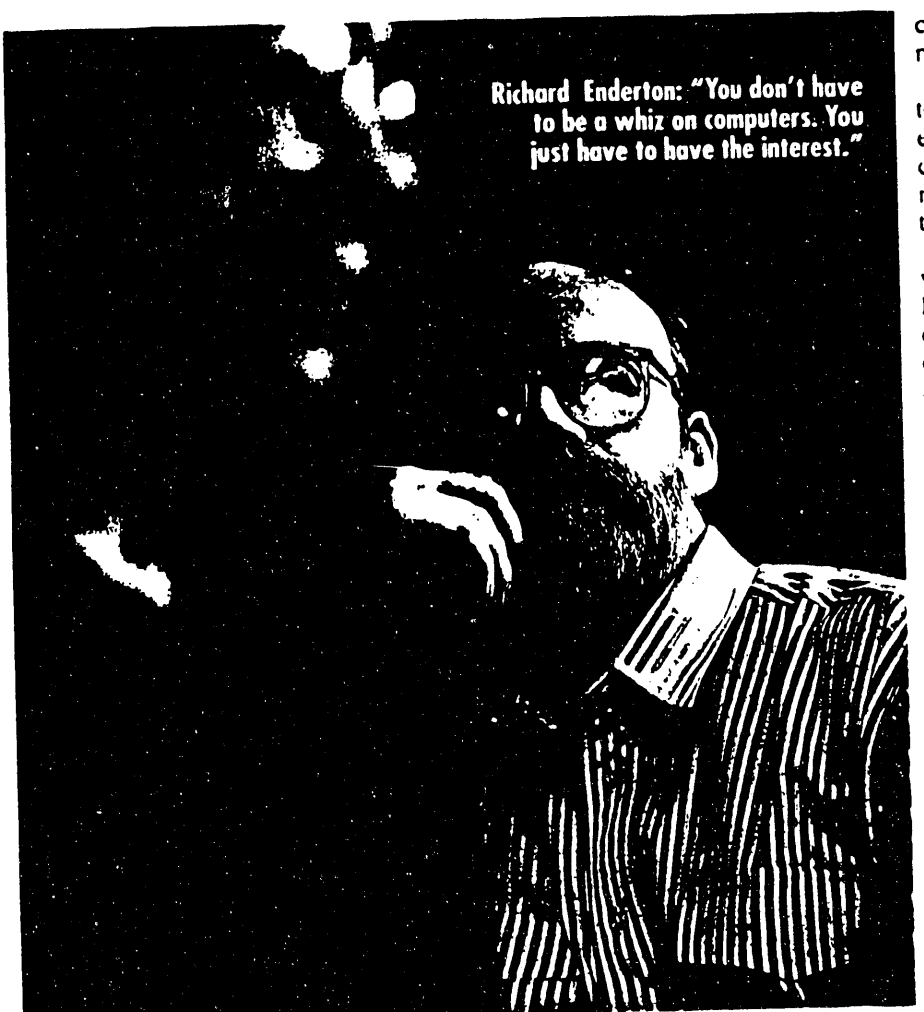
Position: **National Energy Research Supercomputer Center**
Education Program Administrator

Organization: **Lawrence Livermore National Laboratory**

EDUCATOR OF THE YEAR

SUPER COMPUTER MAN

EL's Educator of the Year uses a supercomputer to give his students access to new worlds By Isabelle Bruder



Richard Enderton: "You don't have to be a whiz on computers. You just have to have the interest."

THE HIGH SCHOOL STUDENTS WHO SIGNED UP FOR Richard Enderton's computer programming class last year at Minnehaha Academy, Minneapolis, were transferred to the Lawrence Livermore National Laboratories in California.

Well, sort of.

Rich Enderton, *Electronic Learning*'s 1992 Educator of the Year, asked his high school students if they "would mind being used as guinea pigs" in a Supercomputer Applications course. The course is part of a U.S. Department of Energy initiative called the National Education Supercomputer Program (NESP) that provides free, unlimited modem access to a supercomputer previously used by the government for scientific research.

Enderton, a math and computer science teacher, had only used the supercomputer for a couple of months and devised his course outline that summer. Strange as it may seem, "not all the students were thrilled with the idea," he quips.

What these students found, however, was not your average "computing" class. Enderton's project-based supercomputing course connects students directly to some of the world's foremost research scientists and to one of the most powerful supercomputers ever, the Cray X-MP EA. As a pilot site using both the Cray and software being developed at Lawrence Livermore, the students get hands-on experience with large-scale simulation programs in three areas: climate modeling, known as Climoman; ray tracing, or Wireman, which lets the students create animation; and physics, or Particleman, in which students observe and manipulate atomic particles or planetary motion.

All that may sound extremely high tech, but Enderton's students are not all overachievers—they represent a broad range of abilities and academic interests. "The beauty of the supercomputer is that you don't have to be able to program," Enderton says. "You don't have to be a whiz on computers. You just have to have the interest."

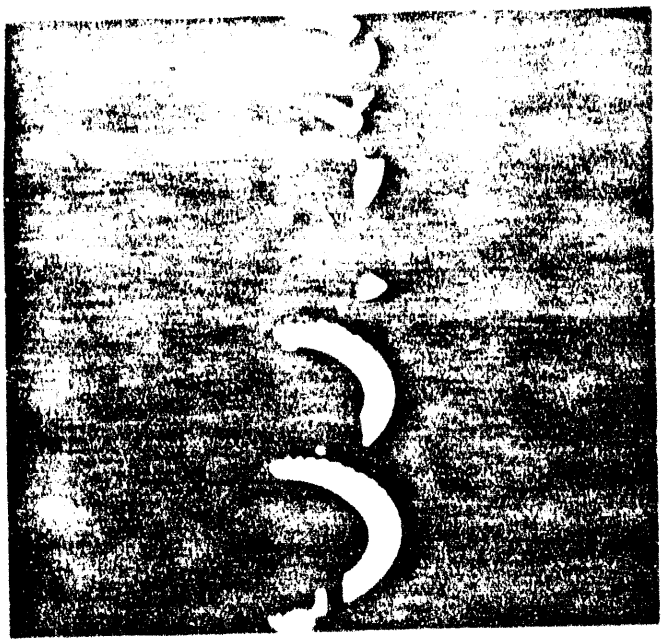
Across the Curriculum

Although the course is a computer science elective, Enderton stresses the integration of other disciplines. One art student, in fact, said that until she took Enderton's course, she "never imagined computers could help" in her chosen profession of graphic artist.

Science is a natural extension of the course, and in one project students create a climate modeling sequence to see what will happen over a period of time when they alter the ozone, carbon dioxide, or ocean temperatures of the earth.

Another student used the Wireman simulation to construct a three-dimensional, animated movie of a cell, including text for

PHOTOS BY STEVE WOIT



SPIRAL

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project — how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

   Don Wieber assists a "Make-A-Wish" cancer patient to access NESP.

2. Give as much detail about the situation as possible:

   Don Wieber is an instructor at Contra Costa College in San Pablo, California. He attended the Northern California Community College Computer Consortium sponsored supercomputer workshop last spring.

   The following is an excerpt from a letter to Brian Lindow from Don. "I know a sixteen-year-old young man, Brent Hohnemann, in San Diego, who has a rather serious form of cancer. His chances for recovery are stated at 25%, but he seems to be doing quite well. "Make-A-Wish" foundation has provided him with an IBM (or clone) with VGA color and a copy of AUTOCAD. He is very interested in computers and quite bright. His father is computer literate and has his own computer, with a modem.

   I recently spent quite a bit of time in San Diego, while my grandson was fighting a losing battle with cancer. I got to know quite a few "cancer kids". They are just amazing! Brent is determined to beat the cancer and become a computer engineer. He may just pull it off.

   I would like to give Brett a Student Account. I would be willing to fly down and spend a couple days introducing Brent and his father to the system. I would also, when I get my modem up, keep in contact with him, monitor his activities, and take responsibility for his performance."

   Don was given permission to establish an account for Brent and flew down to give him instruction.

   In the beginning, Brent was quite active on the system doing raytracing projects. Unfortunately, Brent suffered a relapse and was set back for some months.

We received word from Don Wieber that Brent has once again battled back and the cancer is in remission. Brent is back in school and is active on the NES.

3. Any "quotable quotes"?

   N/A

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Don Wieber
   Contra Costa College
   2600 Mission Bell Drive
   San Pablo, CA 94806

   (510) 235-7800 x 272

2. Date information was reported:

   Original request April 20, 1992

3. Dates(s) of program or project:

   Spring 1992 - ongoing

   Sponsor(s):

   U. S. Department of Energy
   National Education Supercomputer Program
   Make-A-Wish Foundation
   Contra Costa College
   Northern California Community College Computer Consortium

   Nature of activity:

   Raytracing projects conducted by Make-A-Wish cancer patient.

4. In some cases, it may be appropriate to follow up on information provided by your sources(s). Please list here pertinent details about referrals, such as names and phone number of people/projects/organizations to contact, document to review, and so on.

Don Wieber
Contra Costa College
2600 Mission Bell Drive
San Pablo, CA 94806

(510) 235-7800 x 27

Letter from Don Wieber attached.

Your name: **Susan Wiebe**

Position: **National Energy Research Supercomputer Center**
Education Program Administrator

Organization: **Lawrence Livermore National Laboratory**

CONTRA COSTA COLLEGE

April 20, 1992

Brian Lindow
P.O. Box 5509, L-561
Lawrence Livermore Laboratory
Livermore, CA 94551

Dear Brian,

Thanks for an extremely enjoyable, enlightening, and productive workshop. It may be a couple of weeks before I have a modem up and running, so I am resorting to this rather archaic means of communication.

I have a favor to ask.

I know a sixteen-year-old young man, Brent Hohnemann, in San Diego, who has a rather serious form of cancer. His chances for recovery are stated at 25%, but he seems to be doing quite well. "Make-A-Wish" foundation has provided him with an IBM (or clone) with VGA color and a copy of AUTOCAD. He is very interested in computers and quite bright. His father is computer literate and has his own computer, with a modem.

I recently spent quite a bit of time in San Diego, while my grandson was fighting a losing battle with cancer. I got to know quite few "cancer kids". They are just amazing! Brent is determined to beat the cancer and become a "computer engineer". He may just pull it off.

I would like to give Brent a Student Account. I would be willing to fly down and spend a couple of days introducing Brent and his father to the system. I would also, when I get my modem up, keep in contact with him, monitor his activities, and take responsibility for his performance.

I am sure that you, better than I, can see the potential benefits. I also realize that this is outside the "Guidelines" you presented to us. I am quite willing to jump through most any hoops (short of moving to San Diego) that will assist in bringing this off.

I realize that you are more than busy. However, because of my recent experience, I have a (probably unreasonable) sense of urgency about this.

If you could drop me a note (in the inclosed envelope) or leave a message on either my home or school phone tape (Contra Costa College is closed, this week), I would be very grateful.

Home phone: (510) 758-1865
School phone: (510) 235-7800 ext 272

Yours truly,
Don Wieber

Don Wieber
2320 Hoytt Ct.
Pinole, CA 94564

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

   Merrill Senior High School names winner of the Pioneering Partners for Educational Technology Initiative.

2. Give as much detail about the situation as possible:

   John Gravelle received his training on the NES during the 1991 Cray Academy in Wisconsin. John has been very inventive with his use of this classroom resource and very active in creating projects involving his students and others across the nation.

   In May 1992 John received notice from Tommy Thompson, Governor of Wisconsin. In his letter of congratulations to John, Governor Thompson stated, "Your team was selected among other applicants based on creative use of technology in education. The ability to connect the school's Macintosh network to the Cray Supercomputer is impressive. The students are certainly motivated to learn."

   Pioneering Partners is made up of the five Great Lakes states and GTE-North. John's introduction of special technology into his classroom utilizing the NES afforded him the opportunity to participate in this collaborative program.

   Using the NES, John allows his students to see the effect an automobile's design has on the concept of wind drag. They mathematically change the slope of a car's hood and the supercomputer calculates the drag. John's students also use the same type of computer programs that create special effects for movies and can design 3-dimensional pictures of mathematical formulas. In addition, the NES can rotate the object, take electronic snapshots at each stage of manipulation, and then put those snapshots into motion to give students another tools for understanding a complex mathematical concept.

3. Any "quotable quotes"?

"Access to the supercomputer has reshaped the content of an academic course at Merrill High School and the ways teachers impart the material. The Merrill team hopes to extend the benefits of that access, as well as expand other opportunities for sharing between Wisconsin public schools." ***John Gravelle***

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

Tommy G. Thompson
Governor
State of Wisconsin
P.O. Box 7863
Madison, Wisconsin 53707

(608) 266-1212

2. Date information was reported:

May 20, 1992

3. Dates(s) of program or project:

Participation in the NESP July 1991 - ongoing

Sponsor(s):

U. S. Department of Energy
National Education Supercomputer Program
Wisconsin Department of Public Instruction
Governor's Office - State of Wisconsin

Nature of activity:

Introduction of technology into Merrill Senior High School

4. In some cases, it may be appropriate to follow up on information provided by your sources(s). Please list here pertinent details about referrals, such as names and phone number of people/projects/organizations to contact, document to review, and so on.

John Gravelle
Merrill Senior High School
Polk Street
Merrill, Wisconsin

(715) 536-4594

Letter from Governor Tommy Thompson to John Gravelle attached.

Your name: **Susan Wiebe**

Position: **National Energy Research Supercomputer Center**
Education Program Administrator

Organization: **Lawrence Livermore National Laboratory**

TOMMY G. THOMPSON

Governor
State of Wisconsin

May 20, 1992

John Gravelle
806 Adams Street
Merrill, WI 54452

Dear Mr. Gravelle:

Congratulations! It gives me great pleasure to inform you that your team from Merrill Sr. High School is a winner in this first year of the Pioneering Partners for Educational Technology initiative. It is wonderful to recognize this team for the outstanding advances in the use of technology as a tool.

Your team was selected from among other applicants based on creative use of technology in education. The ability to connect the school's Macintosh network to the Cray Supercomputer is impressive. The students are certainly motivated to learn.

Your team's involvement in Pioneering Partners is just beginning. In August, you will attend a leadership institute designed to develop and enhance the teams' ability to share creativity and innovation with other teams of educators. The 1992-1993 school year will bring the opportunity for the sharing of knowledge and dissemination of your innovation.

Thank you for the commitment to create learning opportunities for students throughout the Great Lakes Region which might not otherwise exist. Please extend my congratulations to the rest of the team members.

Sincerely,

Tommy G. Thompson

TOMMY G. THOMPSON
Governor

TGT/ja

cc: Dr. Ralph Neale
Lanny Tibaldo

Room 115 East, State Capitol, P.O. Box 7863, Madison, Wisconsin 53707 • (608) 266-1212 • FAX (608) 267-8983

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

   1989 Rhode Island Superkid uses National Education Supercomputer for high resolution images of a beating heart.

2. Give as much detail about the situation as possible:

   Peter Daly was the 1989 representative from Rhode Island to the Superkids program. He is currently attending the University of Rhode Island majoring in electrical engineering. In October of 1991, Peter requested time on the National Education Supercomputer to do research in the area of medical imaging involving three-dimensional reconstruction of certain cardiac organs.

   The following is an excerpt from his letter of request for Cray time: "Specifically, my colleagues and I get volunteers to submit themselves to MRI scans of the heart. We take "pictures" of different areas of the heart, and save these to pictures on magnetic tape. The tape is taken to our computers at URI, where it is downloaded to out UNIX workstations (suns, mips, dec risc, etc.). From there, we can re-arrange the images and show two-dimensional "movies" of a beating heart."

   "From there, we take the two dimensional "slices" of a person's heart and re-construct them to form a three-dimensional object. When complete, the pictures form a "movie" of a three dimensional beating heart (well, the left and right ventricles of the heart)."

   "I used to do "cheap" rendering techniques in the three-dimensional reconstruction (gourand shading). However, after taking a numerical methods class, I decided to try and get better quality three-dimensional pictures. A two-step approach was taken; use of cubic spline interpolation (to make the heart look a little less choppy) and ray-tracing (to make it look a little more realistic). The ray-tracing program I use (MTV - public domain) takes an eon to run through just one frame (512 x 512 pixels), Multiply that by an 80 frame movie, and things start going a little slow - even on a DEC-5000/200."

"Also, I have a little time constraint. I am scheduled to give a paper on this stuff November 1st, at an IEEE Engineering in Medicine and Biology Conference. . . . "

"Do you think I have a chance at getting some Cray time on the NES Cray? I would like to use it to run the MTV raytracer. Of course, NERSC can have the pictures, as well as the X-based "movie" programs which I use to view the images. On a DEC-5000/200, I can get up to 35 frames/sec, and on a Sparc 1+ I can run movies at roughly 25 frames/sec."

"I realize this is a total shot in the dark, but I figured I would give it a try. Thanks for reading this message, and please let me know that you think. . . ."

The Cray time was allowed and Peter's results were very exciting. He was able to develop a cardiac "movie" loop. This generated a 3D reconstruction of the heart at nine different intervals, moved ahead one point in time, and shifted the view by 10 degrees in each pass. The end effect is 36 "frames", with the heart "beating" one complete cycle every nine frames. By repeating the 36 frames over and over, the heart appears to "beat" continuously, with the viewer walking around it.

Because Peter was an "ex-Superkid" we invited him to be one of our expert speakers at the 1992 High School Science Student Honors Program. He was very well received, presented his subject with a high degree of knowledge and enthusiasm, and related very well to the students. He demonstrated what can be done by being allowed access to National Education Supercomputer.

3. Any "quotable quotes"?

"Thanks again for the Cray time on the NES. Without the services NERSC provides, I would not have been able to produce images of this quality. The NES is a unique tool which serves its purpose very well."
Peter Daly

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Peter Daly
   1989 Rhode Island Superkid
   Senior - University of Rhode Island
   Department of Electrical Engineering

2. Date information was reported:

   June 19, 1992

3. Dates(s) of program or project:

   October 1991 through January 1992

   Sponsor(s):

   Department of Energy
   National Education Supercomputer Program
   University of Rhode Island

   Nature of activity:

   Utilized National Education Supercomputer for realistic animated renderings of the beating heart.

4. In some cases, it may be appropriate to follow up on information provided by your sources(s). Please list here pertinent details about referrals, such as names and phone number of people/projects/organizations to contact, document to review, and so on.

   Peter Daly
   URI Department of Electrical Engineering
   Kelly Hall Annex A-218
   Kingston, RI 02881
   (401) 789-0654 Voice
   (401) 782-1066 Fax

Poster created by Peter Daly attached.

Your name: **Susan Wiebe**

Position: **National Energy Research Supercomputer Center**
Education Program Administrator

Organization: **Lawrence Livermore National Laboratory**

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

Elementary teachers learned to demonstrate physical science principles taught in their science texts with the 130 physics and chemistry experiments each teacher must practice in the week-long Teachers Teaching Teachers workshop.

2. Give as much detail about the situation as possible:

The Rocky Flats Facility and the INEL have been working on a technical transfer of the Environmental Management-sponsored elementary teacher workshop "Teachers Teaching Teachers" since the May 1992 Spring Program Review. Eileen Jemison, Rocky Flats Education Outreach Coordinator, requested a short presentation on the program to take place in July or August. The INEL sent Kent Meikle, a developer and lead instructor for the program to Denver to demonstrate the program. Ms. Jemison and seven area teachers, including Penny Eucker, a secondary teacher in Denver, participated in the informal program demonstration as a means of evaluating the program for adoption and adaption for the Rocky Outreach portfolio. Ms. Eucker, a PhD candidate in science education, responded enthusiastically through a letter to Ms. Jemison, urging adoption of Teachers Teaching Teachers for the FY93 Outreach Program. Ms. Jemison forwarded the letter to the INEL Outreach Office.

3. Any "quotable quotes"?

August 18, 1992 - Teachers Teaching Teachers - Letter
Penny Eucker, Denver, Colorado secondary teacher, wrote after watching a Teachers Teaching Teachers demonstration, "I have reviewed several science programs in the Denver area, and Teachers Teaching Teachers is easily the best. It respects the teacher's ability to incorporate the science into the curriculum and conveys the spirit of discovery to students. With this program, new vitality could be injected into the curriculum."

Attach any photos, articles, or other material that would illustrate the anecdote.

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

August 18, 1992 92-RF-9675

Ms. Karen L. Hollister
Precollege Programs Administrator
INEL Office of Academic Programs
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, ID 83415

TEACHERS TEACHING TEACHERS (T^3) - EAJ-008-92

Dear Karen,

Thank you and Kent Meikle for sharing the T^3 concept. Kent presented the purpose, history, materials and successes with me and seven area teachers. The Teachers Teaching Teachers program is very exciting. Your success in the past three years must be gratifying.

We had four secondary and two elementary teachers attend Kent's demonstration. He gave us good information and a few quick demonstrations in the short time available. Our secondary teachers were very interested in pursuing this project, a letter from one of the participants is enclosed. The elementary teachers were also interested but somewhat reserved. Kent explained that during the first year, elementary teachers were recruited, however, in the past two years you have had to maintain a waiting list in spite of expanding the number of workshops available. That's success.

Rocky Flats is very interested in proceeding with the program. I have many questions and issues that I wish to discuss further with you, perhaps we could review them in the near future. Please call me at (303) 966-2302. Once again, I appreciate your efforts to share this program with Rocky Flats Plant.

Eileen

Eileen A. Jemison
EG&G Rocky Flats, Inc.
Education Outreach Coordinator

ej

Enclosure:
As Stated

MR. and MRS. WILLIAM EUCKER III
1777 LARIMER STREET
DENVER, COLORADO 80202

August 14,1992

Ms. Eileen A. Jemison
Educational Outreach Coordinator
EG&G Rocky Flats
Denver, CO 80402

Dear Eileen;

Thank you for inviting me to the Teachers Teaching Teachers review. I felt strongly about the concept and wanted to follow up. I have reviewed several science programs in the Denver area including the Amoco Science Project, Alliance for Science, and several sponsored by the Colorado School of Mines. Teachers Teaching Teachers is easily the best for several reasons. Primarily, it respects the teacher's ability to incorporate the science into the curriculum. It conveys the spirit of discovery to students. Science is a process not a workbook. Science at the elementary level should move toward the experiential and away from textbooks. According to the National Science Foundation, science interest begins a decline in the third grade. With this program, new vitality could be injected into the elementary science curriculum.

Similar programs can be found in the Denver area, but none are well funded. They lack the ability to follow through with materials and focus. The beautiful resource book clinches the usefulness of the one week workshop. As an extension to the project, teachers in Colorado have access to an 800# out of the University of Colorado which will answer any science question within 24 hours.

If introduced to Colorado, I would like to follow Teachers Teaching Teachers as part of my doctoral research in science education.

Respectfully,

Penny Eucker

Penny Eucker

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

In the Physical Sciences Revisited for Intermountain Educators (PRIME) workshop Junior high teachers spend a week in a secluded mountain resort learning physical science side-by-side with INEL scientists. Through numerous interactive demonstrations, at meal times, and during free time at the close of the day, scientists and teachers commune and question.

2. Give as much detail about the situation as possible:

Dr. Charlie Sellers, INEL scientist and PRIME presenter, (bearded in photo) described his experience with the 1992 PRIME workshop as, "PRIME looks like someone's birthday party. Someone cracking a bullwhip to demonstrate wave action, teachers experimenting with liquid nitrogen, lasers, telescopes, and optics. Even the quietest teachers talked with neighbors, and the conversations during meals were the most interesting and challenging. One teacher asked me, 'What is the nature of bonding metals?' Even scientists don't fully understand that concept, yet this teacher is trying to teach it to his students. I had to do some work to give him something he could take back to his students. Seeing the teachers so excited tells the story of PRIME's success."

3. Any "quotable quotes"?

"It was fun to be a kid learning new ideas again. PRIME is an ideal environment for learning and sharing our concerns in science. Thank you!

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):
   Dr. Charles Sellers, INEL Scientist
   EG&G Idaho, Inc.
   P.O. Box 1625
   Idaho Falls, ID 83415-2211
2. Date information was reported:
   June 21, 1992
3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   PHYSICAL SCIENCES REVISITED FOR INTERMOUNTAIN EDUCATORS (PRIME)

   Date(s) of program or project:

   June 15-19, 1992

   Sponsor(s):

   Energy Research

   Nature of activity:

   Teachers Enhancement Program emphasizing physical science

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   Dr. Charles Sellers, INEL Scientist
   EG&G Idaho, Inc.
   P.O. Box 1625
   Idaho Falls, ID 83415-2211

Your Name: Dr. Morgan McArthur

Position: Project/Program Engineer

Organization: EG&G Idaho, Inc.

ASST. PRINCIPALS
Ed Lloyd
Judi Taylor
ACTIVITIES DIRECTOR
Jim Nelson

Lake Hazel Middle School

11625 LA GRANGE
BOISE, IDAHO 83709
(208) 362-3703

LEE R. MITCHELL, PRINCIPAL

COUNSELORS
John Chastain
Marion Summers
Fritz Jenkins
PSYCHOLOGIST
B. Kent Harris

August 18, 1992

Director
INEL
Idaho Falls, ID 83415

Dear Sir,

I was one of the educators that had the extreme good fortune to attend the PRIME program held at Grand Targhee early this summer. The content of this program was most appropriate, and the presentation of the widely varied curriculum was accomplished in a very professional way. I am delighted that your Scientific community was willing and able to share your considerable expertise with those of us "in the trenchs" of public science education.

The PRIME program is an excellent forum for educators to upgrade their scientific knowledge, and provides an opportunity for us to meet our contemporaries in a casual environment. The sharing of experiences, both constructive and otherwise, enlarge our ability to make content presentations more effective in the classroom and laboratory.

I wish to formally acknowledge my sincere appreciation for the efforts of Dr. Morgan McArthur, who was the "velcro" that made the entire program run so smoothly and so effectively. His great good humor, obvious intelligence, and genuine dedication to the educational objectives of the PRIME program is most noteworthy. Please pass my congratulations to him for a job well done!!!

Joseph P. McMonigle
Chairman, Science Department

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

In the Physical Sciences Revisited for Intermountain Educators (PRIME) workshop junior high teachers spend a week in a secluded mountain resort learning physical science side-by-side with INEL scientists.

2. Give as much detail about the situation as possible:

Joe McMonigle is one of 20 secondary teachers who participated in the 1992 PRIME workshop. McMonigle was a model participant - enthused, inquisitive, and eager to help his colleagues. He was quick to note the value of using scientists as instructors for PRIME and had become an ardent marketer for future versions of the workshop.

3. Any "quotable quotes"?

See attachment

Attach any photos, articles, or other material that would illustrate the anecdote.

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

Junior high teachers spend a week in a secluded mountain resort in the Physical Sciences Revisited for Intermountain Educators (PRIME) workshop learning physical science side-by-side with INEL scientists. Through numerous interactive demonstrations, at meal times, and during free time at the close of the day, scientists and teachers commune and question.

2. Give as much detail about the situation as possible:

The PRIME participants share lodging during the week and become very familiar with each other. Denise Kessinger spent a good deal of her free time during the week with other female teachers. From the first day she heard her companions discussing their reticence about participation in the electricity unit. Ms. Kessinger also heard their comments concerning their attitudes toward teaching electricity following the unit.

3. Any "quotable quotes"?

June 18, 1992 - Physical Science Revisited for Intermountain Educators - Denise Kessinger, Arco Idaho secondary science teacher, said after watching another female teacher finally discover the in's and out's of electricity, "The women dreaded the electricity unit. It was scheduled for Thursday, the fourth day of the workshop, and all week the women said they had never taught electricity and were afraid to try it. The two scientists who taught it gave each of us individual attention for as long as it took to understand it. The women used the voltmeters and ammeters and actually learned what electricity is all about. Without that attention, those women would still avoid teaching electricity. Seeing attitude changes like that and finding out what scientists do and think were the best parts of PRIME."

Attach any photos, articles, or other material that would illustrate the anecdote.

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1. In one sentence, specify the learning, outcome, or result that was reported:

Elementary teachers learned to demonstrate physical science principles taught in their science texts with the 130 physics and chemistry experiments each teacher must practice in the week-long Teachers Teaching Teachers workshop.

2. Give as much detail about the situation as possible:

Denice Nelson (5th grade, Bunker Elementary, Idaho Falls) "I haven't taught science for 8 years. I'm not afraid of it now. I'm going to have journals and science centers in my class. If I'd known it was fun, I would have taught it long ago!" Ms. Nelson has taught elementary students for 25 years and has avoided teaching science wherever possible. She had not been prepared to demonstrate science in her own academic career and had not had pleasant experiences with the subject as a young student. With limited background and negative experiences, Ms. Nelson surprised herself with the enjoyment of the T3 workshop. She entered a reluctant participant and left a crusader convinced of the importance and the fun of science.

3. Any "quotable quotes"?

See No. 2 above.

Attach any photos, articles, or other material that would illustrate the anecdote.

Program Type: Teacher Research Participation

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify one specific outcome, learning, or result that was reported.

   Teachers will be able to incorporate the technology and information that was gained at CEBAF into the classroom.

2. "Quotable Quotes":

   "This is an enormous opportunity for teachers to learn applications of what they teach in the classroom. Hopefully it will give them an idea of what goes on in scientific research." - Phyllis Hunt

   "There can be no question that this will influence the way I teach, for instance, I will be able to assimilate the technology and information that was gained to the courses that I teach. Things that I never had a clear understanding of such as gluons and quarks will be transferred more efficiently into lectures on atomic structure." - Edwin Christmann

   "This type of experience helps to keep teachers aware of what they are training our youth to do when they leave the classroom." - Thomas Spencer

3. Give as much and as many examples as possible concerning #1.

   "During the past several years, students have come to me for assistance with personal projects. I have shied away from involvement because I knew my skills and knowledge of modern electronics was not up to par. Here at CEBAF, I received a crash course in modern electronics. I return to school with new confidence in my abilities. In fact, I plan to look into starting a science club with electronics as the main project area." - Thomas Codding

   "To share with my computer science students, I have frustrating tales of debugging, knowledge of the UNIX system, a better understanding of C, actually tested programming skills, and insight into the job description of a computer scientist. To share with my mathematics students, I have new applications of slope and acceleration, a new respect for the scientific process of gathering and analyzing data, and many applications concerning problem solving." - Barbara Thomas

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   TRAC Exit Report from Barbara Thomas, (804)838-2403
   TRAC Exit Report from Phyllis Hunt, (205)287-0690
   TRAC Exit Report from Thomas Codding, (904)383-6908
   STRIVE Exit Report from Thomas Spencer, (804)486-7688
   STRIVE Exit Report from Edwin Christmann, (804)428-2025

5. Append materials (photos, videos, newspaper articles, etc.)

Your Name: Janet Hill

Position: Education Activity Technician

Organization: CEBAF (Continuous Electron Beam Accelerator Facility)

Please fill in the information below about the data you are reporting:

a. Name of source and his/her position (if known):

Teacher fellows:
Phyllis Hunt (Curt Hovator, mentor)
Edwin Christmann (Al Guerra, mentor)
Thomas Spencer (Brian Kross, mentor)
Thomas Codding (Kelly Mahoney, mentor)
Barbara Thomas (Jorg Kewisch, mentor)

b. Date information was reported: August 1992

c. Specific program, project, or activity in which your source or the person(s) involved in e anecdote participated, including name, date(s), sponsor, nature of activity:

TRAC - Teacher Research Associates - program, sponsored by DOE, June - August 1992

STRIVE - Science Teachers Research Involvement for Vital Education - program, sponsored by DOE/NSF, June - August 1992

Strozak:mlo
October 14, 1992

Teachers STRIVE to become better researchers, educators

Program made one teacher "feel like a freshman"

by Paul D. Mantikoski

After nine months of teaching eight hours a day, five days a week, most teachers look forward to the relaxation that comes with summer vacation.

But this summer, 14 teachers, some from local schools and several from Florida and New Mexico, gave up their cherished summer sojourn to attend a teachers' summer school at CEBAF.

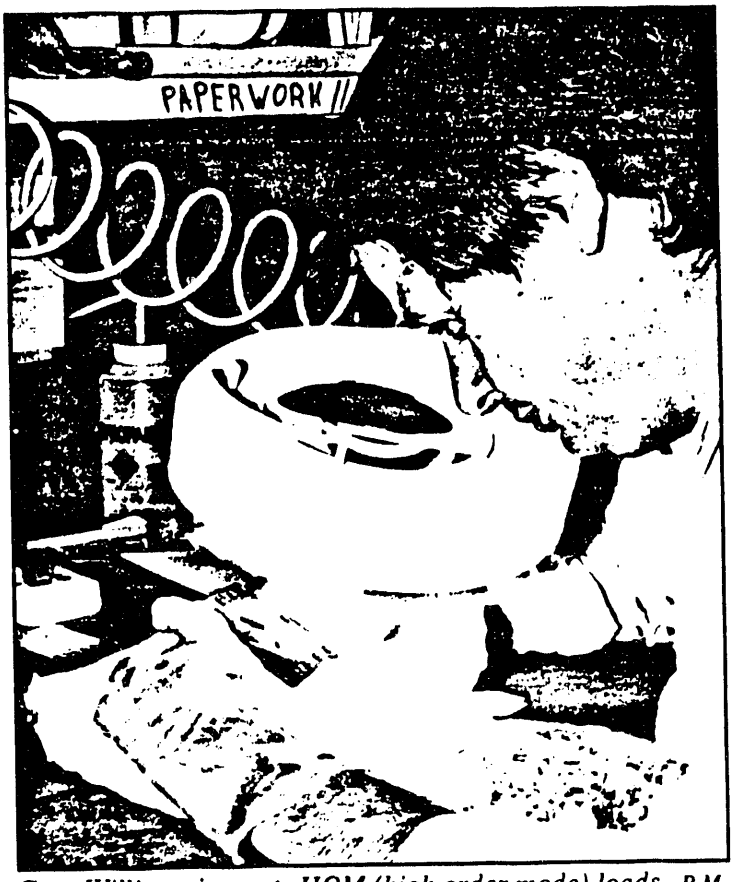
Teachers came to CEBAF through three eight-week programs--Science Teachers Research Involvement for Vital Education (STRIVE), Teachers Research Associates (TRAC), and BEAMS. They worked with engineers, physicists, and technologists on different research teams.

Tom Spencer, an electronics teacher and STRIVE participant from Western Branch High School in Virginia, thinks the program was great. "I love it. It's good for teachers to get out and get this hands-on experience," he said. "It's good to know first-hand what's going on with high-tech research and development."

Spencer spent his summer working with the Hall A vertical drift chamber gas system. He pointed out that while what he was doing did not closely relate to his class lessons, the methods he and staff members used to conduct research would definitely be beneficial.

"You have to keep the age, ability and interest level of the kids in mind," Spencer said. "If I came at them with the things I was doing directly, I'd lose them all." Using less abstract principles from what he learned this summer will help keep the interest level high in class this year.

An example of his research is sublimation, the passing of a solid into a gas or gas into a solid, without either becoming a liquid in the process. "I use the ice cube theory," said Spencer. "I ask them what happens to the ice cubes in the refrigerator when your family goes on vacation for a couple of weeks? When they can relate learning something new with something they're familiar with, it all becomes easier and more fun," he said.



Greg Williams inspects HOM (high order mode) loads. P.M.

Tom Spencer inspects the Hall A drift chamber gas system. P.M.

Spencer admitted that at the start of the summer program he felt almost like a freshman walking into his first science class. He credits his staff mentor, Brian Kross, and CEBAF staff for quickly working him into the research and making his work a part of it.

"Brian was a valuable resource from beginning to end," he said. "I couldn't ask for anything better. It was great working with him to see the way things progress."

Even though Spencer knew what his responsibilities and requirements were, he said it was interesting to see that some things remained up in the air. "There were times when the people I worked with wouldn't know what would happen or come next because it simply hadn't been done yet," he said.

Local

Daily Press

B

Teachers practice what they preach

Educators see theory in action

By Kirk Saville
Daily Press

NEWPORT NEWS

Barbara Thomas has been a computer science and math teacher for 22 years, but it wasn't until this summer that she got a close-up look at how those subjects are used outside the classroom.

"I'm a computer science teacher, and I've never programmed a computer before," said Thomas, who has taught at Phoebus High School since 1977. "I talk about computer scientists all the time, but I've never seen one in action before. Now I feel like I've been one."

Thomas and 13 other teachers spent the last eight weeks at CEBAF, as part of two programs sponsored by CEBAF and the Department of Energy. Most of the teachers worked on research projects alongside CEBAF scientists and engineers.

Most of the teachers are from Hampton Roads, but some are from as far away as Florida and New Mexico.

The programs are designed to expose teachers to a research environment, a new experience for some.

The Continuous Electron Beam Accelerator Facility is a $551 million physics lab under construction in Newport News. When the project is completed, physicists will accelerate electrons to nearly the speed of light before smashing them into atomic targets. Scientists hope the collisions will give them clues as to how atoms are held together.

Thomas spent the summer working on computer programs used to monitor the equipment in the accelerator. She said she would probably spend the first week of class telling students how she spent her summer vacation. "The whole experience is overwhelming for me," said Thomas.

CEBAF officials said one purpose of the program is to get teachers enthusiastic about science so they will share their enthusiasm with students.

Beverly K. Hartline, CEBAF associate director, said the pro-

Please see Teach/B2

Barbara Thomas was one of several local teachers who spent the summer at CEBAF.
Kenneth D. Lyons/Daily Press

Teach

Continued from B1

gram exposes teachers to how science is done.

"It's not as cut and dried as the textbooks make it," Hartline said. "There's a lot of trial and error. There's a real dimension you gain by having done science, instead of reading about it in a book."

Hartline said the trial and error — the "thrill of the chase" — is one of the most exciting elements of science. It's one that often fails to come through in textbooks.

That was something Rachael Cofer, a math teacher at James Blair Middle School in Williamsburg, learned from working with CEBAF's radiation detection system.

"It was real interesting to see that things did not come out nice and clean and easy," Cofer said in a presentation on her project. "I have a whole different perspective on how to go about problem solving."

One lesson the teachers got from the program is that research doesn't work on a schedule. "Teachers are so scheduled," said Susan Moore, a physics and chemistry teacher at Menchville High School in Newport News.

"We think things have to happen by a certain bell. If it doesn't happen by second period, it's not going to happen."

For Moore, the summer job meant freedom from bells. "There are no bells, and I may leave my room without having someone cover for me," Moore said.

Program Type: Teacher Research Participation

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1. In one sentence, specify one specific outcome, learning, or result that was reported.

   Teachers realized how important it is for students to learn to solve real-world problems.

2. "Quotable Quotes":

   "Teaching science instead of teaching about science." - Laymond North

   "I have to say that my experience doing research has changed my perspective on 'problem solving.' I will look for real world problems for them (students) to solve not only from my CEBAF experience, but from other sources as well." - Rachael Cofer

3. Give as much and as many examples as possible concerning #1.

   "In the real world, if you solve a problem, there is no 'answer key' to verify one's solution. Different approaches to solving a problem may exist that produce a workable solution, but researchers analyze them to select the solution that seems 'best' for the problem at hand. This careful analysis will help me to impress upon students the importance of 'thinking for themselves' and the need to be willing to take risks." - Rachael Cofer

   "I plan to incorporate problem solving into my daily teaching of mathematics rather than just at the end of a chapter by:
   1. looking for more real-world problems to solve;
   2. using class time to analyze a problem's multiple approaches as cooperative learning activities and class discussions;
   3. give students more opportunities to think and analyze rather than to just do computation drills." - Rachael Cofer

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   STRIVE Exit Report from Rachael Cofer, (804)898-9129
   Laymond North, (804)838-2438

5. Append materials (photos, videos, newspaper articles, etc.)

Your Name: Janet Hill

Position: Education Activity Technician

Organization: CEBAF (Continuous Electron Beam Accelerator Facility)

Please fill in the information below about the data you are reporting:

a. Name of source and his/her position (if known):

Teacher fellows:
Rachael Cofer (Bob May, mentor)
Laymond North (Curt Hovator, mentor)

b. Date information was reported: August 1992

c. Specific program, project, or activity in which your source or the person(s) involved in e anecdote participated, including name, date(s), sponsor, nature of activity:

TRAC - Teacher Research Associates - program, sponsored by DOE, June - August 1992

STRIVE - Science Teachers Research Involvement for Vital Education - program, sponsored by DOE/NSF, June - August 1992

Strozak:mlo
October 14, 1992

Program Type: Teacher Research Participation

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1. In one sentence, specify one specific outcome, learning, or result that was reported.

   Teachers realized how important it is for students to learn to solve real-world problems.

2. "Quotable Quotes":

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   "I have to say that my experience doing research has changed my perspective on 'problem solving.' I will look for real world problems for them (students) to solve not only from my CEBAF experience, but from other sources as well." - Rachael Cofer

3. Give as much and as many examples as possible concerning #1.

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   "I plan to incorporate problem solving into my daily teaching of mathematics rather than just at the end of a chapter by:
   1. looking for more real-world problems to solve;
   2. using class time to analyze a problem's multiple approaches as cooperative learning activities and class discussions;
   3. give students more opportunities to think and analyze rather than to just do computation drills." - Rachael Cofer

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   STRIVE Exit Report from Rachael Cofer, (804)898-
   Laymond North, (804)838-2438

5. Append materials (photos, videos, newspaper articles, etc.)

Your Name: Janet Hill

Position: Education Activity Technician

Organization: CEBAF (Continuous Electron Beam Accelerator Facility)

Please fill in the information below about the data you are reporting:

a. Name of source and his/her position (if known):

Teacher fellows:
Rachael Cofer (Bob May, mentor)
Laymond North (Curt Hovator, mentor)

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October 14, 1992

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1. In one sentence, specify one specific outcome, learning, or result that was reported.

   Teachers gained a new appreciation for teamwork.

2. "Quotable Quotes":

   "To share with my students, I have the CEBAF story and a new appreciation for teamwork." - Barbara Thomas

   "I was treated as if I belonged, and was a team player. I learned not only about technology, but about being a professional." - Rachael Cofer

3. Give as much and as many examples as possible concerning #1.

   "The people at the Machine Control Center work as a team, and are each and every one of them willing to help. I know because I think I eventually asked each one of them for help at some time or other. It was an interesting teamwork philosophy that I witnessed. Each person had a particular task or set of tasks, but when finished it all tied together." - Barbara Thomas

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   TRAC Exit Report from Barbara Thomas, (804)838-2403
   STRIVE Exit Report from Rachael Cofer, (804)898-9129

5. Append materials (photos, videos, newspaper articles, etc.)

Your Name: Janet Hill

Position: Education Activity Technician

Organization: CEBAF (Continuous Electron Beam Accelerator Facility)

Please fill in the information below about the data you are reporting:

a. Name of source and his/her position (if known):

Teacher fellows:
Barbara Thomas (Jorg Kewisch, mentor)
Rachael Cofer (Bob May, mentor)

b. Date information was reported: August 1992

c. Specific program, project, or activity in which your source or the person(s) involved in e anecdote participated, including name, date(s), sponsor, nature of activity:

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Strozak:mlo
October 14, 1992

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1. In one sentence, specify the learning, outcome, or result that was reported:

   Mary Zinn collaborated with her mentor and post doc to develop a new technique for separating thorium for dating of geological materials.

2. Give as much detail about the situation as possible:

   Mary didn't feel that her background was good enough for this project. She has had only three physics courses and the bulk of the project involved lasers and high energy physics. She added that she initially spent much of her time reading and felt very frustrated with the volume of material and the complexity of the subject.

   The laser broke down fairly early in the project, which led to the development of another technique in order to date of the rock samples. She was able to fully participate in this portion of the project and found it immensely exciting and satisfying work.

   The Friday tours and seminars were "simply incredible". The speakers were very gifted, people were very open and receptive. David Mann (Thin Sectioning Lab) was just delightful as was Mike Kauffman (Omega West Reactor). (David was "out-of-sight") Mary was impressed by how receptive laboratory scientists were to questions and suggestions and that there were no power games (intellectually).

   Housing was an "endless nightmare". Mary said she wouldn't have minded the hassle except for the fact that "housing led me to believe they would do something, then didn't. In the meantime, time had passed. Spring was very traumatic (in reference to obtaining housing)." Most of the TRAC participants had "a bad experience" with housing and found it very frustrating.

3. Any "quotable quotes"?

"I loved it (TRAC experience). It was the most interesting, useful and professional experience I've had since graduate school. The program was superbly run. The research was very exciting. However, TRAC needs better advertisement." Almost everyone who was accepted into the program happened onto a tiny blurb in some publication. She went on to say that information about the TRAC program should be run in The Science Teacher, The Physics Teacher, Physics Today, Scientific American, and in the NSTA Reports.

"I learned an immense amount (lots of reading), but I felt very stupid for most of the early part of the project. I spent a lot of time watching the post doc working with the laser at first because it was very touchy and required a professional hand in order to function properly. Then, fortunately, the laser died and while we were waiting for a repair person, the post doc stopped the project and taught me about the techniques involved."

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Mary Zinn, Ph.D in chemistry from Duke University, teaches chemistry at Lake Ridge Academy, North Ridgeville, OH.

2. Date information was reported: October 28, 1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   TRAC, Resonance Ionization Mass Spectrometry and Photon Burst Mass Spectrometry

   Date(s) of program or project: Summer 1992

   Sponsor(s): Bryan Fearey (mentor)

   Nature of activity:

   Development of a method of thorium identification using mass spectrometry and photon burst mass spectrometry.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

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1. In one sentence, specify the learning, outcome, or result that was reported:

   William has transferred his research experience in which he took part in the design of a portable electron scattering gun into his classroom.

2. Give as much detail about the situation as possible:

   William was very positive about his TRAC experience. He "enjoyed everything" and would take a second term in an instant if it were available. It was one of the most exciting times of his life.

   William's project was putting together a portable electron scattering gun, part of a Star Wars project that had lost funding. He indicated that it was very interesting to see what could be done on a project like this without a budget.

   William has also disseminated materials that he took back to other teachers in his school and in his area.

3. Any "quotable quotes"?

   "The tours were just fabulous. My only complaint is that there weren't enough of them. I would like to have had two tours per week instead of one so we could have seen more of what was going on at the lab."

   "My mentor gave me a lot of freedom in the design and implementation of the research, but was also available to help or to answer questions."

   "I brought back a lot of materials and my students have asked so many questions. I set up the poster in my classroom where students had access to it and they have responded so well to it. We have had long discussions in class about the differences between school and a laboratory and between governmental and industrial research."

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   William Madden, B.S. in education, M.S. in Industrial Engineering, Morehead University, teaches physics at Scioto County Joint Vocational School, OH.

2. Date information was reported: October 27, 1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   TRAC, development of a portable electron scattering gun.

   Date(s) of program or project: Summer 1992

   Sponsor(s): John Kinross-Wright (mentor)

   Nature of activity:

   Development of a workable plan for a portable electron scattering gun from available materials.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

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1. In one sentence, specify the learning, outcome, or result that was reported:

   Randy Martinez has transferred his work in industrial wiring and computer drafting to his science classroom.

2. Give as much detail about the situation as possible:

   Randy is a computer drafting teacher who is also a journeyman electrician. He said his project was an absolutely perfect match. He spent time learning about (hands on) industrial wiring, transformers, worked on a remodeling project at TA-35, and had an opportunity to work in the physics lab testing electrical equipment.

   Randy would have liked to have seen more integration with the other teachers and have more opportunities to share their knowledge and expertise. "There was a lot of interesting stuff that other teachers were doing that I would like to have seen."

   Randy felt that TRAC participants could have put their posters together for less money and less frustration if they had gotten together to discuss it.

   Randy has used much of his experience in his classroom. His students have used the Energy Simulator and reviewed a piece of software on nuclear reactors. He has field trips planned to hydroelectric power plants in the area and has designed a unit of alternative forms of energy.

3. Any "quotable quotes"?

   "My background came in handy; I was able to apply what I already knew as well as learning new things. I learned how computers fit into industry and I have added that to my school curriculum. My students are now doing prototype drawings (drafting) and working out the attributes of a electrical system."

"The tours were terrific and having access to the library was just great. I would like to have toured the areas where teachers were doing research. I was sad that I only got to see what everyone else was doing at the poster session (after the research was complete)."

"Each group has specialized equipment that would have been useful for everyone. Some had great graphics, some color printers, etc. It would also have been more interesting to have worked on this together. Some teachers are artistic, some manipulate data well. It would have been good to have shared our skills."

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Randy Martinez, M.A. Industrial Education, teaches industrial arts and computer drafting at Espanola Valley High School, NM.

2. Date information was reported: October 28, 1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   TRAC, Design of mechanical and electrical facilities and drafting with auto-cad

   Date(s) of program or project: Summer 1992

   Sponsor(s): Ross Garcia (mentor)

   Nature of activity:

   Randy used computer drafting to design wiring for buildings, then installed the equipment.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

Teachers Get Insiders' View Of Los Alamos

By Steve Sandoval

JOURNAL STAFF WRITER

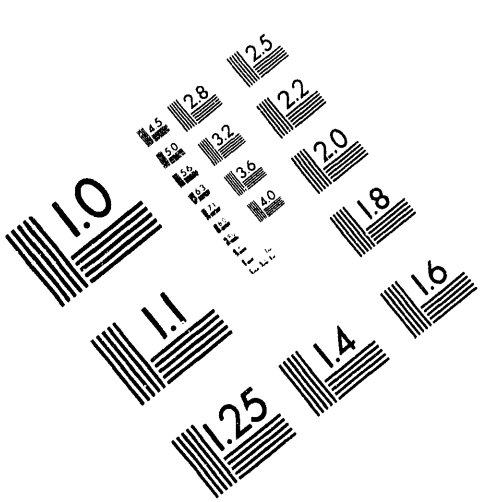
LOS ALAMOS — Pojoaque High School biology and science teacher Ray Padilla had no idea what he was getting into when he applied for a place in the Teacher Research Associates program this summer at Los Alamos National Laboratory.

"I didn't know anything about the program," Padilla recalled this week. But after he was paired with Los Alamos scientists Nicholas Nogar, Ross Nuenchausen and Ron Estler, Padilla ended up making superconducting films and working with radioac-

MORE See TEACHERS on PAGE 6

SYDNEY BRINK / JOURNAL

Dulce High School teacher Maria Abeyta-Garcia examines a culture of petunia cells as James Heyser, her sponsor, looks on.



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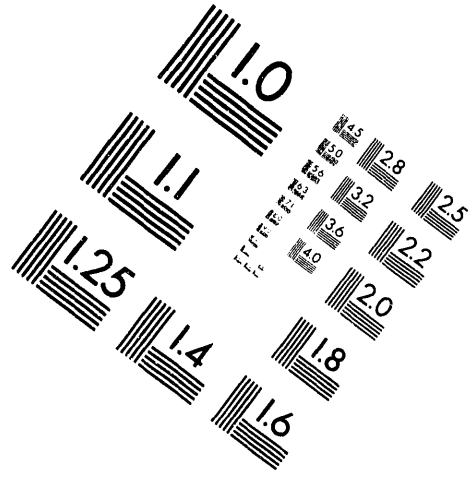
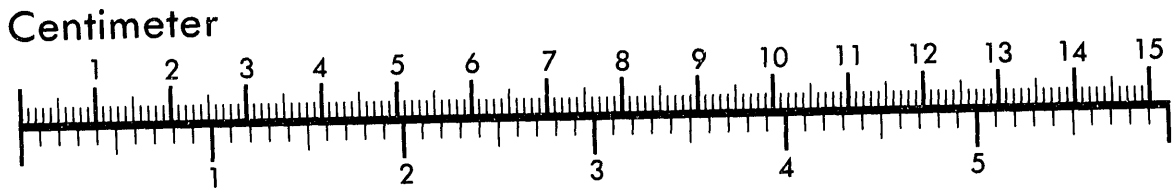
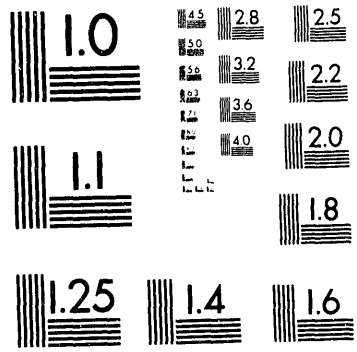
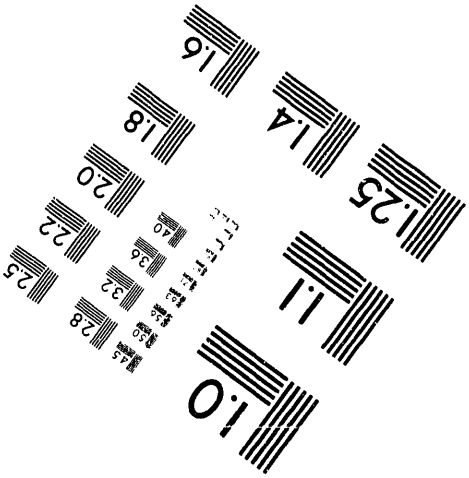
Silver Spring, Maryland 20910

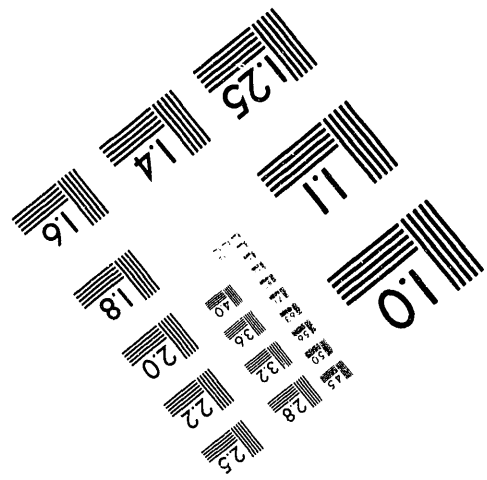
301/587-8202











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3 of 3

DOE's National Teacher Enhancement Project

Lab helps educate precollege science teachers

Details of a national program to educate precollege science teachers were discussed Jan. 16 at the annual meeting of the American Association for the Advancement of Science in San Francisco. (See Jan. 13 Newsbulletin.)

The National Teacher Enhancement Project is sponsored by the U.S. Department of Energy and administered by a group of DOE facilities including Los Alamos National Laboratory. It was initiated by several DOE facilities to develop partnerships between the nation's laboratories and its schools.

Judith Kaye, acting group leader of Educational Programs (CPA-2) at Los Alamos, and Lucille Day, an education specialist at Lawrence Berkeley Laboratory, described the effort in detail for the AAAS.

The project is a two-pronged approach to increasing the number of skilled science teachers in elementary and secondary schools throughout the United States.

It includes hands-on research experience for a select group of outstanding high school teachers. Another element, yet to be funded, would establish science training for elementary and middle school teachers.

About half of the 23 national laboratories that now sponsor precollege education programs are working together on the National Teacher Enhancement Project.

The program seeks to link current scientific research to scientific curriculum and to increase awareness and understanding of present-day science and technology among teachers. Another goal is to help participants build leadership skills so they are better equipped to share this knowledge with students and other educators.

. . . linking current scientific research to scientific curriculum and increasing awareness and understanding of present-day science and technology among teachers . . .

One component of the project, the Teacher Research Associates program, will give talented high school math and science teachers research experience through summer employment at one of 11 national research facilities.

Recruitment will be aimed at teachers of biology, chemistry, computer science, earth science, mathematics, physics, agriculture, engineering and technology, materials science and medical science.

The program is an outgrowth of the DOE's Residence in Science and Technology program, which brought high school teachers to DOE national laboratories each summer from 1985 to 1988. The first group of about 125 Teacher Research Associates will be placed this summer.

Participating DOE research facilities and university consortia include Argonne National Laboratory in Illinois; Associated Western Universities Inc. in Salt Lake City; Brookhaven National Laboratory in Upton, N.Y.; Fermi National Accelerator Laboratory in Batavia, Ill.; the Idaho National Engineering Laboratory in Idaho Falls.

Also the Inhalation Toxicology Research Institute in Albuquerque, N.M.; Lawrence Berkeley Laboratory in California; Los Alamos National Laboratory; Oak Ridge Associated Universities Inc. and Oak Ridge National Laboratory in Tennessee; Pacific Northwest Laboratory in Richland, Wash.; Sandia National Laboratories in Albuquerque, N.M.; and the Solar Energy Research Institute in Golden, Colo.

In addition to the high school program, a proposal has been submitted to the National Science Foundation for its support of training for elementary and middle school teachers. The goal of the K-8 Project is to improve the general level of science instruction in regions served by each laboratory. The program will include math and technology training.

—Kathy Haq

Newsbulletin, Jan 20, 1989

The New Mexican,
Santa Fe, N.M.
July 23, 1989
Places and Faces

□□□

The following nine New Mexico teachers are getting experience in their fields this summer by conducting research at Los Alamos National Laboratory: **Ernest E. Quintana** of Las Vegas, J. **Scott Kerr** of Questa, **Maria Abeyta-Garcia** of Dulce, **John D. Drabanski** of Santa Fe, **Ann C. Downes** of Santa Fe, **Thomas Lopez** of Espanola, **Raymond Padilla** of Santa Fe, **Fannie Sapir** of Los Alamos, **Juan A. Maestas** of Gallina and **Catherine Cottingame** of Los Alamos

Juan Maestas

Studies at Los Alamos

Fermilab

Fermi National Accelerator Laboratory
MS 226 • P.O. Box 500
Batavia, Illinois 60510
708-840-3092 • FAX 708-840-4343

Education Office

ANECDOTAL DATA REPORT FORM

Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Kristin Ciesemier, Program Leader

2. Date Reported: August 4, 1992

3. Program: Topics in Modern Physics (TMP) National Institute
   Dates: July 6 - July 24, 1992
   Sponsor: DOE
   Nature of Activity: High School Physics Teacher Enhancement

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   See quotes below from letter dated August 4, 1992 by Helen Perry, program participant from Mississippi School for Math/Science, Columbus, Mississippi.

5. "Quotable Quotes":

   "It was a wonderful experience, and it [is] my sincere belief that I will return to the physics classroom with more knowledge and expertise in the area of particle physics. It is my intent to share this acquisition, as well as my enthusiasm concerning physics education, with other science teachers in Mississippi. Then not only my students, but also their students, may benefit from my experience at Fermilab."

6. Other details:

7. Related Information.

Fermilab

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Education Office

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Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Kristin Ciesemier, Program Leader

2. Date Reported: August, 1992

3. Program: Topics in Modern Physics (TMP) National Institute
   Dates: July 6 - July 24, 1992
   Sponsor: DOE
   Nature of Activity: High School Physics Teacher Enhancement

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   See quotes below from letter by Mark David, program participant from Gross Pointe South High School, Gross Pointe, Michigan.

5. "Quotable Quotes":

   "For the past 3 weeks I was privileged to be part of the 'Topics in Modern Physics National Institute' for high school teachers. It was a super, high energy, enlightening experience!"

   "Like many others in this program, I have come away with a new awareness of your mission in physics research and physics education. I will be able to incorporate much of what I have learned into my physics courses. Thank you for helping me to become a better physics teacher. "

6. Other details:

7. Related Information.

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708-840-3092• FAX 708-840-4343

Education Office

ANECDOTAL DATA REPORT FORM

Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Kristin Ciesemier, Program Leader

2. Date Reported: August 10, 1992

3. Program: Topics in Modern Physics (TMP) National Institute
   Dates: July 6 - July 24, 1992
   Sponsor: DOE
   Nature of Activity: High School Physics Teacher Enhancement

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   See quotes below from letter dated August 10, 1992 by Sister Mary Catherine Burns, program participant from Coyle & Cassidy High School, Taunton, Massachusetts.

5. "Quotable Quotes":

   "I came home...with new information, with a clearer understanding of...modern physics...and (best of all) with and enthusiasm about the subject that demands sharing. My students and colleagues will truly benefit from my experience. There is no way my courses can be the same as they were last year!" "Many of us teach in small schools and have little opportunity to talk physics with other physics teachers. What a great lift it was to be able to discuss content as well as methodology with peers." "...many of us will collaborate in the fall and continue to communicate with each other thoughout the coming year. The contacts we made are so enriching."

6. Other details:

7. Related Information.

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Education Office

ANECDOTAL DATA REPORT FORM

Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Walter Schearer, Project Coordinator
   Kristin Ciesemier, Program Leader

2. Date Reported: July 24, 1992 and August 10, 1992

3. Program: Topics in Modern Physics (TMP) National Institute
   Dates: July 6 - July 24, 1992
   Sponsor: DOE
   Nature of Activity: High School Physics Teacher Enhancement

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   Mary Anne Wells, Newark, Deleware was a TMP program participant and verbally reported (7/24/92) to Walt Schearer her enthusiasm and that she intended begin a Master's degree program.

5. "Quotable Quotes": The quotes below were taken from a letter by Mary Anne Wells dated August 10, 1992 which was addressed to Kris Ciesemier.

   "It was definitely the best educational experience that I have had following my undergraduate education." "I look forward to integrating more modern physics into my curriculum and to sharing everything with my colleagues in Deleware this fall." "The experience has also motivated me to apply for the DOE TRAC program for next summer and to finally apply for graduate school!"

6. Other details:

7. Related Information.

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708-840-3092 • FAX 708-840-4343

Education Office

ANECDOTAL DATA REPORT FORM

Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Kristin Ciesemier, Program Leader

2. Date Reported: August 7, 1992

3. Program: Teacher Research Associates Program (TRAC)
   Dates: June 15 - August 7, 1992
   Sponsor: DOE
   Nature of Activity: Research participation for secondary teachers

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   John Cooper, program participant from Window Rock High School, Window Rock, Arizona said his research appointment was a perfect fit and that he hoped to use his Follow On Award to purchase and build instructional physics equipment like those he saw or received information on while at Fermilab to make science more hands-on for his Native American students.

5. "Quotable Quotes":

6. Other details:

7. Related Information.

Fermilab

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Batavia, Illinois 60510
708-840-3092 • FAX 708-840-4343

Education Office

ANECDOTAL DATA REPORT FORM

Name: Kristin Ciesemier
Position: Program Leader
Organization: Fermi National Accelerator Laboratory

1. Source Name/Position: Kristin Ciesemier, Program Leader

2. Date Reported: August 7, 1992

3. Program: Teacher Research Associates Program (TRAC)
   Dates: June 15 - August 7, 1992
   Sponsor: DOE
   Nature of Activity: Research participation for secondary teachers

4. Specific outcomes, learnings, or results that were reported (give details and examples):

   See quotes below from a letter dated August 7, 1992 by program participant Bruce Mason, Lindley Middle School, Mableton, Georgia.

5. "Quotable Quotes":

   "The professional value of the experience turned out to be more than I could have imagined."

   "Aside from the skills and information I may have learned while here, (and that was a considerable amount) this total immersion into the heart of real science has resulted in the fact that I will never teach science the way I did before. I cannot imagine any science teacher not feeling the same way after being here."

6. Other details:

7. Related Information.

NREL LabTalk

They're more than just "NEPA police"

Deborah Amidaneau, Staci O'Connell, and Maureen Jordan (left to right) of the Environmental Section enjoy their outdoor lab.

Enforcing the National Environmental Policy Act, or NEPA, and all other government environmental regulations is a critical function of the staff in the Environmental Section of the Safety and Security Office. But it isn't all they do. And according to Environmental Section Manager Deborah Amidaneau, it isn't always "the fun part" of their job, either.

In that case, what *are* the fun parts of their job?

The answer has to do with NREL's 300-acre permanent site being a kind of natural outdoor laboratory; it also has to do with mentoring several summer interns and a teacher.

Because abundant animal and plant life inhabit the permanent site, geologic surveys, soil profiles, wildlife dynamics studies, and plant life assessments are all in a day's work for the Environmental Section.

For example, a large mule deer herd lives in the area; according to Amidaneau, this herd watches the SERF construction with great interest. Other wildlife observed there include red fox, raccoon, jackrabbits, coyotes, red-tailed hawks, a golden eagle, and the ever-present rattlesnakes. Great care is taken during the construction not to disturb the animals' feeding and nesting areas.

A two-year botanical project is also under way to collect and identify vegetation on the site. This could result in a botanical library for the proposed visitors' center. "We're also working on creating an environmental education center that will go hand in hand with the kind of research that NREL does," Amidaneau said. The section has plans for a nature trail on South Table Mountain and a laboratory for in-house soil and water analyses.

Supporting education is another enjoyable part of their work. The three staff members

See ***NEPA*** *on page 3* .

inside

Volume 1, Number 8
August 1992

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Farewell to Beth Whyman 5
Minority students excel 6
Helena Chum is honored 7
One mother's viewpoint 8

Students do research. See page 6.

Teachers keep science

id education on TRAC

Hanks, who teaches physics at Denver's Thomas Jefferson High School, worked with Blaugher's group in superconductivity; he'll demonstrate some measurement techniques he learned when he returns to school. "This summer has been my most exciting experience in science," he said. "I was really impressed by the helpfulness of the people here. I hope this program continues."

Reid, a physics teacher at Green Mountain High School, worked with Education Programs Administrator Linda Lung on a teacher-training module integrating microcomputer-based science labs and project-based learning. "The summer program is an extraordinary opportunity for teachers. But the big winners are the children," Reid said.

Gilbert teaches high school math in Kirtland, New Mexico, and worked with Craig Christensen and Chuck Kutscher. She said, "The benefit for me was tremendous. I'm much more comfortable with solar science and scientific instruments now."

The enthusiasm, dedication, and talents of these science and math teachers suggest that our students are learning a lot in school and having fun, too. **PJP**

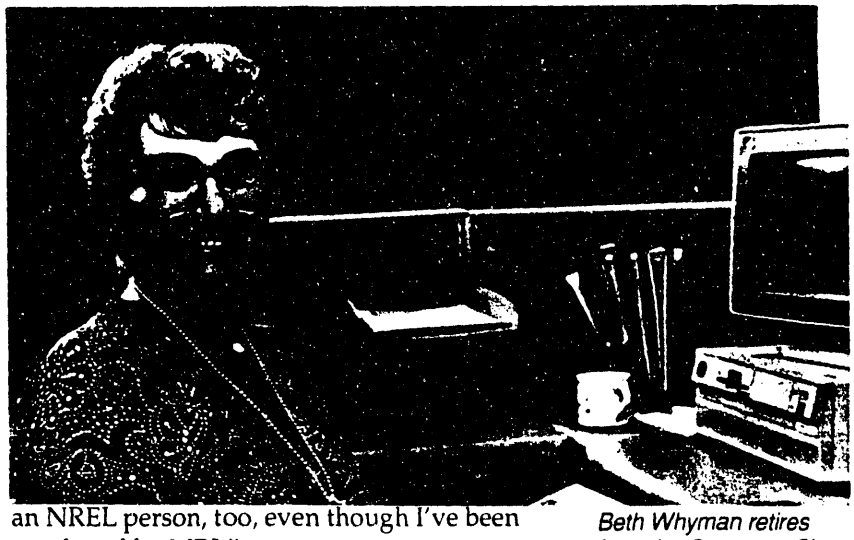
Beth Whyman retires

One of our most engaging and dedicated co-workers is retiring on September 1. Beth Whyman bids us farewell after more than nine years as the administrative assistant for MRI's Corporate Site Office at NREL.

Starting out as a temporary, Beth became a full-time SERI employee in 1980. She worked for several different people, including Sylvia Motazedi and Ken Touryan, before joining the MRI Corporate Site Office in 1983. Since then, she has reported to Jack Dinwiddie and provided administrative support to other MRI staff members, such as Don Kornreich, Bill Davis, and Harry Peebles, when they've been in Golden.

Though her hours have been fewer in recent years, she's always had a more-than-full-time commitment to her job. Her co-workers will remember soft-spoken Beth as a capable, dedicated, caring worker ready to fill any administrative request from DOE, MRI, or NREL. If they could imagine a motto for Beth, it might be this: "Not snow, nor rain, nor heat, nor night keeps her from accomplishing her appointed course," because she never let a little thing like terrible weather keep her from her work.

As an MRI employee working at NREL, Beth says she's never felt like an outsider because she's never been treated like one. "I feel like an NREL person, too, even though I've been employed by MRI."



Beth Whyman retires from the Corporate Site Office in September.

Among her memories is the brand new suit she wore to provide support to former Energy Secretary Hodel when he visited NREL. (She took some good-natured kidding about that.) Her fondest memory, though, will be of the people she's worked with. "The people of NREL make it really special. This talented staff keeps you on your toes and keeps you challenged. I've thoroughly enjoyed them."

We'll miss her, but we wish her the best as she and her husband take some long-delayed trips and spend more time on the golf links. Good luck, Beth; thanks for your enduring commitment and concern for us. **PJP**

July 25, 1992
13287 W. Montana Place
Lakewood, Colorado 80228

Ms. Linda Lung, Administrator
Office of Education
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Linda,

I find it very difficult to believe the summer is more than half over! The thought of time 'flying' as one has fun is most appropriate for the activities I have been involved with during my experience at NREL. Seldom during my summer employments have I had an opportunity to work and prepare simultaneously. And, with certainty, I have never had the degree of freedom and encouragement which you have offerred through this assignment. As I begin making those last strides of my professional career, this summer's events and experiences will rank high among those career opportunities that were both beneficial and joyful.

I appreciate your commitment for excellence among teachers, administrators and citizens of Colorado and across our Nation. These times are very different from many perspectives. Yet, when one takes the time to look at the wonderous gifts of time and effort shared and given by you and those associated with the 'Colorado Alliance for Science', we receive a full measure of encouragement. It is my wish and hope that experiences similar to those afforded me this summer will await others in the future. Always present is the specter of what might be done if we only had ... more, more time and more resources. But, as I worked along this summer, it also became a time of reflection and thanksgiving. Change during the near thirty years spanning my career have been both significant and bountiful. I have known the joy of working with many very talented people: teachers, instructors, administrators, scientists and many students. The people of our Country are creative and gifted in so many ways. Keeping this ever present is a most important plus as we weigh events affecting the 'ebb and flow' of community, national and world events.

It is my hope that the product of this summer's work will benefit both the teachers and students in our immediate community. Should this model for 'teacher training' prove to be successful, hopefully it will be used in a broader context. And, it would open the possibility of working with you again. Your professional style and your positive, winning personality are immediate cause for hope of future opportunities . Again, I want to thank you, the Gates Foundation, the Colorado Alliance for Science and the National Renewable Energy Laboratory for this wonderful, professional opportunity.

With High Regard,

Dave

David D. Reid
Green Mountain High School

August 8, 1992
13287 W. Montana Place
Lakewood, Colorado 80228

Admiral James D. Watkins,
The Secretary of Energy
United States Department of Energy
Washington, DC 20585

Dear Admiral Watkins,

I would like to take this opportunity to thank you, The Department of Energy, The National Renewable Energy Laboratory in Golden, Colorado and most especially Linda Lung, Administrator of Educational Programs at this site for one of the most gratifying experiences of my life. Opportunities such as this one are of vital importance if we are to make progress on returning our Country into a state of world-class excellence and leadership in education and scientific expertise.

I have been blessed during my teaching career to be on the 'cutting edge' of change and to work with a cadre of professional leaders. These associations have significantly affected my view of excellence in education and have reinforced my commitment of time and talent to provide our students with a quality experience and opportunity. Since the summer of 1985, a number of unique opportunities have provided me a window to view 'a bit' into the future of education and communication. Through this vision, I see the microcomputer being the central component in this change. The bias associated with this view comes from experiences and involvements with the The American Association of Physics Teachers 'Physics Teacher's Resource Agent (PTRA)' Program and the Technical Education Research Center in Cambridge, Massachusetts. Through grants received from the National Science Foundation, both of these groups have developed ancillary hardware and software components to collect and analyze data gathered from remote sensors in a near 'real time' environment, the 'microcomputer based laboratory.' The product from these inquiries can be easily incorporated into a wordprocessing applications to form a document which can be presented in hardcopy or electronic formates. These two formates provide a multitude of options for distribution and ultimate communication. Today's students will be using these skills and others(in particular, the audio-digitizers) to enhance the electronic telecommunications options in tomorrow's marketplace.

At no other time in my twenty-nine year professional experience have I had an opportunity to link the efforts of so many into one piece of work. The direct product of this summer's work has given me such an opportunity. Hopefully, as we try to field test this strategy for teacher training with secondary science teachers in the Jefferson County Public Schools of Golden, Colorado, very positive responses will occur. Again, Thank you: NSF, AAPT, TERC, NREL and Jeffco.

With High Regard,

David D. Reid

David D. Reid
Green Mountain High School

August 13, 1992
Aurora, CO

Mr. Duane N. Sunderman, Director
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401-3393

AUG 14 1992

Dear Mr. Sunderman,

I was one of the teachers that had the opportunity to participate in the Teacher Research Associates (TRAC) Program this summer at NREL. I was fortunate to have Mr. Dick Blaugher as my mentor and I wish to express my gratitude to you and all of the staff at NREL for allowing me to have one of the most rewarding experiences that I have had in twenty-five years of teaching.

Opportunities such as these are rare and have immeasurable value to those of us chosen to participate. Like most science teachers, I have never had the opportunity to do "real science". This experience has allowed me to reconfirm my convictions that certain concepts and skills are necessary for students to learn and to discover that other concepts and skills are not so necessary. I am convinced that what I teach this next year will have real value to my students and will prepare them to be more successful in their endeavors after graduation from high school.

On a personal level, this experience has given me a much needed boost in enthusiasm. After twenty-five years it was getting harder to put the same amount of energy into my classes as I had in previous years. I have not had much time to relax this summer but I am more anxious and excited about starting school this fall than I have been in many years.

With Dick Blaugher as my mentor and under the day-to-day guidance of Phil Parilla and Raghu Bhattacharya, I was given the responsibility to prepare samples of thin film superconductors and perform critical tests to characterize their properties. I learned techniques, procedures, and theoretical background that I will be able to take directly to my physics classroom. I intend to have my advanced placement students measure some of the properties of superconductors and learn about some of the applications that superconductors are being used in now as well as being planned for in the future.

Everyone that I met at NREL was very professional, extremely helpful, and most friendly. I looked forward to my long drive across town every morning and was reluctant to leave in the afternoon. It was especially difficult to leave after my eight weeks was over and I hope for the opportunity to return in the future. Your participation in the TRAC program is greatly appreciated and I hope that you will continue providing teachers this most rewarding experience.

Information: Williamson Sunderman
Lung Stokes
Seibert S. Dale
Blaugher

Sincerely,
Marshall Hanks
Marshall Hanks
Thomas Jefferson High
Denver, CO

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the values of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is often provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically. Please continue your descriptions on another piece of paper,if necessary.

Your Name: **Jeff Estes**

Position: **Science Education Specialist**

Organization: **Science Education Center; Battelle, Pacific Northwest Laboratories**

Please fill in the information below about the data you are reporting:

1. Name of source and his/her position (if known):

   Traci Caves, Classroom Teacher (Grades K-12)

2. Date information was reported:

   Report #1 - June 1991
   Report #2 - August 1992

3. Specific program, project, or activity in which you source or the person(s) involved in the anecdote participated, including name, date(s), sponsor, nature of activity:

   Project: **U.S. Department of Energy Multilaboratory National Teacher Enhancement Project**

   Program: **SCIENCE ALIVE (A Workshop for Elementary School Teachers at the Pacific Northwest Laboratory)**

   Dates: **July 30 - August 17, 1990 (with academic year follow up)**

   Sponsor: **Funded by the National Science Foundation, Sponsored by the U.S. Department of Energy**

   Nature of the Activity:

   SCIENCE ALIVE is a program designed to enhance teachers' content knowledge and instructional strategies in environmental sciences. During a three-week summer workshop, teachers

   - **participate in hands-on problem solving field and laboratory experiences led by scientists and lead teachers. Studies include**

aquatic ecology, terrestrial plants, atmospheric sciences, wildlife, and solid earth sciences.

- develop hands-on classroom "lessons" based on the laboratory and field experiences, associating the new ideas with in-place curricula. New materials are based on an investigative skills approach, designed to help students collect data, find problems and solve them.

- receive a weekly stipend, travel reimbursement during the summer, a materials grant and take part in follow up activities during the school year. Each teacher is obligated to work with their school administration to prepare and conduct an inservice program for other teachers in their school and/or district.

One of the activities Caves participated in involved a study of the Touchet River near Dayton, Washington. Caves was part of a team of scientists and teachers who gathered, analyzed and evaluated biological, chemical and physical data about the Touchet in order to monitor the ecological "health" of the stream. This included invertebrate collection and identification; alkalinity, dissolved oxygen, hardness, pH and temperature testing; and gathering physical measurements of the stream such as width, depth, velocity and substrate size.

4. Specific outcomes, learnings, or results that were reported (give as much detail and as many examples as possible):

Report #1 - School year 1990-91: Caves develop an investigative skills approach to stream ecology for her fifth-grade students, inspired by her PNL experience. However, she never dreamed that her students would witness stream pollution first hand - and become involved with an investigation by the Washington State Department of Ecology.

Caves' students were collecting water and small vertebrate and invertebrate samples in a city park canal in October 1990 when suddenly the water turned from clear to a milky white; and according to the students, mosquito larvae began to die and water skippers "got wobbly." At the time, Caves was working with students at another sampling station but her assistant helping the students at the canal photographed the samples jars. After ensuring the students' safety, Caves delivered their samples (both clear and milky) to the state Department of Ecology for analysis.

The Ecology Department reported that the milky water contained industrial detergents and solvents, possibly from an apple packer's plant along the canal. Although reluctant to "point the finger" at any plant based on the children's samples, Department officials said they had received other complaints about a milky substance entering the canal in previous months.

One of Caves' goals in this experiential activity was to increase students' awareness and knowledge of vertebrate and invertebrate life in an aquatic ecosystem and use techniques to closely observe them. Caves' initial concern for the students' safety kept her from thinking about

the value of the experience. Later, she concluded, "After much contemplation, and learning that the pollutant was not harmful to my students, I now believe it to be one of the best lessons they may ever learn."

Report #2 - School year 1991-92: Caves was back in local streams, and local news, with her fifth-graders - this time planting tubes containing Coho salmon eggs as part of a continuing project to learn about aquatic ecosystems and increase salmon population in the stream.

As a result of Caves' interest in stream ecology, both she and her husband, Gary Caves, applied for and received a grant from the Washington Department of Fisheries to raise salmon in the classroom. The grants provided each of them with $1500 in equipment to raise salmon.

Caves' established a network of schools (three elementary, one middle school and one junior high) to adopt and monitor a local stream for at least two years as part of state Adopt-a-Steam and Streamkeepers programs. The teachers and students released their salmon fry they raised in the classroom into the stream in the spring of 1992.

5. "Quotable Quotes":

1990-91 - . . . according to the students, mosquito larvae began to die and water skippers "got wobbly."

1990-91 - Later, she concluded, "After much contemplation, and learning that the pollutant was not harmful to my students, I now believe it to be one of the best lessons they may ever learn."

1991-92 - Caves says this about her stream ecology projects, "It has all been very exciting, and the amazing part is that this all stemmed from one exceptional experience from PNL with a scientist on the Touchet River."

6. Other useful details:

Caves' was one of twenty-two teachers selected nation-wide to participate in a two-week workshop sponsored by the UpJohn Company during the summer of 1991. She was asked to contribute an "exemplary" lesson plan as part of her involvement. She chose to develop a lesson called "Field of Streams" which was based on her PNL experience and work with the Adopt-a-Stream and Streamkeeper programs.

Caves' has presented her experiences at the National Science Teachers Association Convention in Boston (1992), the Regional National Science Teachers Association Convention in Vancouver (1991), and the Washington Science Teachers Association Conferences (1991 and 1992).

Among her other accomplishments, Caves' received 1) the Washington State Excellence in Education Award, 2) the Yakima School District's Excellence in Education Crystal Apple Award, 3) Washington State-Level Presidential Award for Excellence in Elementary Science Teaching, and 4)

the Washington Science Teachers Association Science Teacher of the Year Award for Region #2 (Elementary Science).

7. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

Currently Traci Caves is teaching at a K-12 community school at Chenega Bay, Alaska. Her address is Chenega Bay Community School, Box 30, Chenega Bay, Alaska, 99574-9999, Phone 907-573-5123, Fax 907-573-5137.

Anecdotal Data Report Form

Name: Royace Aikin

Position: Science Education Specialist

Organization: Science Education Center; Battelle, Pacific Northwest Laboratories

1. Source and his/her position

Patrick Ehrman, Biology and Molecular Biology Teacher, Davis High School, Yakima, Washington

2. Date of appointment

Summer, 1986 (four weeks)
Summer, 1987 (ten weeks)

3. Specific Program, project, activity, advisor, etc..

Program: Department of Energy's Teacher Research Associates (TRAC) Program

Sponsor: U. S. Department of Energy

Dates: Mid-June to mid-August

Mentor: Lucie K. Fritz

Nature of Activity:

TRAC is an eight-week experience in which middle and high school teachers from across the United States are selected to participate in a real-to-life science research experience using state of the art scientific equipment and techniques. Participants work with renowned scientists and engineers in hands-on research and development projects currently being conducted at PNL. Assistance is made to help the teachers develop new curriculua and instructional strategies to take back to their classrooms. This effort serves to prepare better qualified teachers and to strengthen and promote science literacy in schools and in society. Participants receive reward, revitalization, and recognition from the TRAC program.

Assignment:This assignment focused on the b-galactosidase mechanism in E. coli, and the preparation for teaching this level of technology in a high school setting. Skills included learning the appropriate protocols involved in plasmid isolation, gel electrophoresis, and bacterial transformation. Special attention was given to refining and modifying curriculum materials to accommodate students who are capable of independent research.

4. Specific outcomes, learnings, and results:

Through Pat's two summers of work at PNL he was able to create a new advanced molecular biology class for his high school. He actually wrote the text for this class. Through the TRAC experience Pat was able to change his classroom to meet the needs and enhance the learning behaviors of his students. Based on his research experience, Pat was able to develop a student research program centered around his new molecular biology course. Curriculum materials from his molecular biology class have migrated into the regular classes and even upwards into his International Baccalaureate Program. Skills mastered and utilized by his students include plasmid isolation, restriction and ligation of DNA, gel electrophoresis, use of chemically labeled DNA and RNA probes, and use of the Southern Transfer Technique.

5. Quotable quotes:

"I get to teach today's science today, and I do not have to deliver cookbook labs in my classroom" - Pat

"This is the most realistic teaching technique I have ever see!" - fellow teacher

"We are using the same equipment I saw a scientist using on TV last night." - student

"Through Pat's work and dedication to educating all students, he has developed a course the reaches across the entire curriculum of his school." - former teacher, fellow scientist, and friend

6. Other useful details:

Pat has continued his learning through participation in seminars and workshops that pertain to his field of expertise. He has made and maintained appropriate connections with specific organizations and scientists which help him to remain current in his teaching field and his research. Pat makes three or four presentations annually regarding his curriculum and research. In the summers of 1988 and 1989 Pat worked in the TRAC program at Lawrence Berkeley Laboratory with Dr. Mina Bissell, Director of the Molecular Biology and Human Genome Center. At LBL he perfected his research skills and became better able to guide his students in related research projects. He has worked tirelessly to perfect his technical writing skills in order to teach them to his students. Pat has received many awards for his creativity and teaching skills: The Washington Presidential Award for Excellence In Science Teaching and the Washington State Biology Teacher of the Year Award are two examples. The research setting in which Pat was trained now permeates all of his teaching.

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the values of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is often provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically. Please continue your descriptions on another piece of paper,if necessary.

Your Name: Jeff Estes

Position: Science Education Specialist

Organization: Science Education Center; Battelle Pacific Northwest Laboratories

Please fill in the information below about the data you are reporting:

1. Name of source and his/her position (if known):

   Guy Whittaker, Science Teacher, Coupeville High School

2. Date information was reported:

   October 5, 1992

3. Specific program, project, or activity in which you source or the person(s) involved in the anecdote participated, including name, date(s), sponsor, nature of activity:

   Programs: Teacher Research Associates (TRAC)
   Materials Science and Technology (MST) Institute

   Sponsor: U.S. Department of Energy

   Dates: TRAC - 1989, MST - 1990, 91 and 92

   Mentors: TRAC/MST - Mike Schweiger, Roy Bunnell, Mary Bliss, Ross Gordon, Gordon Graff, Nat Saenz

   Program Description:

   TRAC is an eight-week experience in which middle and high school teachers from across the United States are selected to participate in a real-to-life science research experience using state of the art scientific equipment and techniques. Participants work with renowned scientists and engineers in hands-on research and development projects currently being conducted at PNL. Assistance is made to help the teachers develop new curricula and instructional strategies to take back to their classrooms. This effort serves to prepare better qualified

teachers and to strengthen and promote science literacy in schools and in society. Participants receive reward, revitalization, and recognition form the TRAC program.

MST is an institute that trains secondary teachers to use a unique science course that encourages students to investigate the nature, structure and properties of metals, ceramics, glasses, polymers and composites. The course has been regionally disseminated through a grant from the U.S. Department of Education and is now being disseminated nationally through funding provided by the U.S. Department of Energy. The course has been endorsed by the U.S. Materials Education Council.

4. Specific outcomes, learnings, or results that were reported (give as much detail and as many examples as possible):

The TRAC appointment was the spark that allowed Guy to finally realize a goal he had been working on for about 10 years. That goal was to find a working program that allowed a high school teacher to give specific examples of how science and real life are related. He had spent a lot time and energy going to friends in industry settings to find examples of ties for science and work. Sometimes he found good examples, some times he felt his efforts were wasted. Guy had developed a few relevant connections that he was using in his Chemistry and Physics classes. But, it wasn't until he took part in TRAC that finally felt that his search had been successful. Guy worked in a glass laboratory and participated in tours to local industries. He used the glass making experiences to develop laboratory exercises for use in the classroom.

Through his participation in MST, Guy contributed an activity that he had used previously, Raku, to the curriculum notebook that PNL was developing. The school year following the TRAC experience Guy infused the teaching material on glass and many of the metal activities from MST into his chemistry program. The results were magnificent. The excitement generated by the activities was so profound that the following year Guy to had offer two chemistry classes. The students from the first years chemistry class all enrolled in Physics because Guy had told them he would use the connections that had been established in Chemistry to continue science explorations in Physics with relevant science-life connections. In his Physics class, force and tensile strength, ductility and malleability became much easier to understand because the students used the terms in relation to drawing wire and forming malleable alloys. The physics students wanted to do more glass work so Guy developed a laboratory exercise to measure the rate of leaching of metallic ions from a glass. His class explored the formulas of glass to see what happens when the recipe was changed. They tried various heat treating factors to see if they had an effect on the leaching rate. Students learning emphasized problem solving and exploring-hypothesizing. Students were excited and Guy became a facilitator instead of the center of learning. In the third year, the two chemistry classes both went into Physics and again Guy developed more new problems for them to solve. Because the second chemistry class also had experience with polymers and composites, Guy gave them a problem in ballistics. Students had to make a container that would allow an egg in their container, fired from a cannon, land and be

removed unbroken. The problem allowed them to draw upon all of their previous experiences and the solutions were intriguing. The students used two approaches, either a shock absorbing container or soft landing device. Guy further defined the limitations on their container by saying the container could only be three times the mass of an egg, twice an egg's length, and again as wide as an egg. All students were successful! Some took many trials and redevelopments, some took ideas from lessons other teams had learned, and some totally reformulated ideas. As an added bonus one of the girls in the Guy's physics class, developed enough confidence in herself to apply to MIT, and was accepted. She is now in her second year at MIT and has decided to go into ceramic engineering.

5. "Quotable Quotes":

I have no doubt, that it was the spark of the TRAC program that allowed me to continue into the MST program and now into a doctoral program in science education. I can not thank the people at PNL and DOE enough for the opportunities that have opened up because of their program.

During the eight weeks that I worked at PNL I was able to obtain many relevant examples of how science and real life are related.

I was able to get many wonderful activities from the MST program as a direct result of my TRAC experience.

6. Other useful details:

Guy was a lead (mentor) teacher in the 1992 National Teachers Institute in Materials Science and Technology.

Guy is currently working on a science education doctorate at Washington State University. He has an appointment at PNL working in the Science Education Center.

7. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

Anecdotal Data Report Form

Name: Royace Aikin

Position: Science Education Specialist

Organization: Science Education Center; Battelle, Pacific Northwest Laboratory

1. Source and his/her position

   Paul Dorrance; physics, trigonometry, electronics; Helena High School, Helena, Montana

2. Date of appointment

   Summer, 1990

3. Specific Program, project, activity, advisor, etc..

   Program: Department of Energy's Teacher Research Associates (TRAC) Program

   Sponsor: U. S. Department of Energy

   Dates: Mid-June to mid-August, eight weeks in length

   Mentor: Ed Coomes; Energy Sciences Department/Thermal and Power Systems, Applied Physics Center

   Nature of Activity: TRAC is an eight-week experience in which middle and high school teachers from across the United States are selected to participate in a real-to-life science research experience using state of the art scientific equipment and techniques. Participants work with renowned scientists and engineers in hands-on research and development projects currently being conducted at PNL. Assistance is made to help the teachers develop new curricula and instructional strategies to take back to their classrooms. This effort serves to prepare better qualified teachers and to strengthen and promote science literacy in schools and in society. Participants receive reward, revitalization, and recognition form the TRAC program.

Assignment: Paul's assignment was in research and assessment of NASA missions for Lunar Base and manned Mars exploration. His objectives were to identify the mission requirements and technology needs necessary to accomplish these missions with emphasis on energy and space transportation.

4. Specific outcomes, learnings, and results:

Paul's physics, trigonometry, and electronics classes did a year long project following his TRAC experience at PNL. Their charge was to design a permanent human presence on Mars. Working in teams they did massive research on where to build the settlement, building materials, how to construct it, supply mechanisms, waste management, energy needs and management, and weather. They also worked on orbital mechanics, space craft design, public relations on and between the Mars colony and Earth, and the economic implications of the project. Education, government, recreation, stages of construction, and telecommunication networks were other facets in the project.

The TRACLINK Project is actually a spinoff of Paul's efforts that summer. TRACLINK is an electronic mail communications system established to enhance communication between TRAC teachers, students in their schools, and participating mentor scientists at PNL. Paul wrote the software that interfaces TRACLINK messages onto HEADMASTER Distance Learning Service with the cc:mail used at PNL. This enables TRAC teachers to communicate with each other through electronic mail and with participating staff scientists through cc:mail. TRAC teachers and their students have a free flow of communications with leading edge scientists of today. There are many professional and educational benefits of this communication service. Paul has returned to PNL the last two summers to train two groups of TRAC participants, one group of Science Alive teachers, and four groups of teachers from OPTIONS schools. Over 130 teachers and PNL scientists are networked through TRACLINK because of Paul's efforts.

Each year Paul does staff development workshops for NASA and the Challenger Center.

5. Quotable quotes:

"The TRAC experience rates above all other educational experiences I have had. TRAC has all the nuts and bolts, day to day, real to life experiences of the functioning scientist. TRAC helps teachers make great strides at 'blowing the walls' off the classroom. No other program helps the teacher learn how to teach the student how to plug into the stream of scientific and technological information that flows around the world. TRAC stresses teamwork in the classroom, just as teamwork is emphasized in scientific research. The TRAC program nourishes enthusiasm toward creating new ideas and then works to make them a reality. I feel, because of the TRAC program, that I am having an impact on mathematics, science, and technology education."

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the values of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is often provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically. Please continue your descriptions on another piece of paper, if necessary.

Your Name: **Jeff Estes**

Position: **Science Education Specialist**

Organization: **Science Education Center: Battelle, Pacific Northwest Laboratories**

Please fill in the information below about the data you are reporting:

1. Name of source and his/her position (if known):

   Donna Friedrich, Classroom Teacher (Grade 6)

2. Date information was reported:

   October 1, 1992

3. Specific program, project, or activity in which your source or the person(s) involved in the anecdote participated, including name, date(s), sponsor, nature of activity:

   Program: OPTIONS Program

   Project: Teacher Enhancement Workshop

   Activity: Terrestrial Ecology Workshop - Arid Lands

   Date: March 18-22, 1991

   Sponsor: U.S. Department of Energy

   Nature of the Activity:

   OPTIONS is a program to share the excitement of science with Northwest middle schools having large populations of underrepresented students. The Pacific Northwest Laboratory initiated the OPTIONS program as part of the U.S. Department of Energy's program to revitalize science, mathematics, and technology education. As part of this program, teachers get the opportunity to experience "live" science. Working directly with our scientists, new options for creating curricula and teaching science using actual research approaches are explored.

Using the terrestrial sciences content area, the workshop sought to

- engage teachers in the investigative processes used by scientists to solve environmental challenges.
- immerse teachers in hands-on problem solving field and laboratory experiences.
- update teachers' fundamental concepts of ecology.
- help teachers understand what motivates a scientist.
- help teachers understand the importance to science of observing, communicating, writing, cooperating, questioning, experimenting, gathering data, and applying what they had learned.
- enhance teachers' ability to do hands-on science with their students by helping them to develop lessons based on their field and laboratory experiences, associating the new ideas with in-place curricula.
- encourage teachers to use laboratory journals during the workshop and with their students following the workshop.
- to practice the Experiential Learning Model (see attachment)

In a four-day workshop teachers simulated the processes used by scientists to conduct environmental assessments. After an introductory session that practiced mapping skills to be used later in the workshop, teachers were given an environmental scenario (problem) which they were to address. The group, working with scientists, brainstormed what they would need to know and do to address their assignment. They then narrowed the focus of their work to the essential tasks, identified information needed, gathered necessary background information, identified field and laboratory research work to be conducted, carried out the research, gathered data, analyzed and evaluated the data, applied what they had learned to their original assignment, and made recommendations for further research.

4. Specific outcomes, learnings, or results that were reported (give as much detail and as many examples as possible):

Friedrich developed a unit where she proposed that students could grow "money trees" in their yards if the right environmental conditions existed. To obtain the money tree seeds, students had to conduct an environmental assessment of their yard and provide documentation that characterized the soil, climate, water, plants and animals of the site. In the process of assessing the acceptability of environmental conditions for this hypothetical money tree, students gained knowledge and insight into the factors that influence the ability of real trees to survive in an arid environment. Several students branched off into actual research as to why some trees in their yards were dying and attempted to mitigate the problem.

Friedrich reported that this "creative" science unit generated excitement on both the part of students and parents. Several creative writing projects spun out of this unit including efforts by some students to discuss the economic viability of a money tree.

5. "Quotable Quotes":

Teachers participating in the workshop were asked to review their journal entries and share insights and thoughts they had about the workshop experience. Below are excerpts of what Friedrich shared.

. . . It is important to write down data, facts and events; but being able to organize, reflect, and relate new information to what is already known is very valuable.

. . . Transferring new knowledge through group discussion and questioning activities increases learning and knowledge.

. . .Immersing ourselves in the work brought the science alive -- sampling was fun, analyzing data can be tedious.

. . .Being blown about on top of Rattlesnake Mountain while discovering the life forms clinging to life in this hostile environment; a person's knowledge, understanding and appreciation are forever changed.

. . . Data graphically presented on a computer makes for better communication of information and comparison with other sites.

. . . There is incredible diversity when we take time to examine it.

. . . Preparing data for presentations demands teamwork skills.

. . . I've never used a laboratory journal like this to record observations, thoughts and questions. Journal writing needs to be focused, precise and procedural PLUS free wheeling, exploratory, probing, questioning and pushing the limits .

. . . No wonder children love science, its only as we grow up that we are afraid to admit we don't know or are embarrassed by what is new or different!

. . . All collected data needs to be analyzed!

. . . Patience increases when others support and encourage you in group efforts.

. . . Questioning is as important as answering - maybe more!

. . . The immersion experience for a week created bonds between teachers involved from various schools. There is an air of reluctance to return to the "real world" of classroom responsibilities, etc. We wanted to recheck data, try another idea, investigate under other circumstances (time of day, year, weather) to find out more about our problem. We aren't just following scientists directions anymore, we want to know and

are trying different ways to find out. Failure is not a dead end, but just another piece of data, perhaps significant. We keep asking questions and probing sources - do answers lead to more questions? I'm enthused, excited to work this "magic of science involvement" with my students.

6. Other useful details:

Friedrich was one of eight teachers who took part in this workshop. Each OPTIONS school sent a team of two teachers to the workshop. Since this workshop, OPTIONS has conducted six other workshop in varying content areas using the same immersion strategy. Although content changes, the critical elements of the workshops are repeated. Gradually a cadre of teachers at each OPTIONS school is gaining experience with this approach and experimenting with the transfer of this learning method to the classroom.

7. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

Donna Friedrich (509) 375-6362

Anecdotal Data Report Form

Name: Royace Aikin

Position: Science Education Specialist

Organization: Science Education Center; Battelle, Pacific Northwest Laboratory

1. Source and his/her position

   Craig Gabler, High School Physics and Chemistry Teacher

2. Date of appointment

   Summer, 1990

3. Specific Program, project, activity, advisor, etc..

   Program: Department of Energy's Teacher Research Associates (TRAC) Program

   Sponsor: U. S. Department of Energy

   Dates: Mid-June to mid-August, eight weeks in length

   Mentor: Mary Ann Parkhurst, Dosimetry Technology/Radiological Sciences

Nature of Activity:

TRAC is an eight-week experience in which middle and high school teachers from across the United States are selected to participate in a real-to-life science research experience using state of the art scientific equipment and techniques. Participants work with renowned scientists and engineers in hands-on research and development projects currently being conducted at PNL. Assistance is made to help the teachers develop new curriculua and instructional strategies to take back to their classrooms. This effort serves to prepare better qualified teachers and to strengthen and promote science literacy in schools and in society.
Participants receive reward, revitalization, and recognition form the TRAC program.

Assignment:

This assignment was a 50/50 split between dosimetry and pathology involving topics related to both disciplines.
(1) To investigate the distribution of transuranics in histologic tissue sections using standard autoradiographic techniques and alpha track detectors.

(2) To detect alpha interactions in glass and plastics and attempt to quanitfy alpha exposures from these surfaces. Craig's project at PNL lead him to sense students' needs to better understand radiation in their environment. He prepared and adapted the procedures from his summer research experience to be used in a series of laboratory exercises involving radiation detection. Students are taught to construct their own radiation detector, place it in their homes, return it to school, and chemically determine the approximate radon activities in their homes. Additionally other research projects have been derived directly from this activity. A project on detector design and efficiency was selected as a presentation at the Washington Junior Science and Humanities Symposium in Seattle in 1991.

4. Specific outcomes, learnings, and results:

Students acquired a basic knowledge of natural background radiation, especially from radon, and its hazards. Specific analytical techniques and research procedures were developed in each student. Students became more aware of their own community, homes, businesses, and public buildings, and the effect of architecture on radon activity. A community-wide map of radon activity was made. Students became skilled in using inductive and deductive logic in planning protocals for an independent research project.

Craig states that the TRAC experience had a profound effect on his fifteen year old teaching career. He is now able to better convey to his students what real scientists are like and what their jobs entail. He has developed a much greater sense that some of the things he is doing are worth sharing with other teachers. Craig actively seeks opportunities to grow and share more. He explains that the TRAC experience had a multiplier effect in his school's science department. Other teachers in his school are getting excited about the research that students are doing. His fellow teachers are becoming interested in doing research on their own and in their classrooms. Teachers in his department have become sharers of knowledge and teaching hints. His behavior has had a positive effect on all the other teachers in his department.

5. Quotable quotes:

"I never realized that radiation was such a part of my daily life. I thought it was something that you got from a bomb or nuclear reactor." - student

"I truly felt like a full-share -partner in the laboratory at PNL. My mentor valued my contribution." - Craig

"What an honor for our high school to have a teacher bring

in this type of experience for our students." - parent

"It was the most interesting part of my whole school year." - student

"Craig's attitude toward teaching changed after his TRAC experience. How do I get to be a TRAC appointee?" - teacher

6. Other useful details:

Since Craig's appointment to the TRAC program at PNL, he has been a stellar representative of science education in Washington State and nationally. He was a participant in the Battelle Public Relations Event in August, 1991. He served on the DOE/TRAC Evaluation Panel in April, 1992. His service to teachers has been seen in staff development courses taught at the Oregon Science Teachers Conference, the Puget Power Teachers Workshop, ,and the Washington Science Teachers Conference. Craig was selected to present at the International Conference on Chemical Education in Bangkok in December, 1992. He has also developed a computer module for radon studies for high schools.

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

Overall strength and/or impression of the assignment

2. Give as much detail about the situation as possible:

The research group sent Paul with the environmental Assessment team to a south Florida swamp. Paul had to be sure the mission conformed to all local, regional, state, and national regulations. He also performed a video/slide documentation of all aspect of the mission and contributed to the final report.

3. Any "quotable quotes"?

Paul Koutnik: "Imagine...a science teacher arrives at Argonne, fresh from a year of fighting obstacle after obstacle in order to deliver science as knowledge-research-and-investigation, in an environment that is more like a high-speed assembly line.....He finds himself in an environment [Argonne] where hundreds of people have, as their only function, the removal of obstacles, so that significant research can take place! Resources are available to get the job done. The Job gets done. The teacher is treated as a team member and given project responsibility...Research participation takes place and the teacher's "battery" is charged up so as to be able to return to the "obstacle course" with intelligent energy." " Perhaps a way could be found to make teachers a more "permanent" part of the team by having mail/on-site contact during the year and enabling the teachers to see, during the [course of the] year, reports and articles, partly as a consequence of their participation.."

Attach any photos, articles, or other material that would illustrate the anecdote.

Paul will have some!

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):
Paul Koutnik Wheaton/Warrenville Middle School, Wheaton, IL
708/852-5682

2. Date information was reported: August 7, 1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:
Wetlands Mitigation Banking Project as applied to pipeline rights-of-way
Date(s) of program or project: June 15 - August 8

Sponsor(s): Argonne - DEP
Environmental Systems - D. Edgar

Nature of activity:

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.
DUE + ANL-DEP Evaluations

Your Name: Lou Harnisch

Position: TRAC Program Coordinator

Organization: Argonne

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

Impacts for students; Overall program impression.

2. Give as much detail about the situation as possible:

Kristin has a degree in engineering, so she was specially qualified for this task (see # 3, page 2.). The spectrometer will be installed at CEBAF, Newport News, VA, so she had an opportunity to visit the installation site.

3. Any "quotable quotes"?

Kristin Newton: "I really felt I was a valuable part of a research team and not a "gopher". My supervisor was very supportive of my taking advantage of all programs that we did as a group [enhancement & classroom transfer] such as field trips, lectures, discussions, and presentations." "I hope I will show [my students] what it is like to be a scientist and get them excited about current research.....and show parents and administrators we are constantly learning"

Attach any photos, articles, or other material that would illustrate the anecdote.

Kristin may have some.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):
Kristin Newton Cambridge Ringe & Latin High School
617/776-7640 Cambridge, MA

2. Date information was reported: August 7 '92

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:
Assist in the design of a high-acceptance hadron spectrometer installatio from CAD/CAM drawings.

Date(s) of program or project: June 15 - August 8, 1992

Sponsor(s): Argonne, DEP
Physics - H. Jackson

Nature of activity:

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.
DOE + ANL Exit Evaluations

Your Name: Lou Harnisch

Position: TRAC Program Coordinator

Organization: Argonne

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

   Comment on the importance on non research directed experiences – those not directly relating to his research appointment.

2. Give as much detail about the situation as possible:

3. Any "quotable quotes"?

Barry Farris: "The Argonne community lends itself to apprentices. They take in outsiders very well. Issues are the hardest to keep up with. We would have a presentation on something such as Maglev or Alternate Fuels and that weekend it was in the newspaper (Chicago Tribune). Timeliness!

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):
Barry Farris Columbia Academy, Columbia TN
615/388-6167 (home)

2. Date information was reported: August 7, 1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:
Drying of low ranked coal to improve coal liquifaction.

Date(s) of program or project: June 15 - August 8, 1992

Sponsor(s): Argonne, DEP
Chemistry - Karl S. Vorres

Nature of activity:

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.
DOE + TRAC (ANL) Exit Evaluations

Your Name: Lou Hamisch

Position: TRAC Program Coordinator

Organization: Argonne

SELECTED COMMENTS
TRAC PROGRAM 1992

Paul Koutnik: "Imagine...a science teacher arrives at Argonne, fresh from a year of fighting obstacle after obstacle in order to deliver science as knowledge-research-and-investigation, in an environment that is more like a high-speed assembly line.....He finds himself in an environment [Argonne] where hundreds of people have, as their only function, the removal of obstacles, so that significant research can take place! Resources are available to get the job done. The Job gets done. The teacher is treated as a team member and given project responsibility...Research participation takes place and the teacher's "battery" is charged up so as to be able to return to the "obstacle course" with intelligent energy." " Perhaps a way could be found to make teachers a more "permanent" part of the team by having mail/on-site contact during the year and enabling the teachers to see, during the [course of the] year, reports and articles, partly as a consequence of their participation.."

Kristin Newton: "I really felt I was a valuable part of a research team and not a "gopher". My supervisor was very supportive of my taking advantage of all programs that we did as a group [enhancement & classroom transfer] such as field trips, lectures, discussions, and presentations." "I hope I will show [my students] what it is like to be a scientist and get them excited about current research.....and show parents and administrators we are constantly learning"

Barry Farris: "The Argonne community lends itself to apprentices. They take in outsiders very well. Issues are the hardest to keep up with. We would have a presentation on something such as Maglev or Alternate Fuels and that weekend it was in the newspaper (Chicago Tribune). Timeliness!

For the remaining comments, the source cannot be identified

"The program provided creativity, the ability to do "hands on" projects or activities. It gave support to my interests in science and the opportunity to discover "new" applications to some "old" principles."

"Participants were given an actual laboratory/research assignment. There was excellent safety instruction - useful for a school lab. There was an excellent working relationship with full-time scientists - they were schooled in why we were there and they knew how to help."

"My perception of what it means to be a scientist has changed and it will impact my teaching, both in content and in the way I perceive my subject - more realistically..I also had the opportunity to work in a really organized chem lab. This will carry over[to the classroom]."

The program is excellent. Every teacher needs a program like this every five years for rejuvenation, recognition of the importance of teachers, and the awareness of careers, and understanding of reserach in today's world!.....A teacher gets hundreds of new ideas from projects, classes, visits, speakers, etc."

"I can talk to my classes with real knowledge about current science problems and solutions. Real life applications for my students. With colleagues, I can share what I have found in the way of curriculum and ideas.....I learned alot from the projects and talks with other teachers, and the events: the Nuclear Teleconference, the Energy Environment Simulator, etc. There are many things I can use."

"Sometimes I felt isolated and had no contact with other TRAC members. Lou's Wed.'s lunch sessions and the [classroom transfer] sessions to follow, were welcomed!"

"I was given freedom to shape my activities within the program to [match] my own interests. This resulted in a very productive use of my time."

"The program enabled me to use Lotus 123 to manipulate data from an instrument. I also learned the mechanics of writing grants and maintaining support for projects. It was also very beneficial to share teaching tips with other TRAC teachers."

"The sharing of favorite activities and resources was very valuable; Great to get input from dynamic, dedicated, and devoted teachers. The program as been extremely effective in its mission to allow teachers to get a first-hand view of how scientific research is done. It is an honor to have been selected for this program - the experience has been wonderful!"

A comment in response to scheduled social activities (White Sox Game, Lunch, Rolling Stones Movie): "Information exchanged here and contacts made were invaluable"

"The program was invigorating - brought new life and ideas. I was also reasurring to see teachers using the same activities that I use."

Argonne National Laboratory
Division of Educational Programs
1992 Regional Teacher Research Associates (TRAC)

Teacher	Supervisor	Division
Arko, Janez	F. Siegeltuch	DEP
Brunner, Ann	F. Siegeltuch	DEP
Kerr, Kenneth	F. Siegeltuch	DEP
Quigley, Catherine	F. Siegeltuch	DEP
Zipprich, Gregory	F. Siegeltuch	DEP

The assignment will developing the pre-calculus sequence that will be used at Chicago State University as a part of the A-Prime project.

Bleak, Daniel — Samuel Bowen — DEP

Mr. Bleak will work on some programs Dr. Bowen is writing to analyze epileptic EEG data using fractal models. This would involve some Pascal programming with an application to mathematical modeling to some real data. Daniel would also be learning some statistical and data analysis.

Brekke, Stewart — Drs. G. Berry/Dunford — PHY

The assignments is working on the measurement of soft x-ray spectra of highly-charged ions using the ATLAS accelerator. Also, the development of a two-dimensional position-sensitive detector for efficient collection of the photons using both gratings and crystal spectrometers.

Buller, Thomas — L. Hill — EID

This assignment is that you will set up an introductory summer course designed for high school students or students that are entering college after the summer. This program would be used as prototype for funding for following years. The program would be designed to get students acquainted with the exciting field of protein crystallography. The students would be taught to grow crystals. Argonne National Laboratory Structural Biology Center is a world leader in this cutting edge area of biology. The successful determination of protein structures has lead the way in advanced medical breakthroughs. You will work with a high school student to determine the level of knowledge a student can attain and design a program for high school students to become interested in this field.

Case, Glen | John N. Mundy | MSD

The assignment is to assist Ion milling (removing layers of atoms) from either metal or oxide surfaces in a carefully controlled manner. Ion milling is used throughout the semiconductor industry for surface preparation. the project is part of the work of the Interface Group whose overall interest is the structure and properties of grain boundaries and other surfaces.

Cook, Jerry H. | Robert S. Heinrich | CMT

Mr. Cook will be working in the Instrument Analysis Group of the Argonne Analytical Chemistry Laboratory. His task will include the analysis of environmental samples for hazardous waste components (some of which *may* be slightly radioactive). In the execution of these tasks Jerry will have the opportunity to operate state-of-the-art analytical equipment, evaluate analytical data, and routinely interact with computers.

Dornfield, Richard | Harold W. Myron | DEP

Mr. Dornfield will assist in the instructional laboratory of the Division of Educational Programs at Argonne. Richard will be responsible for teaching established laboratory modules in materials science and/or nuclear physics.

Dowling, Joseph | T. Marciniak | ES

The assignment is working in the Experimental Systems Engineering Section of the Energy Systems Division, under the direction of Tom Marciniak. Your assignment will include the development and application of computer based models to analyze data and describe the operation of diesel engines, gravel bed combustors and other energy technologies. Also, you will be involved in the development of section procedures to enhance computer based graphics, presentation and planning.

Dundek, Jeffrey | K. Largory | EID

The assignment is to participate in a field study of ecological conditions at several wetlands on and in the vicinity of the Advanced Photon Source (APS) construction site. One of these wetlands was created in 1990 to mitigate the loss of wetland habitat on the site; two other wetlands would be examined for comparison. Most of your work would be in conducted in the field with some office work required for species identifications. See the enclosed sheet for more detailed information.

Evertson,David W. | V. C. Stamoudis | ESH

David is expected to interface a Geiger Counter (GC) instrument to a personal computer. Then transfer GC data reports to personal computers and manipulate data by applying commercial software.

Farris, Barry L. Karl S. Vorres CHM

Drying of low-rank coal to improve coal liquefaction. The program involves studies of the rate of drying of lignite and other coals over a range of temperatures to understand the nature of water in the coal. Additional studies with a variety of hydrocarbon solvents will be carried out to study alternatives in to the thermal drying process and the effects of drying on the extent of liquefaction and oil yeilds.

Fitzgerald, Rose C. Huber EID

The assignment is to assist staff in three areas: 1) Develop an equipment inventory database using dBase IV or Foxpro database management software. 2) AQUIS Information System (AQUIS trancks equipment that generate air emissions). 3) GIS system using GIS Plus software (A graphical information system called GIS Plus will be evaluated).

Fordyce, Sue L. R. Larsen ES

The assignment is to assist the Center for Transportation Research in evaluating the Jr. Solar Sprint Competition for Science Students in 7th and 8th grades and to extend the curriculum package for teachers who participated in the program.

Gold, Nancy H. Myron DEP

The assignment is to assist in laboratory modules in the instructional laboratory of the Division of Educational Programs. These laboratory modules are at an advanced level but are targeted to pre-college students and teachers. This position requires training to reinforce technical skills and as well as pedagogical skills in presenting high level scientific content to students in the Argonne Pre-college program.

Greenawalt, Kathleen M. Miller ER

The assignment is working in the Terrestrial Ecology Section of the Environmental Research Division, under the direction of Mike Miller. Your assignment will be to examine the role of mycorrhizae in soil structure formation.

Hathcox, Susie C. Roger B. Poeppel MCT

Assist in the preparation of ceramic samples for superconductivity studies.

Heckert, Barbara G. Woloschak BIM

The assignment is working in the Molecular Radiobiology Group of the Biological and Medical Research Division, under the direction of Dr. Gayle Woloschak. Your assignment will include the the modulation of gene expression following exposure to ionizing radiation.

Helberg, Kenneth C. D. Diercks CMT

The assignment is to evaluate data obtained by digital scanning equipment for X-radiographs and develop computer software for converting digital data into graphical format.

Kolody, Theresa L. Hill EID

The assignment is that you will set up an introduction summer course designed for high school students or students that are entering college after the summer. This program would be used as prototype for funding for following years. The program would be designed to get students acquainted with the exciting field of protein crystallography. The students would be taught to grow crystals. Argonne National Laboratory Structural Biology Center is a world leader in this cutting edge area of biology. The successful determination of protein structures has lead the way in advanced medical breakthroughs. You will work with a high school student to determine he level of knowledge a student can attain and design a program for high school students to become interested in this field.

Koutnik, Paul D. Edgar ES

The assignment is to participate in our Wetlands Mitigation Banking Project in evaluating benefits and cost-effectiveness of the mitigation banking concept as applied to gas transmission pipeline rights-of-way.

Knapp, Wesley L. Roger B. Poeppel MCT

Assist in the preparation of ceramic samples for superconductivity studies.

Krupp, Robert J. Bouillard ES

A new large-scale NMR spin echo frequency encoded technique is presently being developed at Argonne to non-intrusively measure particle concentrations and velocities in suspensions used, such as those in colloidal, gas-solids and polymer flows. The NMR technique is intended to be applied on the world's largest 6-TESLA magnet at Argonne. You will assist the project in surveying prospective potential users (academic, industrial, etc) for their needs and requirements for such a facility.

Lannan, Joseph J. Williams CHM

Study of organic conductors and superconductors basedpp on BEDT-TTF and C_{60}. This process involves: **1) Synthesis** - donor/aceptor molecule design and synthesis of charge transfer complexes and **2) Structure & Properties** - single crystal X-ray structure determination, single crystal neutron diffraction, electron spin resonance spectroscopy, four-probe electrical conductivity, radio-frequency penetration depth measurement, and AC magnetic susceptibility measurements.

Lenz, Michele K. Groh BIM

This appointment investigates the effects of 60 Hz electric-field and magnetic-fields radiation. Alterations in cellular differentiation due to magnetic exposure are studied along with chronobiological rhythms in mice and rats. An integrated approach combines biochemical, physiological, and behavioral measures to determine effects of typical electromagnetic-field exposures (home and workplace) and those measured on magnetic levitation (maglev) and other transportation systems. This position is not completely defined at this time, however, your background in medical technology will be essential in completing some responsibilities in data acquisition and lab analysis.

Marturano, Anthony C. Foster MSD

The assignment will be to work with Dr. Foster on optical absorption equipment development and data acquisition.

McAllister, Valeria C. Huber EID

The assignment is to assist staff in three areas: 1) Develop an equipment inventory database using dBase IV or Foxpro database management software. 2) AQUIS Information System (AQUIS trancks equipment that generate air emissions). 3) GIS system using GIS Plus software (A graphical information system called GIS Plus will be evaluated).

Murray, Richard R. Botto CHM

The assignment will involve computer graphics visualization and image analysis of nuclear magnetic resonance imaging data on polymers, ceramics, fossil fuels and environmental systems.

Newton, Kristin H. Jackson PHY

The Medium Energy Physics Program is currently constructing a high-acceptance hadron spectometer for use in high-energy electron scattering experiments devoted to probing the properties of nuclear forces at short distances. Kristin's task will be to review and establish the mechanical integrity of the design developed by project engineers and to manage a CAD/CAM file of the final engineering drawings.

Nieminski, Kenneth N. Golchert EWM

The assignment is working in the Environmental Monitoring and Surveillance Group of the Environmental Waste Management Division, under the direction of Dr. Norbert W. Golchert. Your assignment would provide support to the ongoing environmental monitoring and surveillance program of Site A/Plot M in the Palos Park Forest Preserve. Tasks would include field measurements, sample collection, and characterization activities. The majority of the time would be spent in field work, with some of the ANL-E staff, along with laboratory preparation of samples for radiochemical analysis. Limited use of computers will be required to input sampling information.

Ouellet, Richard C. Bruce P. Hamilton EID

Richard will be assisting in the development and use of energy and environmental databases. These databases will be used in assisting the ENPEP user with their environmental analysis.

Peterson, Elaine G. B. Hamilton EID

The assignment is to assist in the enhancement of Argonne's ENergy and Power Evaluation Program (ENPEP). ENPEP is a state-of-the-art microcomputer based energy planning package. While working with ENPEP you will be introduced to concepts associated with energy planning.

Pettigrew, Loraine J. S. Gaffney ER

The assignment will be to complete studies on analytical method for dissolved silica examining organic diacid interference with moly-B-Date Blue Colorometric Method using visible /UV spectroscopy. And the possibility of fouier transform infra-red spectroscopy work on structure of org-Si complex.

Repkin, Nikolai E. Langenberg ESH

The assignment is working in the Training Group in the Health Physics Section of the Environment, Health and Safety Division, under the direction of Eddi Langenberg and Dean Larson. Your teaching experience in curriculum development and your technical backround will be essential in designing and developing training in one of these areas: 1.) Training skills development to adjunct instructors, i.e., on-the-job trainers and/or master performers. 2) Training documentation. Developing trainer's guides (outlines & lesson plans) for existing ESH training courses. The ESH Training Group is responsible for providing environment, safety and health training to the 4000 people at Argonne empoyed by the Laboratory an the Department of Energy.

Splaine, Mary S. Kakar ER

This project will involve some of the latest techniques in molecular genetics. Activities will include: recovery and concentration of bacterial cells, release of DNA from these cells, amplification of target gene sequences via Polymerase Chain Reaction (PCR), and detection of sequences with specific DNA probes. The ultimate goal is to identify and characterize specific microorganisms.

Stewart, Paul M. Robinet ESH

The assignment is working with radiation monitoring devices and associated instrumentation. Attached is a memo with a more complete description of your tasks.

Tippett, Michael D. Peterson ER

The assignment is providing support by enhancing the Environmental Research Material Safety Data Sheet and Chemical Inventory; identifying compliance issues in ER for the Chemical Hygiene Plan, ANL Environment, Safety, and Health Policy and Procedure, and DOE Orders. Also, assisting data collection and reduction for the ER Self-Assessment in 1992.

Tucker, Kelley M. Craig C. Huber EID

Kelley will utilize d-Base software along with a graphical interface to enhance an environmental tracking system.

Thomas, John C. B. Hamilton EID

This assignment is to assist in the development of environmental databases and associated model applications for the Energy and Power Evaluation Program.

Wilson, Mike L. Harnisch DEP

The assignment is to instruct teachers in video production techniques and assist these teachers with the actual shooting and editing of their video projects. You will also design and implement a system for allocating use of available equipment for the summer.

Wooten, Orlando R. Peters ES

The assignment is to assist in several of our waste management projects. The following is a brief description of some of these research topics. We currently have a waste minimization project which investigates the minimization of wastes in a R&D Laboratory, coupled with using bar code technology to track the wastes generated through disposal. A second project involves remediation of soil contaminated with gasoline, employing a vapor extraction/bioventing technique. A third project involves a pilot demonstration using ultraviolet irradiation to destroy volatile organic compounds, following vapor extraction from a contaminated site.

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1. **In one sentence, specify the learning, outcome, or result that was reported:**

   A Biology teacher reported that, in addition to using some material in his Ecology unit, he has tried the panel discussion method in class and has produced an emergency lesson plan, based on his Institute term paper, to be used in the event of his sudden absence from class.

2. **Give as much detail about the situation as possible:**

   The Institute was a thirty-week, three-hour session each week, in which local teachers (9-12) learned about "Energy: Its Forms and Uses." In addition to a tutorial session each evening, each participant was part of an energy-technology defined study group. Guided by a staff mentor, the participants each developed a paper on a topic relevant to the subject matter of the group's technology.

3. **Any "quotable quotes"?**

   "I'm afraid that your course made me so aware that (a) I now drive a smaller car; (b) I had cellulose blown into the attic; and (c) I had a more efficient heat system put in the house..."

   Also "...The school and the community and I personally have benefitted from the Institute...We may not solve the energy dilemma, but we have fostered objective, intelligent thought and discussion on these matters..."

Attach any photos, articles, or other material that would illustrate the anecdote.

Page 2, Anecdotal Data Report Form

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Source of anecdote was a biology teacher, whose name and location have faded into the past.

2. Date information was reported:

   Approximately 1975.

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   An In-service Institute on "Energy" It's Forms and Uses."

   Date(s) of program or project:

   Approximately 1975

   Sponsor(s):

   National Science Foundation, AEC, ERDA, Long Island Lighting Co.

   Nature of activity:

   A content oriented course on energy and energy technologies.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   See attached.

Your Name: Donald J. Metz

Position: Head, Office of Educational Programs, Science Education Center

Organization: Brookhaven National Laboratory

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

   Teacher was exuberant over the fact that, after 20 or so years of teaching chemistry, he had finally had an opportunity of doing chemistry.

2. Give as much detail about the situation as possible:

   This teacher was one of the first participants in a BNL program that gave summer research assignments to local secondary-level school teachers. Each teacher participated for three consecutive summers, which allowed the teacher to progress from raw novice to skilled technician while affording him/her the opportunity of observing the long-range progress accomplished by the group to which he/she had been assigned.

3. Any "quotable quotes"?

   "...Hey, Don, do you know that I actually ran an infra-red spectrum myself today? Look, here it is!..."

Attach any photos, articles, or other material that would illustrate the anecdote.

Page 2, Anecdotal Data Report Form

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Carl Anderson, Chemistry teacher at Sayville High School, Sayville, New York. (He may be retired by now.)

2. Date information was reported:

   Summer 1984

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   Summer Research Participation Program

   Date(s) of program or project:

   1984 - 1989

   Sponsor(s):

   National Science Foundation

   Nature of activity:

   Research appointments - 3 summers, 8 weeks each - for local secondary-level science/math/technology teachers. (Forerunner of TRAC program.)

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   Prof. Pamela Kramer, Polytechnic University, Brooklyn, New York, prepared an evaluation report on the program.

   See enclosed videotape.

Your Name: Donald J. Metz

Position: Head, Office of Educational Programs, Science Education Center

Organization: Brookhaven National Laboratory

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

   NSF Director commends former BNL teacher research associate to Secretary Watkins.

2. Give as much detail about the situation as possible:

   When visiting New York University to meet educators leading local reform efforts, Dr. Walter Massey encountered a high school science taecher who had participatedin the BNL/NYU Teacher Training Program. She attributed much of her recent successes to what she had learned at the Brookhaven program. Dr. Massey commended this teacher to Admiral Watkins as the sort of person who should be utilized in publicizing the educational activities of DOE.

3. Any "quotable quotes"?

   See attached.

Attach any photos, articles, or other material that would illustrate the anecdote.

Page 2, Anecdotal Data Report Form

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Dr. Pamela Abder-Frazer, New York University

2. Date information was reported:
   1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   BNL/NYU Teacher Training Program

   Date(s) of program or project:

   1991-

   Sponsor(s):

   US DOE Office of University and Education Programs; New York University/ Metropolitan Life Insurance Company Teacher Opportunity Corps Program.

   Nature of activity: Six-week summer research appointment for secondary level science/math teachers; participants successfully completing research and associated academic activities receive six graduate credits in science/math education from NYU. Program covers tuition and cost-of-living stipend.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   Communication referred to K. Swyler by Dr. Pamela Abder-Frazer, New York University.

Your Name:

Position:

Organization:

NATIONAL SCIENCE FOUNDATION
1800 G STREET N.W.
WASHINGTON, D.C. 20550

NSF

OFFICE OF THE
DIRECTOR

May 1, 1992

The Honorable James E. Watkins
Secretary
U. S. Department of Energy
1001 Independence Avenue, S.W.
Washington, D.C. 20585

Dear ~~Admiral Watkins~~ Jim,

Earlier this month, I visited New York University and met with university and precollege educators leading local mathematics and science education reform efforts. During my visit, I met with a high school science teacher who spoke highly of a unique experience she had at the Department of Energy Brookhaven Laboratory in 1991.

Ms. Irma Garceau of the Manhattan Center for Science and Math is making a major difference in educating minority, inner-city students. During the summer of 1991 she participated in Brookhaven's Laboratory Cooperative Program Activity for Minority Teachers. I was impressed with Ms. Garceau's recent successes, much of which she attributes to what she learned at the Brookhaven program. I encourage you to utilize her and other program participants in your efforts to publicize the educational activities of DOE.

I look forward to continuing our dialogue and joint efforts to promote excellence in science and mathematics education.

Sincerely,

Walter

Walter E. Massey
Director

cc: Dr. William Harper
Director, Office of Energy Research

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1. **In one sentence, specify the learning, outcome, or result that was reported:**

   A middle school class of inner-city students visisted BNL to formally present what they had learned in classroom activities derived from their teacher's research participation at BNL.

2. **Give as much detail about the situation as possible:**

   An intermediate school teacher from NYC spent eight weeks during the summer of 1991 as a research associate in BNL's Injury Prevention and Analysis Group. The assignment included working with the "eggmobile" -a simple spring-driven mechanical accelerator illustrating the role of constraining systems in limiting damage due to impacts. The teacher expanded the application of the eggmobile to introduce basic physics concepts to his students, as well as introduceing a unit on injury prevention. Subsequently, he brought his students to BNL and taught a lesson in which they individually presented what they had learned to the staff of his BNL research group. The proceedings of this "mini-symposium" were videotaped, to add the excitement of being "on-camera" and for later use in developing the students' presentation skills.

3. **Any "quotable quotes"?**

   "This is an experience that will stay with me forever...One of the things that turned me one to this project is that it applied directly to the classroom."

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Mr. Larry J. McCoy, Science Teacher, Intermediate School 53, Far Rockaway, NY

2. Date information was reported:

   1991-1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   Brookhaven National Laboratory/New York University Teacher Research Associate Program

   Date(s) of program or project:

   1991-

   Sponsor(s):

   US DOE Office of University and Education Programs; New York University/ Metropolitan Life Insurance Company Teacher Opportunity Corps Program.

   Nature of activity: Six-week summer research appointment for secondary level science/math teachers; participants successfully completing research and associated academic activities receive six graduate credits in science/math education from NYU. Program covers tuition and cost-of-living stipend.*

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   Mr. Larry J. McCoy
   89-02 Vanderveer Street
   Queens Village, NY 11427

   *Mr. McCoy offered to stay on as a volunteer for two weeks beyond the term of his original appointment.

Your Name: Karl J. Swyler

Position: Pre-College Program Manager

Organization: Brookhaven National Laboratory

ANECDOTAL DATA REPORT FORM

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1. In one sentence, specify the learning, outcome, or result that was reported:

   A lesson plan drawing on a teacher's summer research participation experience at BNL received a STAR award from the National Science Teacher's Association for 1990.

2. Give as much detail about the situation as possible:

   A secondary school chemistry teacher from Florida spent eight weeks during the summer of 1989 as a research associate in BNL's environmental biotechnology group. The teacher incorporated concepts from his research assignment in a teaching strategy he had developed earlier to create a corporate lab dynamic within the classroom - the students' task was to devise a practical and (hopefully) profitable process to remove toxic metals from geothermal well sludges and dispose of the waste. The lesson received a 1990 NSTA-American Gas Association STAR award.

3. Any "quotable quotes"?

   "Since I had worked on the Biodetoxification of Geothermal Sludge, this year's corporation lab started with a hot task from the real world of scientific research."

Attach any photos, articles, or other material that would illustrate the anecdote.

Page 2, Anecdotal Data Report Form

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

Mr. Otto Phanstiel, Chemistry Teacher, Stanton College Preparatory School, Jacksonville, Florida.

2. Date information was reported:

1989-1990

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

USDOE Teacher Research Associate (TRAC) Program

Date(s) of program or project:

1989 -

Sponsor(s):

US DOE Office of University and Education Programs

Nature of activity:

Eight-week stipend-bearing summer research appointment for secondary level science/math/technology teachers.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

Mr. Otto Phanstiel
2875 So. Fletcher AVenue
Fernandia Beach, FL 32034

Your Name: Karl J. Swyler

Position: Pre-College Program Manager

Organization: Brookhaven National Laboratory

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW
Washington, DC 20009-1171

(202) 328-5800
FAX (202) 328-0974

February 7, 1990

Mr. Otto Phanstiel
XChemistry Teacher
Stanton College Preparatory School
1149 West 13th Street
Jacksonville, FL 32209

Dear Mr. Phanstiel:

I am delighted to tell you that your entry in the 1990 NSTA-American Gas Association STAR award program was chosen by the Awards and Recognitions Committee to receive an award of $500.

Congratulations to you both from the American Gas Association and the NSTA. We hope you will find it possible to attend the 1990 NSTA National Convention in Atlanta, Georgia, to attend General Session II on Friday, April 6, from 9:00 AM to 10:30 AM in the Regency Ballroom of the Hyatt Regency Hotel. Front-row seats will be reserved for the award recipients. This year we are conducting the awards ceremony in a different manner. We plan to show three slides of each award recipient preceded by a slide of the sponsoring company's logo. The actual presentation of the awards and photography session will follow General Session II immediately in the same room.

If you would like to contact the sponsor of this program, write to Mr. Louis Ray Volrath, Manager, Educational Programs, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209.

Thank you for your participation in this professional endeavor.

Sincerely,

Gerry M. Madrazo, Jr.
Chairman, Awards and
Recognitions Committee

GMM:ms

Enclosures

ANECDOTAL DATA REPORT FORM

This form is to assist you in reporting data about your project. Often we find ourselves in situations where participants or others provide anecdotes about the impact of a project -- how it has affected an individual's self-confidence, leadership abilities, classroom behavior, professional development, and so on. Because this information is usually provided in a spontaneous, informal way, it is frequently not reported. This form is to help you document these important comments, which deserve to be reported along with other data that projects collect more systematically.

1. In one sentence, specify the learning, outcome, or result that was reported:

An in-school weather club was established as a result of a teacher's summer research participation in BNL's Meteorology Department.

2. Give as much detail about the situation as possible:

An earth science teacher spent the summer of 1990 involved in meteorology on two levels - daily forecasting and research analysis of mesoscale phenomena. BNL meteorology department staff members served as the teacher's research mentors. One staff member went well beyond this in offering to produce a videotape for the teacher, documenting her summer experience and other meteorology activities at BNL. The resulting videotape was used by the teacher both as a classroom resource and in presenting her proposal to develop an in-school weather club with forecasting capability. This proposal was implemented in the 1991-92 school year.

3. Any "quotable quotes"?

"The first thing I'm going to do when I get back to school is start a weather station."

"I have also realized that proper math background is very important in order to feel confident in approaching new ideas. I am going to write a preparatory math book for regents earth science and require students to understand the math before they tackle the concepts."

Attach any photos, articles, or other material that would illustrate the anecdote.

Please provide the following information about the data you are reporting:

1. Name of source and his/her position and location (if known):

   Ms. Deborah E. Miller, Earth Science Teacher, Hewlett H.S., Hewlett, New York

2. Date information was reported:

   1990-1992

3. Name of specific program, project, or activity in which your source or the person(s) involved in the anecdote participated:

   US DOE Teacher Research Associate (TRAC) Program

   Date(s) of program or project:

   1989 -

   Sponsor(s):

   US DOE Office of University and Education Programs

   Nature of activity:

   Eight-week stipend-bearing summer research appointment for secondary level science/math/technology teachers.

4. In some cases, it may be appropriate to follow up on information provided by your source(s). Please list here pertinent details about referrals, such as names and phone numbers of people/projects/organizations to contact, documents to review, and so on.

   Ms. Deborah Miller
   Science Department
   George W. Hewlett H.S.
   60 Everit Avenue
   Hewlett, NY 11557

Your Name: Karl J. Swyler

Position: Pre-College Program Manager

Organization: Brookhaven National Laboratory

HEWLETT AFTER HOURS

Science Department:

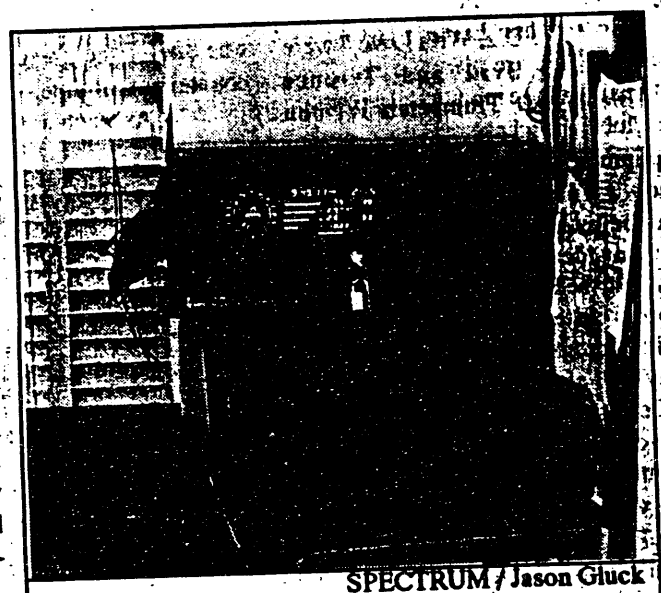
New Clubs Offered After Hours

by Keith Winer and Tracey Mayer

This year, the Hewlett High School science department is offering three exciting and very interesting clubs for all students. This year's clubs include the Weather Club, the Environmental Club, and the Science Olympiad.

Every morning about twenty members of the Weather Club meet with Ms. Debbie Miller in room 101 to predict the day's weather. The Weather Club is the newest activity at Hewlett. Their forecasts are announced daily during morning announcements. However, according to faculty advisor Ms. Miller, the club lacks the funding it needs to buy certain equipment that would enhance the student's ability to forecast.

The club takes readings from the school's weather station computer that records conditions from the roof of the school building. They also watch the weather channel on television and study cloud formations.



SPECTRUM / Jason Gluck

Weather equipment enables the club to predict accurately.

So far, Ms. Miller said the predictions have been "fairly accurate, but we feel limited because we don't have the maps." Ms. Miller hopes for a computer program that would provide accu-weather maps for raw data.

According to Dr. Stuart Lubert, science department chairperson, "Many schools are connected to the accu-weather service. There is a monthly fee that varies on how much time you are hooked-up. Most schools pay somewhere around six hundred dollars a year."

The initial funding for the instruments and console came from Foster's, the office of education district coordinator of computers, according to Dr. Lubert. "Maintenance built the enclosures and installed the sensors. I did most of the wiring myself," he explained.

Jarett Kass, a freshman who is president of the Weather Club, said, "I am learning a tremendous amount about predicting weather, but I can't understand how TV weathermen can make so many mistakes." The club meets Monday afternoons to discuss special topics. They also expect special guests, including Nick Gregory from channel 5 News who will be making his annual visit.

Weather Club because she felt meteorology would be the most interesting topic for her Earth Science students. "We are planning on a bake sale to raise money to enable the club to purchase the necessary equipment," said Jarett.

The Environmental Club, supervised by Ms. Barbara Barnett, has many ideas to inspire people into saving the Earth. They are in the process of starting a new paper recycling program in our school. They will also be in the Cedarhurst Center to start a petition for recycling in our area. Lastly, the club will see the first bald eagle to visit a Long Island classroom on February 12. "The Environmental Club is actively doing our part to save our planet," said Ms. Barnett.

Lastly, the Science Olympiad deals with many science related topics. The team competes at 10 olympiads this year and can possibly advance to the state finals, the regionals, and if they do very well, the nationals. Ashok Dubey, one of the captains who is very pleased with this year's results, said, "We have a shot at going to West Point, the

FACULTY IN THE NEWS

New members of our High School faculty this year include: **SCOTT RYAN, MAUREEN FOLEY** and **FREDERIC STARK** in Science. **GAIL GALLUBA** in Special Education and **BARBARA WALLACH** in Counseling (Guidance). We Welcome them!

LISA COHEN, Chairperson of English recently passed her doctoral comprehensives and is now at the dissertation stage of her advanced degree.

PAT WINDELS, Social Studies teacher, was the beneficiary of a National Endowment for the Humanities Grant, and attended a five week Summer Institute at Princeton University studying Ancient China.

BARBARA KELLY, Business Education teacher, helped to coordinate and instruct Effective Teaching Training for new teachers at the inception of our school year.

LINDA DIEZ, Foreign Language teaher, spent one month in an intensive Spanish immersion program to strengthen her bilingual abilities. Already an accomplished teacher of French, Mrs. Diez studied Spanish Phonetics, Geography and Literature during her month of intense study at Millersville University in Lancaster, PA.

DEBORAH MILLER, Earth Science teacher, used her scholarship at Brookhaven National Laboratories to study meteorology. One of the results of which is going to be her own classroom weather station during the 1990-1991 school year. In time, her students will do a daily weather forecast to be broadcast over the public address system at Hewlett High School.

AUDREY STERENFELD, Chemistry teacher, has been named to receive the American Chemical Society's Nichols Award which is awarded to the outstanding New York State teacher of chemistry.

STUDENTS IN THE NEWS

We are proud that five seniors have been named as National Merit Semi-Finalists for the 1990-1991 school year. The Board of Education will recognize the following students at the November 8 meeting, **MATTHEW BROZIK, SUZANNE LAVIN, DOUGLAS LIPTON, JOSHUA SLANSKY, and STUART WEINGART.**

APPENDIX E:

Budget

Removed

APPENDIX F:

Viewgraph Packet

Goals for Precollege Program Evaluation

1. DEVELOP MEANS TO DETERMINE:

   * Program Quality
   * What Works Best and When

2. DEVELOP MEANS TO DETERMINE CONTRIBUTION OF DOE PRECOLLEGE PROGRAMS TO:

   * Teacher Enhancement
   * Student Achievement

3. PROVIDE:

   * Evaluation Designs and Instruments
   * Reports on Program Quality and Impact

4. BUILD DOE'S AND LAB'S CAPACITY TO:

   * Do Short-Term and Long-Term Planning
   * Deliver Effective Program
   * Conduct Evaluations

Kinds of Activity

- ☆ Program Profiling
- ☆ Impact Assessment
- ☆ Technical Assistance & Networking

Features of Project

- ★ Collaborative
- ★ Ongoing
- ★ Emergent
- ★ Learning - oriented

PROGRAM TYPES

YEAR I 1992-1993	TEACHER RESEARCH PARTICIPATION TEACHER DEVELOPMENT
YEAR II 1993-1994	SYSTEMIC PROGRAMS STUDENT FOCUSED PROGRAMS
YEAR III 1994-1995	SPECIAL PROGRAMS

EVALUATION/

TECHNICAL ASSISTANCE MEETINGS

PURPOSES:

Develop and implement evaluation

Provide staff development

Networking and co-development

Build a community of inquiry

MEETING SCHEDULE

Year 1

3-4 June 1992	Task Group, Washington, D.C.
25-26 June 1992	Washington, D.C.
9-10 Sept. 1992	Oak Ridge, TN
10-11 Nov. 1992	Berkeley, CA
14-15 Jan. 1993	Santa Fe, NM
30 March 1993	Kansas City, MO
25-26 May 1993	Chicago, IL

TYPICAL AGENDA

Day 1

Training in profiling of teacher development programs

Concurrent topical sessions

Small group new template development

Day 2

National project update and resource alert

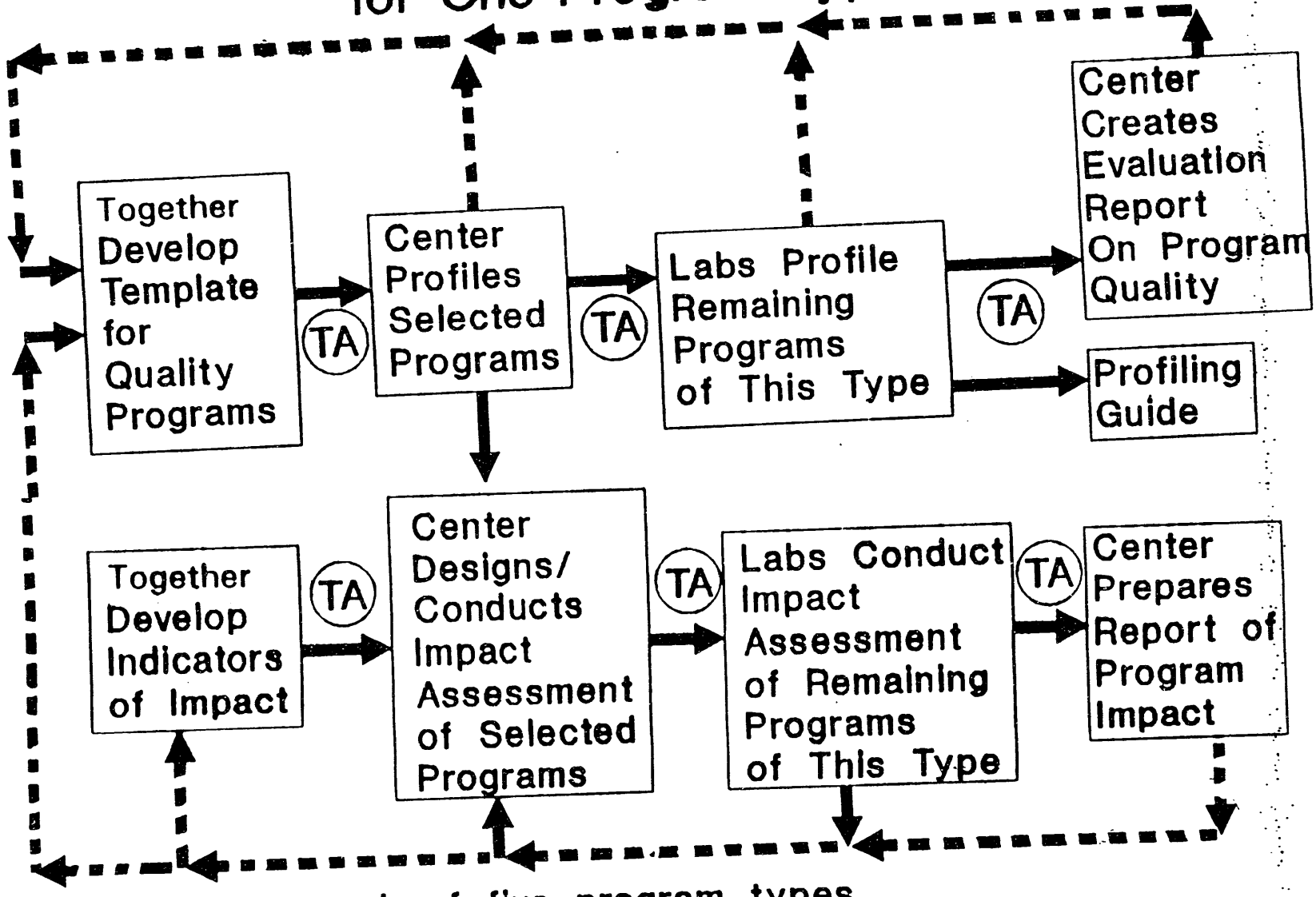
Design for impact assessment of research participation programs

Small group discussion of design

Concurrent topical sessions

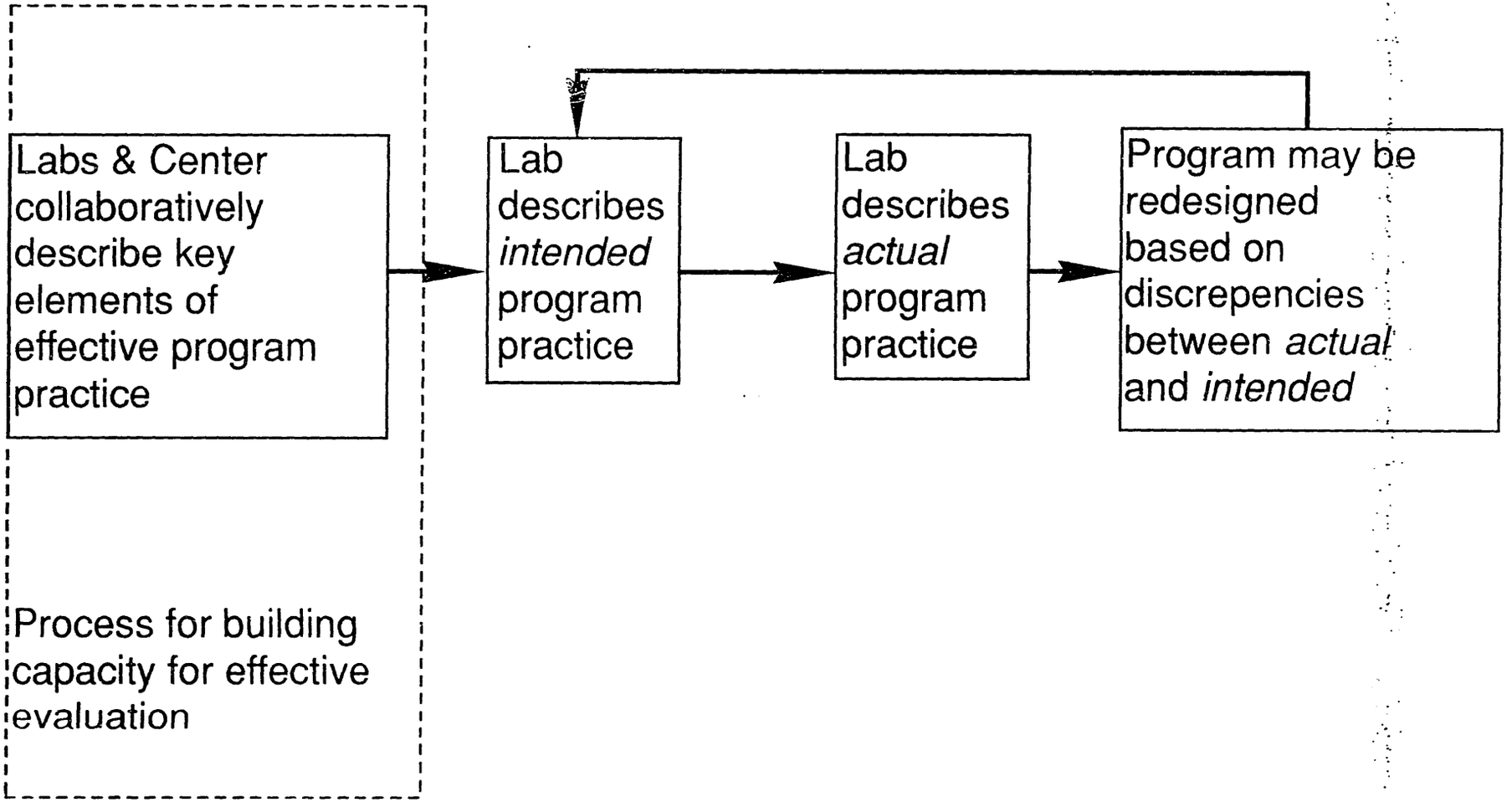
Ideas for next meeting

Description of Activities to Achieve Goals for One Program Type*

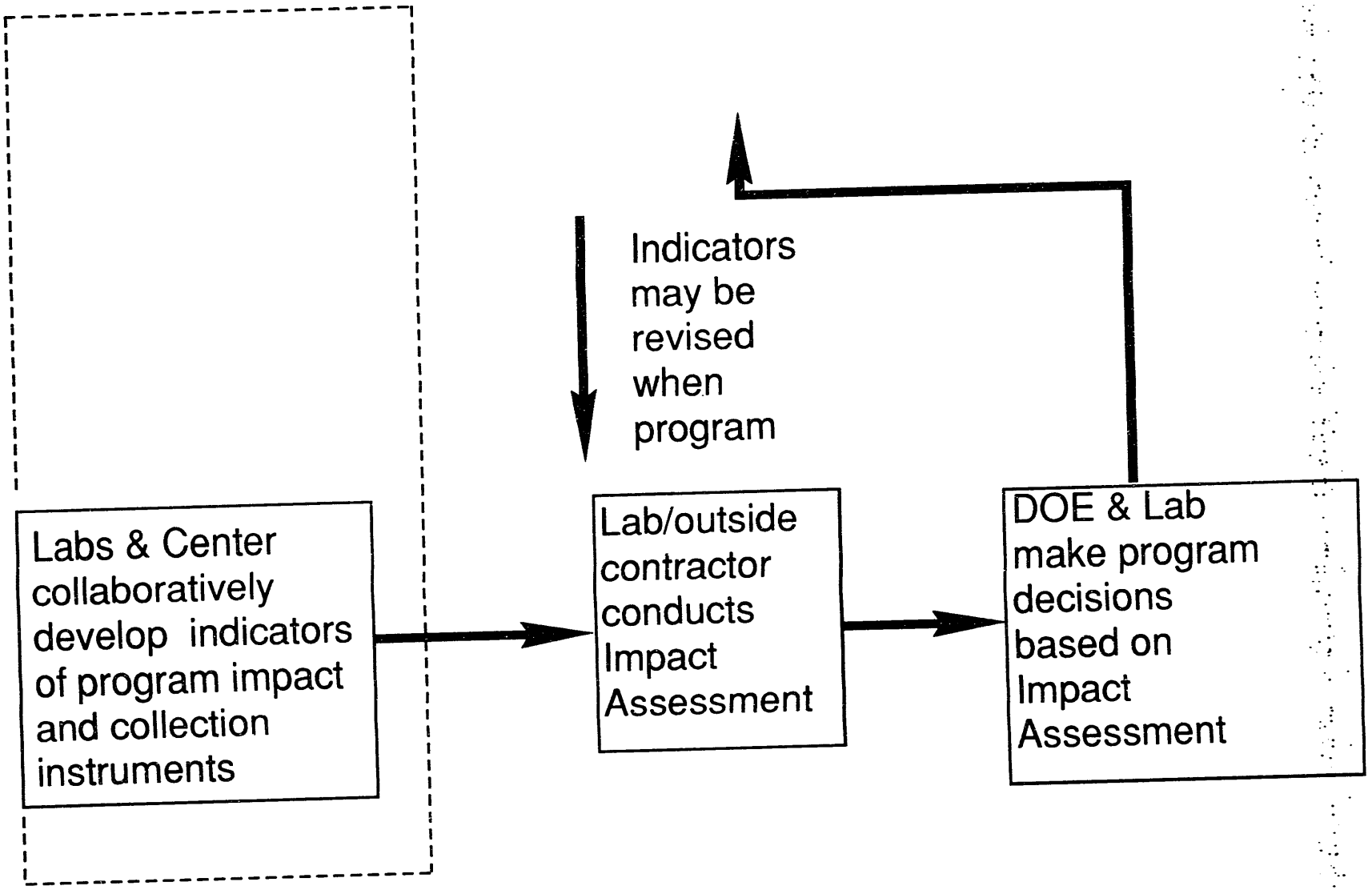


* Repeated for each of five program types

Evaluation Process



Evaluation Process



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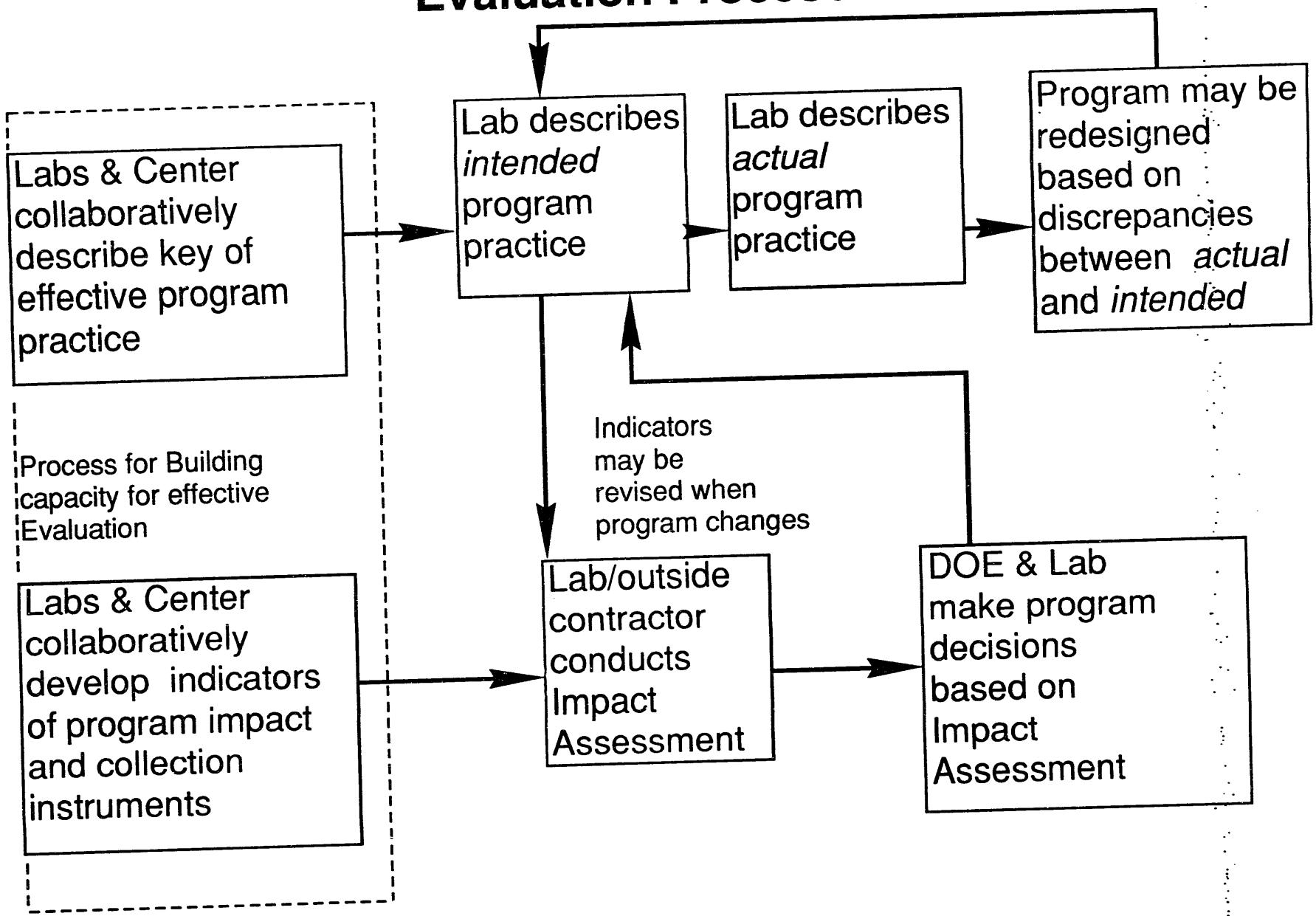
Evaluation Process



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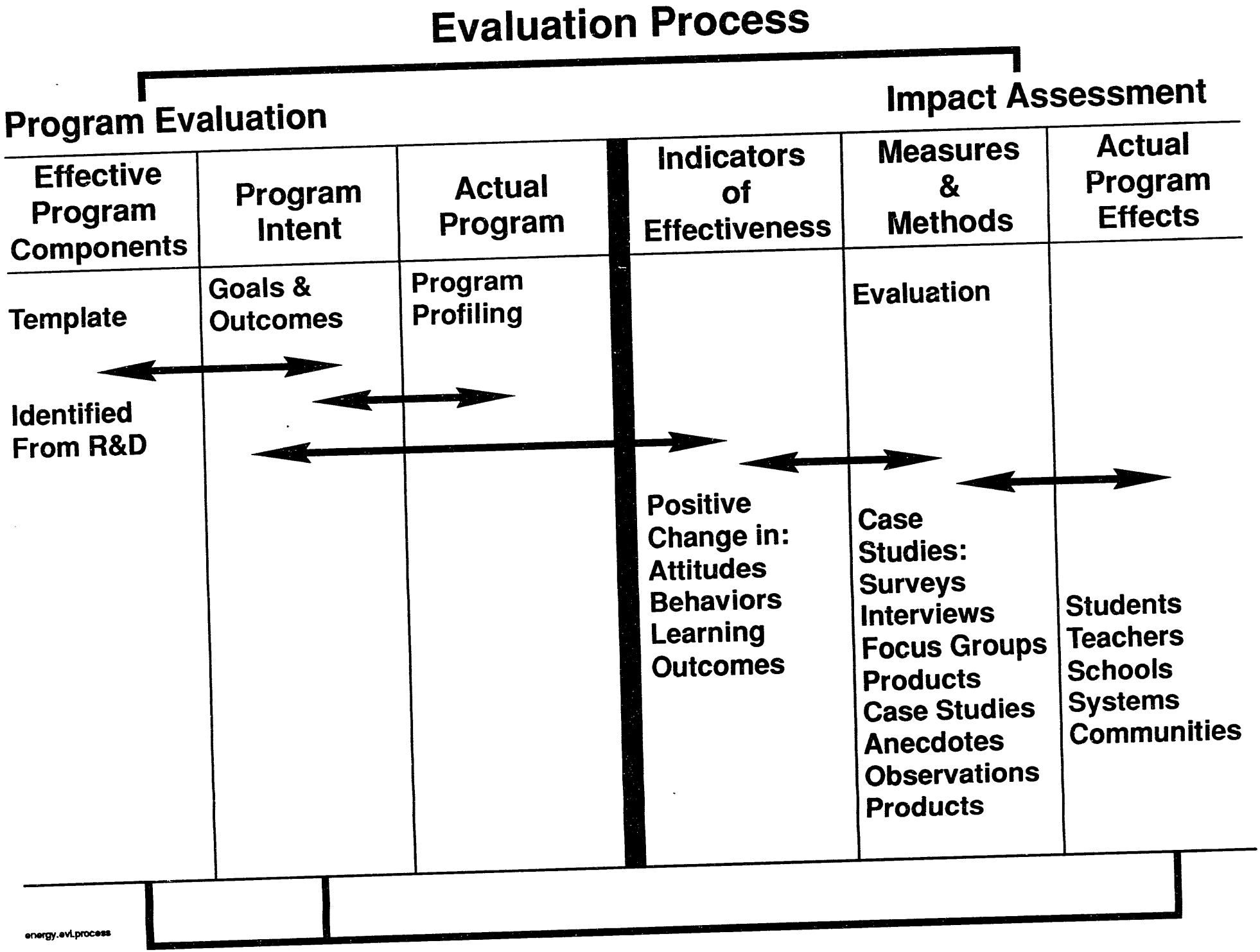

Evaluation Process
Program Evaluation
Impact Assessment
Effective Program Components
Program Intent
Actual Program
Indicators of Effectiveness
Measures & Methods
Actual Program Effects
Template
Identified From R&D
Goals & Outcomes
Program Profiling
Evaluation
Positive Change in:
Attitudes
Behaviors
Learning
Outcomes
Case Studies:
Surveys
Interviews
Focus Groups
Products
Case Studies
Anecdotes
Observations
Products
Students
Teachers
Schools
Systems
Communities
energy.evl.process

Some Questions a Completed Template Can Address

1. What is best practice for these types of programs?

2. To what extent is the program designed to reflect what is most effective?

3. To what extent does the program in place reflect best practice?

4. To what extent is the program's design actually carried out?

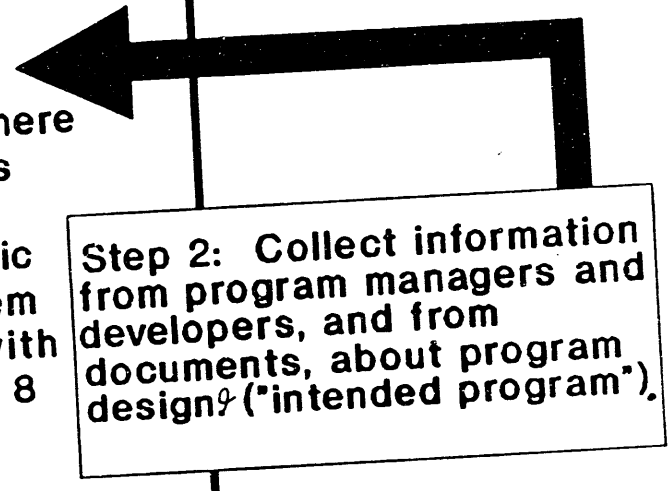
5. Where are the gaps? What can be improved? What is beyond our control?

Template for Teacher Research Participation Programs

Components of Effective Practice	Intended	Actual
The Research Experience • has an unknown outcome, but definable output or end point for teacher • models the research process, e.g., uncertainties, false starts . . . • • •		

Template for Teacher Research Participation Programs

Components of Effective Practice	Intended	Actual
The Research Experience • has an unknown outcome, but definable output or end point for teacher	At DNL, the design is: • each teacher is assigned to a research team where it is the mentor's responsibility to identify a specific project or problem to be pursued with some closure in 8 weeks	
• models the research process, e.g., uncertainties, false starts. . .	• as a member of a team, teacher is expected to experience the process of scientific inquiry . . .	



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Template for Teacher Research Participation Programs

Components of Effective Practice	Intended	Actual
The Research Experience • has an unknown outcome, but definable output or end point for teacher • models the research process, e.g., uncertainties, false starts...	At DNL, the design is: • each teacher is assigned to a research team where it is the mentors responsibility to identify a project or problem to be pursued with some closure in 8 weeks • as a member of a team, teacher expected to experience the process of scientific inquiry ...	At DNL • some teachers work on projects that are open-ended with no sense of completion; others have projects with a known outcome (e.g, they do an assigned task); others conform with design • some teachers are assigned tasks that are procedural, most experience the impatience, uncertainties and lack of closure more common to scientific process

Step 3: Interview and observe participants (e.g., teachers, mentors, past participants) and project staff about what is actually happening

omb9/92-24

Primary Goals and Outcomes for Teacher Research Participation Programs

G1 Review and Revitalize Teachers

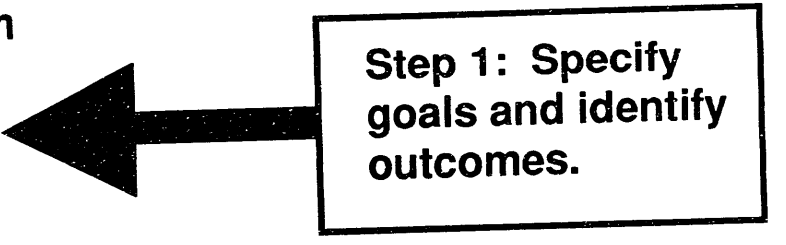
- 01 Strengthen Interest and Enthusiasm for Teaching SMET
- 02 Confirm Teacher's part in SMET Community
- 03 Embrace the Challenge of Providing Classrooms Where Students Engage in Authentic SMET Work

G2 Increase Teachers Knowledge of SMET

- 04 Cutting-Edge SMET Content
- 05 Equipment Use and Techniques
- 06 Research Process

G3 Transfer SMET Knowledge to Classroom

- 07 SMET Content
- 08 Equipment and Techniques
- 09 Research Processes
- 10 Learning of Science



G4 Enhance Leadership in SMET Education

- 11 Active in School, District, State
- 12 Active in SMET Education Community

Evaluation Design

GOALS

EVALUATION INSTRUMENT

G2 Increase teachers' knowledge of SMET

-
-
-
-

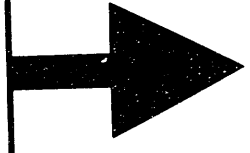
Case Studies
Individual Teacher Interviews
Mentor Survey and Interview
Classroom Observations
Judge Research Projects

G4 Transfer SMET kn dge to classroom

-
-
-
-

Entry/Exit and Follow-up Surveys
Teacher Classroom Products
Student Products
Pre/post Classroom Observations
Teacher, Colleague, Principal Interviews
Anecdotes

Step 2: Match Evaluation Instruments to Goals



Evaluation Design

GOAL	INSTRUMENTS	SPECIFICS
G3 Transfer SMET knowledge to classroom	Teacher Survey Entry/Exit Follow-up	How often do students in your classes participate in each of the following:

a. complete individual projects — Never 1 | Rarely 2 | Occasionally 3 | Frequently 4 | Never 5 | Is Not Available to Me 9

Teacher Product

Classroom Observation Checklist:

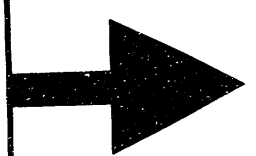
Time	Activity	Descriptive Notes	Code

Student Product

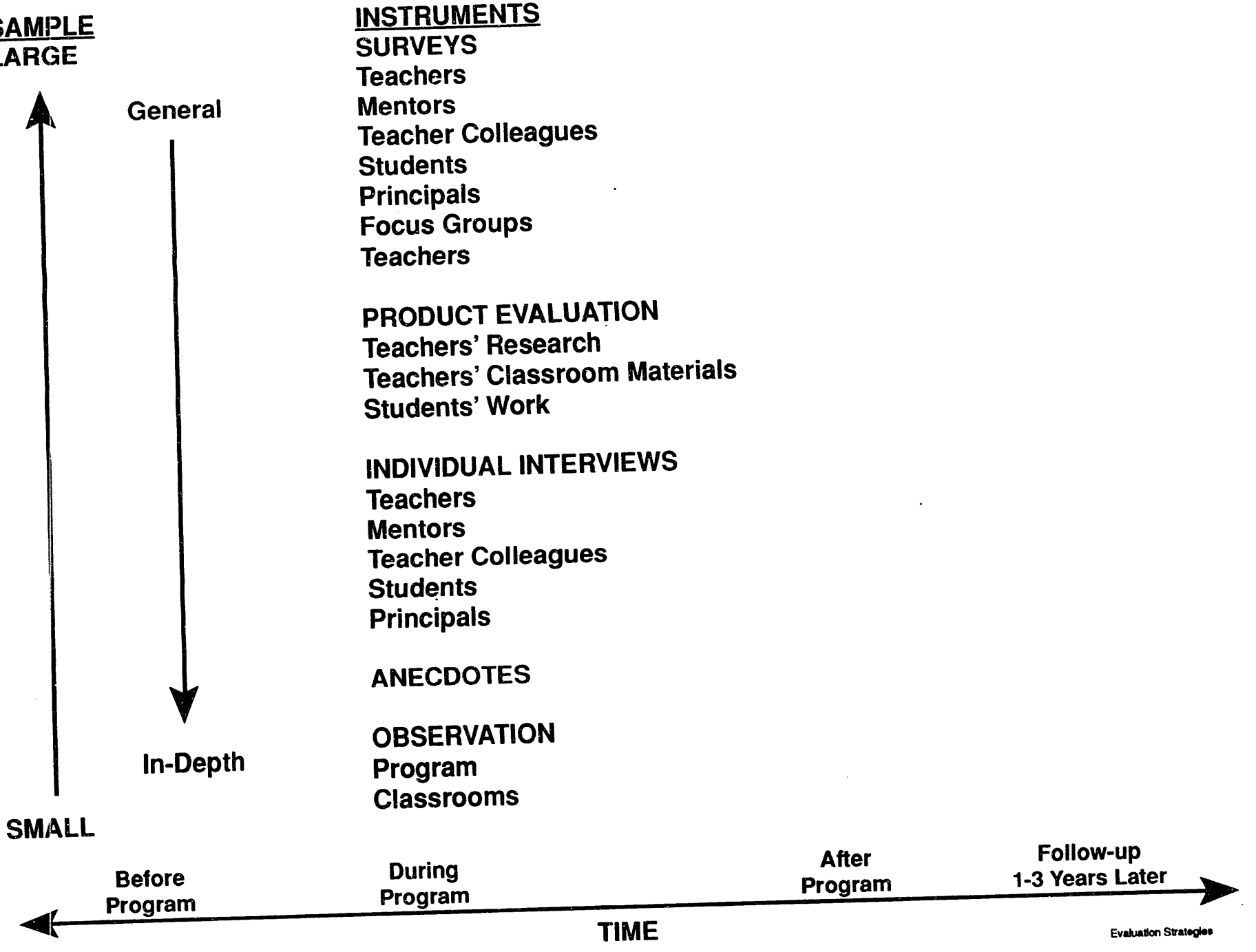
Student has completed independent research and presented the results to classmates.

Topic or question:
Methods:
Instruments used:
Analysis:
Conclusions of answer:

Step 3: Design Specific Questions and Evaluation Protocols



Evaluation Strategies



Evaluation Products From The National Center for Improving Science Education Over 4 Year Grant

Templates -- Standardized Elements for Program Effectiveness From Research and Best Practice.

Impact Assessment Design and Instruments

- Survey Instruments
- Focus Group & Individual Interview Protocols
- Product Assessment Protocols
- Anecdotal Formats
- Case Study Design
- Classroom Observation Checklist

Products (continued)

Pilot and Summary Reports on Program Quality and Impact

Technical Assistance Sessions

Program Profiling Guidebooks

Guidelines for Program Quality and Impact Assessment

Status Reports

DATE
FILMED
8/3/93
END