Annual Report for Period: 11/2001 - 10/2002
Submitted on: 11/06/2002
Principal Investigator: Shymansky, James A.
Award ID: 9911857
Organization: U of Missouri Saint Louis
Title:
Science Co-operatives

Project Participants

Senior Personnel

Name: Shymansky, James
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Cain, George
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Hand, Brian
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Matthews, Charles
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Everett, Susan
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Everett a Co-PI on the University of Iowa subcontract in which role she serves as summer workshop instructor and school year contact for field coordinators and facilitators in two of the clusters of school districts (co-ops).

Name: Olson, Joanne
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Olson is a Co-PI on the Iowa State University subcontract and serves as a summer workshop instructor, research team member and contact for field coordinators and facilitators in one the school district clusters (co-ops).

Post-doc

Graduate Student

Name: Annetta, Leonard
Worked for more than 160 Hours: Yes
Contribution to Project:
Mr. Annetta is responsible for organization of materials for all site workshops and collection of data related to participant evaluation of the interactive television delivery medium.

Name: Chung, Chia Jung
Worked for more than 160 Hours: Yes
Contribution to Project:

Undergraduate Student

Technician, Programmer

Name: Walker, Tim

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Walker is no longer involved with the project.

Other Participant

Name: Matthews, Doris

Worked for more than 160 Hours: Yes

Contribution to Project:

Beginning in Year 2, each of the 39 school districts was assigned a 'field support' person who works directly with the advocate/partner/district leadership team(s) on all facets of the Co-op school year agenda. The field support person attends all school district planning and inservice meetings related to the K-6 science curriculum and assists in the regional summer workshop attended by the assigned district(s).

Name: Crandall, William

Worked for more than 160 Hours: Yes

Contribution to Project:

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Name: Reuland, Mary

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Reuland no longer works on the project.

Name: Christensen, David

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Christensen is no longer involved with the project.

Name: Yoder, Kathy

Worked for more than 160 Hours: Yes

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Orange, Hal

Worked for more than 160 Hours: Yes

Contribution to Project:

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Name: Brock, Mick

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Brock is no longer part of the project.

Name: Cool, James

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Cool is no longer part of the project.

Name: Andresen, Luanne

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Andresen is no longer involved with the project.

Name: Mosher, Gordon

Worked for more than 160 Hours: Yes

Contribution to Project:

Mr. Mosher is no longer involved with the project.

Name: Chidsey, Jennifer

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Chidsey served as one of seven topic instructors at the first summer leadership workshop and will continue to serve as a lead instructor at subsequent area summer workshops in the co-ops.

Name: Annetta, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

Ms. Annetta serves as assistant to the PI and is responsible for managing communications among project staff and constultants and workshop and meeting arrangements.

Name: Henriques, Laura

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Henriques served as one of seven topic instructors at the first summer leadership workshop and will continue to serve as a lead instructor at subsequent area summer workshops in the co-ops.

Name: Monhart, Becky

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Monhart served as one of seven topic instructors at the first summer leadership workshop. She is no longer involved with the project.

Name: Veronesi, Peter

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Veronesi served as one of seven topic instructors at the first summer leadership workshop.

Name: Monhart, Leigh

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Monhart served as one of seven topic instructors at the first summer leadership workshop. He is no longer involved with the project.

Name: Jo Anne, Ollerenshaw

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Ollerenshaw served as one of seven topic instructors at the first summer leadership workshop

Name: Granger, Charles

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Granger served as an expert science resource person at the summer leadership workshop

Name: Camillo, Gerardo

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Camillo served as an expert science resource person at the summer leadership workshop

Name: Harris, Hal

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Harris served as an expert science resource person at the summer leadership workshop

Name: Glennister, Brian

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Glennister served as a science topic expert on the interactive television series during the school year

Name: Stay, Barbara

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Stay served as a science topic expert on the interactive television series during the school year

Name: Sjolund, Richard

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Sjolund served as a science topic expert on the interactive television series during the school year

Name: Quinlan, Connie

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Megivern, Kathy

Worked for more than 160 Hours: Yes

Contribution to Project:

Beginning in Year 2, each of the 39 school districts was assigned a 'field support' person who works directly with the advocate/partner/district leadership team(s) on all facets of the Co-op school year agenda. The field support person attends all school district planning and inservice meetings related to the K-6 science curriculum and assists in the regional summer workshop attended by the assigned district(s).

Name: Wiele, Lowell

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, each of the 39 school districts was assigned a 'field support' person who works directly with the advocate/partner/district leadership team(s) on all facets of the Co-op school year agenda. The field support person attends all school district planning and inservice meetings related to the K-6 science curriculum and assists in the regional summer workshop attended by the assigned district(s).

Name: Shafer, Ron

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Anderson, Colleen

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Vidergar, Kevin

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Christensen, Peg

Worked for more than 160 Hours: No

Contribution to Project:

The AEA is a resource for geographic areas in Iowa. It operates as part of the Iowa Department of Education and is part of the support team for the project.

Name: Anderson Rascher, Dawn

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Anderson Rascher is no longer involved with the project.

Name: Shier, Patrick

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Wilkerson, Linda

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Wilkerson no longer serves as a Local Facilitator.

Name: Becker, Denise

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Blackmer, Dianne

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Bonner, Beverly

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Burch, Janice

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Burch no longer serves as a Local Facilitator.

Name: Casey, Bill

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Charles, Connie

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Clatt, Sherrill

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Foust, Nancy

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Foust no longer serves as a local facilitator.

Name: Hart, Karen

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Hornung, Steve

Worked for more than 160 Hours: No

Contribution to Project:

Mr. Hornung is no longer involved with the project.

Name: Miller, Jean

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Oliver, Sherry

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Hughes, Robert

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Kruthoff, Barb

Worked for more than 160 Hours: No

Contribution to Project:

Ms. Kruthoff no longer serves as a Local Facilitator.

Name: Crall, Kevin

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: King, Bob

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Metcalf, Jane

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Newsum, Robert

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Morgan, Anne

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Carr, Bob

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Olsen, Edric

Worked for more than 160 Hours: No

Contribution to Project:

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Name: DeRosear, Anne

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Mohning, Randy

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Lawrence, Debra

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Colton, Peggy

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Biggs, Lodena

Worked for more than 160 Hours: No

Contribution to Project:

Beginning in Year 2, a curricular leader (curriculum coordinator, K-6 principal or superintendent) was identified for each of the 39 school districts. The local facilitator works with the field support person to organize monthly district inservice meetings with the teachers and leads the discussions related to the interactive television sessions selected by the participating teachers.

Name: Graeve, Sam

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Tippett, Margie

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Van Ness, Dave

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Houseman, Marian

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Price, Dulcie

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Mallette, Kirk

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Moore, Rob

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Weeks, Dale

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Miller, Lisa

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Tiedemann, Jim

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Campie, Sandie

Worked for more than 160 Hours: No

Contribution to Project:

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Name: Montgomery, Cathy

Worked for more than 160 Hours: Yes

Contribution to Project:

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Research Experience for Undergraduates

Organizational Partners

Iowa State University

Co-PI Brian Hand and Joanne Olson are responsible for conducting summer workshops and school year activities for three of the co-op hubs which involve 18 school districts. They also direct the special activities for the secondary school science partners for all the co-op districts and are conducting the evaluation of that partner role.

University of Iowa

Co-PI George Cain (now at San Diego State University) is responsible for organizing the volunteer scientists who participate in both the summer workshops in all co-op hubs and in the weekly interactive television seminars during the school year. Susan Everett is responsible for conducting summer workshops and school year activities for 2 of the co-op hubs which involved 6 school districts. The Howard Hughes Medical Institute grant which George Cain directed while at the University of Iowa continues to provide $10,000 or more per year for support of teacher workshops and kit adaptation activities.

Iowa Department of Education

Through its State Science Consultant, Dr. Tony Heiting and its Area Education Agency (AEA) facilities, the IA DOE is providing personnel support (Ron Shafer, Patrick Shier, Colleen Anderson, Sandie Campie, Peggy Christensen, and Kevin Videgar),funds to purchase inquiry kits and facility support for school year leadership training and activities.

Other Collaborators or Contacts

We have had substantial involvement of scientists from the University of Missouri-St. Louis, Iowa State University, the University of Iowa, Monsanto, St. Louis University, Washington University in St. Louis, the St. Louis Zoo,Boeing, the Science Center,NOAA and area school districts. They are: John Archer, Chris Brochu, Jim Colbert, Jeffrey Denburg, John Donelson, Charles Drewes, John Dunkase, Sonya Franklin, Phil Fraundorf, Robert Fulton, Thomas Greenbowe, Steve Heard, Richard Hurtig, Erin Irish, Shawn Lockhart, Bette Loiselle, Lisa Martin, David Meltzer, Wilfid Nixon, Mary Oakland, Anne Oldham, Edwin Powell, John Rosazza, Janet Sharp, Fred Skiff, Barb Stein, James Van Allen, Carolyn White, Bonnie Armbruster, Dan Ochs, Steve Thunder-McGuire, Joseph Stepans,Jack Kennel,Jonathan Poulton,Kathleen

Kurz,Keith Koper,Diane Slusarski,Paul Markovits,Shawn Nordell,Larry Gilbertson,Kathy Kitts,Ann Parker,Ann McMahon,John Encarnacion,Sherrie Barris, Jill Ramig, Jim Jordan,Marcia Daab,Ron Przybylinski,Carol Valenta,Dr. Atkins, Pam Nazzoli,Scott Chumbley, Ken Holscher,Larry Genalo, Vaughan Prain,Cynthia Haynes,Mike Zeller,Connie Hargrave,Kris Anderson, Theresa Becker, Carol Fuller,Jay Staker, Dianne Blackmer, Dave Van Ness, and Michael Clough.

Activities and Findings

Research and Education Activities:

1. help school districts transform their K-6 science program into an inquiry program that is consistent with NSES, state standards, and research on how children think and learn;
2. help school district teams learn how to select, adapt, and implement instructional units from existing innovative science programs;
3. improve the science content knowledge and instructional practices of all K-6 teachers in the participating school districts on the science units selected;
4. collect evidence of the impact of the district's reform effort to share with school boards, parents, and community groups;
5. create a network of teachers, students, and parents within and across Co-op school districts to capitalize on a larger, shared expertise;
6. create an infrastructure of teaching staff and resource material support to ensure long-term, cost-effective systemic reform.

Findings: (See PDF version submitted by PI at the end of the report)

Year 2 of the project continued with the 'cascading' idea of slowly moving ownership and responsibility for professional development to the district and CO-OP leadership teams by decentralizing the summer professional development into 8 regional workshops. A template was developed in terms of general content, requirements, structures, and costs. The external evaluator's report suggests that workshop schedules were consistent and maintained. 2001-2002 of the Science Co-op LSC project was successful in providing quality professional development and support for science education reform;logistical changes and adjustments in professional focus addressed many of the concerns from 2000-2001. Classroom observations indicate that most teachers are demonstrating satisfactory science instruction and are using some parts of the modified learning cycle, inquiry modules, and teaching strategies promoted by the Science Co-op Project. The effective use of consolidation and assessment, a wide array of literacy practices, teacher questioning, and a variety of methods to document learning were not apparent in many classrooms during the April/May 2002 visits. Teacher interviews indicate a neutral to somewhat positive view of the Science Co-op professional development activities and of the LSC project. Most of the negative assessments are related to technology - ITV, website and email network. Most positive assessments are related to field-based staff, opportunities for professional growth and networking, and summer workshops (2000 & 2001). The evaluations of the professional development activities suggest that the leadership workshop and summer workshops are highly valued and good examples of effective professional development, the ITV sessions on science content are not as effective, and the monthly meetings are extremely varied. This summer's workshops have had a much greater control on topics and time allotments, consistent effectiveness, but variances in number of participants caused by geographic factors were apparent.

Training and Development:

Our Year 3 cycle of activity began this past summer with the participation of 447 teachers in 8 regional, one-week workshops. Staffs consisting of co-PIs, consultants, scientists, advocates, and partners and a local support person conducted the workshops. The school year activities this year focused on the continued adaptation of science inquiry kits that fit with each district curriculum framework and assessment plan. The weekly interactive television seminars are continuing throughout the school year again as planned with the addition of a study of three variations of delivery of the weekly seminars (interactive video with live speakers and live discussions, interactive video with videotaped speakers and live discussions and asynchronous sessions with videotaped speakers and on-line discussions). This year each school district leadership team will plan and conduct one or two half-day, full-staff inservice sessions focused on cross-curricular science inquiry as part of the district's professional development calendar. A two-day leadership training workshops for district leadership teams will be conducted again this Spring in preparation for the Year 4 summer workshops. Finally, a segment of the participants (N=115) are continuing in the second year of a master's degree program at the University of Missouri-St. Louis.

Outreach Activities:

The CO-OP project continues to serve as a model for Iowa's state initiatives in elementary science. The Department of Education has earmarked an additional $25,000 this year for inquiry kit acquisitions to support CO-OP districts in their implementation efforts. Project leaders will again make presentations at both the Iowa and Missouri state science education conferences this fall and at the AETS and NARST conferences this coming Spring. The project website continues to serve as a major vehicle of communication with participants and as a window to interested persons world-wide.

Journal Publications

Books or Other One-time Publications

James A. Shymansky and Leonard A. Annetta, "Developing Children's Content Reading Skills During Hands-On Science Time", (2001).
Monograph, Published
Editor(s): To be decided
Collection: To be decided
Bibliography: National Geographic Society

Web/Internet Site

URL(s):
http://www.umsl.edu/~scicoop
Description:

Other Specific Products

Contributions

Contributions within Discipline:

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements:
Unobligated funds: less than 20% of current funds will remain at the end of the second funding cycle.

Change in Objectives or Scope: None
Unobligated funds: less than 20 percent of current funds
Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Journal
Any Product
Contributions: To Any within Discipline
Contributions: To Any Other Disciplines
Contributions: To Any Human Resource Development
Contributions: To Any Resources for Research and Education
Contributions: To Any Beyond Science and Engineering

Science Co-op Annual Report for 2001-2002 (Year 2):

Introduction

This report covers September 2001 to August 2002 and involves data collected as part of the HRI Core Evaluation for Year 2 (Year 0 was May-August 2000; Year 1 was September 2000 to August 2001; please note that last year's annual report may have used the wrong year indicator according to HRI); email interview with principal investigators, co-op leaders, and regional support staff; and observations and artifacts from staff meetings and discussions. This preliminary version of the annual report is prepared for use at the October 3-5, 2002, Science Co-op Meeting, Cedar Rapids, IA; it contains the assertions and comments, but it does not contain the actual data or the reports from the summer workshop leaders.

General Evaluation

Year 2 of the Science Co-op LSC project (2001-2002) was successful in providing quality professional development and support for science education reform; logistical changes and adjustments in professional focus addressed many of the concerns from Year 1 (2000-2001 report attached). Classroom observations indicate that most teachers are demonstrating satisfactory science instruction and are using some parts of the modified learning cycle, inquiry modules, and teaching strategies promoted by the Science Co-op project. The effective use of consolidation and assessment, a wide array of literacy practices, teacher questioning, and a variety of methods to document learning were not apparent in many classrooms during the April-May 2002 visits. Teacher interviews indicate a neutral to somewhat positive view of the Science Co-op professional development activities and of the LSC project. Most negative assessments are related to the technology—ITV, website, and email network. Most positive assessments are related to field-based staff, opportunities for professional growth and networking, and summer workshops (2000 & 2001). The evaluations of the professional development activities suggest that the leadership workshop and summer workshops are highly valued and 'good' (3H, 3H, 4 ratings) examples of effective professional development, the ITV sessions on science content are ineffective and the monthly meetings are extremely varied. This summer's workshops have had much greater quality control on topics and times allotments, consistent effectiveness (3H and 4 ratings), but variances in number of participants caused by geographic factors were apparent (Edina, <Unionville<Centerville).

Specific Components

Classroom Observations

The random sample of 16 teachers, consisting of 81% primary (K-3) and 19% intermediate or middle (4-6) schoolteachers, were observed during April-May 2002. The teachers observed included 2 Advocate, 10 first year participants and 4 non-participants. All regions of the LSC project were included: Northern, Central, Southeastern, and Southern Iowa and Northern Missouri. Classroom observations indicated two things:

1. Participants were attempting to infuse Science Co-op ideas into their science teaching.
2. Effort needs to be placed on the Consolidate and Assess elements of the modified learning cycles teaching strategy.

Nearly a full range of HRI capsule ratings were observed (13% 1A, 6% 1B, 13% 2, 6% 3L, 19% 3S, 38% 3H, 6% 4, and 0% 5). The most frequent capsule ratings of the teachers observed were 3 (3L, 3S, 3H); 69% of the 16 teachers observed received satisfactory (3) or good (4) capsule ratings. These ratings are reasonable for the current development and maturity of the Science Co-op project. There were no distinct patterns in the ratings between Science Co-op participants and non-participants and between primary schoolteachers and intermediate/middle schoolteachers. The following descriptions taken from the HRI online forms will provide a brief reference for interpreting these categories and for focusing your discussions about future emphases in the professional development activities. Please note that category 5 represents excellence and the artful implementation of inquiry science teaching and may not be achievable by large numbers of teachers.

Capsule Ratings Descriptions

Level 1a: Ineffective Instruction--Passive "Learning"
There is little or no evidence of student thinking or engagement with important ideas of science. Instruction is highly unlikely to enhance students' understanding of the discipline or to develop their capacity to successfully "do" science. Lesson was characterized by Passive "Learning". Instruction is pedantic and uninspiring. Students are passive recipients of information from the teacher or textbook; material is presented in a way that is inaccessible to many of the students.

Level 1b: Ineffective Instruction--Activity for Activity's Sake
There is little or no evidence of student thinking or engagement with important ideas of science. Instruction is highly unlikely to enhance students' understanding of the discipline or to develop their capacity to successfully "do" science. Lesson was characterized by Activity for Activity's Sake. Students are involved in hands-on activities or other individual or group work, but it appears to be activity for activity's sake. Lesson lacks a clear sense of purpose and/or a clear link to conceptual development.

Level 2: Elements of Effective Instruction
Instruction contains some elements of effective practice, but there are serious problems in the design, implementation, content, and/or appropriateness for many students in the class. For example, the content may lack importance and/or appropriateness; instruction may not

successfully address the difficulties that many students are experiencing, etc. Overall, the lesson is very limited in its likelihood to enhance students' understanding of the discipline or to develop their capacity to successfully "do" science.

Level 3 Low: Beginning Stages of Effective Instruction
Level 3 Solid: Beginning Stages of Effective Instruction
Level 3 High: Beginning Stages of Effective Instruction
The “Low”, “Solid”, and “High” ratings in the middle category is a judgment based on the degree of effective practices compared to the degree of ineffective practices resulting in the “somewhat limited likelihood of enhancing student learning”. Instruction is purposeful and characterized by quite a few elements of effective practice. Students are, at times, engaged in meaningful work, but there are weaknesses, ranging from substantial to fairly minor, in the design, implementation, or content of instruction. For example, the teacher may short-circuit a planned exploration by telling students what they "should have found", instruction may not adequately address the needs of a number of students, or the classroom culture may limit the accessibility or effectiveness of the lesson. Overall, the lesson is somewhat limited in its likelihood to enhance students’ understanding of the discipline or to develop their capacity to successfully "do" mathematics/science.

Level 4: Accomplished, Effective Instruction
Instruction is purposeful and engaging for most students. Students actively participate in meaningful work (e.g., investigations, teacher presentations, discussions with each other or the teacher, reading). The lesson is well designed and the teacher implements it well, but adaptation of content or pedagogy in response to student needs and interests is limited. Instruction is quite likely to enhance most students' understanding of the discipline and to develop their capacity to successfully "do" science.

Level 5: Exemplary Instruction
Instruction is purposeful and all students are highly engaged most or all of the time in meaningful work (e.g., investigation, teacher presentations, discussions with each other or the teacher, reading). The lesson is well-designed and artfully implemented, with flexibility and responsiveness to students' needs and interests. Instruction is highly likely to enhance most students’ understanding of the discipline and to develop their capacity to successfully "do” science.

One classroom of a **non-participant** resembled a turn-of-the-century classroom—unfortunately, it was the last century—while another classroom of a participant (Advocate) put into action the emphases in the teaching standards of the NSES (NRC, 1996, p. 52). The first teacher (rated 1a) was not using a textbook or modular science program but supplemented her core program of language arts and mathematics with teacher-made units on science, social studies, and environment topics. These teacher-made units and instruction appeared to consist of low-level worksheets and children filling in the blanks in unison with information provided by the teacher or found in books. The exemplar classroom teacher, an **Advocate**, (rated 4) incorporated children’s literature as a springboard into a series of “balance” applications from human performance (stilts, unicycle, scooter) demonstrated by a parent, a former student from Grade 3, and one of the Grade 2 students. This lesson as designed would have been a category 5, but the actual implementation revealed weaknesses in the teacher's questioning, consolidation, and assessment.

Generally, the use of children's literature as springboards for inquiry was apparent in most Science Co-op classrooms; and there were few indications of other literacy practices infused into the FOSS, STC, and Insight modules. The implementation of talking and listening in science, argumentation involving evidence, claims and known science, explicit instruction about literate practices in science, and effective use of reading science and writing in science were neither as common nor explicit as proposed by the Science Co-op LSC project. Greater effort is required on incorporating (1) meaningful debate/argument strategies in the small group interactions; (2) teacher-generated questions to promote inquiry (see Marten, 1999, summary by P. Bright attached) and to scaffold knowledge construction in small and large group sessions; (3) recording and reporting experiences; (4) explicit instruction on the literate practices in science and as part of science literacy; and (5) reading and writing strategies to enhance inquiry science learning.

There was little evidence of consolidation and assessment in most of the 16 classrooms observed. The post-explore activities were not as deliberate as we had envisioned and infrequently did large groups share ideas, consider alternative interpretations, construct knowledge construction, and apply their new ideas to the real world. Primary teachers may not view large-group discussions as effective practice. There were a few examples of culminating products being produced and of student presentations, but assessment rubrics were not used or shared with the students for these tasks and products. Unfortunately, assessment was not as explicit and varied as intended by the assessment standard in NSES. Part of the problem with consolidation and assessment appears to be that teachers are not concentrating on knowledge building and integrating new ideas into students' conceptual understanding or networks, but only on getting the activity done and on managing students and materials. Likewise, many of these teachers do not appear to value formative assessment and the need to document learning on a regular basis using creative and non-traditional techniques like checklists, instructional artifacts, journals, presentations, etc. Primary schoolteachers need some design principles based on the Science Co-op ideals to guide their teacher-designed themes and science units.

Teacher Interviews

A random sample of 10 participating teachers (1 Advocate and 9 first year participants) was selected for interview by email, then for telephone or face-to-face follow-up interviews that were custom-designed for each teacher based on their email response during April-June 2002 prior to the summer workshops. These teachers (number in parentheses) indicated they were neutral or mixed (4), somewhat positive (5), or very positive (1) about the Science Co-op project and the professional development provided. Eight teachers identified the summer workshop (2001) as the most beneficial component of the LSC project. Other positive items mentioned were the on-site graduate programs, supportive co-op coordinators, and the opportunity to network with other teachers interested in the same topics and grade levels.

Teachers are still concerned about the ITV sessions. All 10 teachers interviewed from Iowa and Missouri indicated the least effective component of the Science Co-op professional development strategies was the ITV sessions or, more generally, technology. One teacher suggested that unreliable technology had destroyed any positive effects of the ITV, web site, and email network. The science content level, use of technology, technical problems, and presentation techniques are negatively influencing their perceptions of this delivery mode. Clearly, primary teachers are the least happy with the content level and the topic selection, but even reasonably well-prepared intermediate teachers discount the ITV sessions in terms of the delivery style and procedures. First, the presentations need to incorporate both oral presentations and visual supplements. Science and pedagogy sessions that utilize visual aids and demonstrations are more positively received than straight "talking heads". Presenters, especially scientists, need to consider their audience and craft their presentation and language accordingly. The common practice of having all groups from the sites report their deliberations and results after small-group activities is not perceived as being time efficient or teaching effective.

Local meetings were variable across the cooperatives and school buildings. Teachers' responses were bi-modal; some described outstanding local meetings that addressed science standards and curriculum, and others were unable to describe what had happened. The most positive comments came from places that have concerned, informed local facilitators and frequent, clear communications with Science Co-op staff. School improvement plans and assessment issues appeared to provide a productive context for these meetings. It is likely that the regional facilitators and coordinators/leaders need to work with the local facilitators to enact their and our goals to promote science literacy, inquiry science teaching, the modified learning cycle, cross-curricular connections, and diverse authentic assessment strategies. The school improvement plans (Iowa) and the science curriculum framework and assessment program (Missouri) might be authentic foci for this year. Science Co-op staff need to identify 2 or 3 central issues, actions and resulting products for the 2002-2003 monthly meeting.

Professional Development Activities

Attendance at last fall's (September 2001) project meetings; interviews with co-op staff, field-based associates, advocates, parents, and teachers; conversations with the principal investigators and workshop leaders; and observations of professional development activities inform the following comments and suggestions. These data were separated to address the individual components of the Science Co-op professional development system.

Workshops

Twelve half-day observations of workshops were made and 8 formal reports on the workshops were submitted to HRI. The HRI overall capsule ratings were four 3H and four 4 ratings. The following descriptions of the HRI capsule rating for professional development activities were taken from the HRI online system and provided for your interpretation of the ratings.

Professional Development Observation Protocol: Capsule Ratings Descriptions

Level 1a: Ineffective Professional Development--Passive "Learning"
There is little or no evidence of participant thinking or engagement with important ideas of science education. Session is highly unlikely to enhance the capacity of participants to provide high quality science education or to be effective leaders of science education in the district(s). Session is pedantic and uninspiring. Participants are passive recipients of information; material is presented in a way that is inaccessible to or inappropriate for many of the participants.

Level 1b: Ineffective Professional Development--Activity for Activity's Sake
There is little or no evidence of participant thinking or engagement with important ideas of science education. Session is unlikely to enhance the capacity of participants to provide high quality science education or to be effective leaders science education in the district(s). Participants are involved in hands-on activities or other individual or group work, but it appears to be activity for activity's sake. Session lacks a clear sense of purpose and/or a clear link to the conceptual development of participants.

Level 2: Elements of Effective Professional Development
Session contains some elements of effective practice in professional development, but there are serious problems in the design, content, and/or implementation given the purposes of the session. For example, the content is presented in a way that would reinforce misconceptions or the pace is clearly too rapid for meaningful participant engagement. Overall, the session is very limited in its likelihood to enhance the capacity of most participants to provide high quality science education or to be effective leaders of science education in the district(s).

Level 3 Low: Beginning Stages of Effective Professional Development
Level 3 Solid: Beginning Stages of Effective Professional Development
Level 3 High: Beginning Stages of Effective Professional Development
The sub-categories in this middle rating differ in the degree of strengths and weaknesses and the perceived limitations in the likelihood of enhancing the participants' content knowledge, pedagogical knowledge, pedagogical-content knowledge or leadership abilities. Professional development is purposeful and at times effective, but there are some weaknesses in the design, content, or implementation of the session. For example, participants' expertise is not well utilized; or participants are not given sufficient opportunity to reflect on what they are learning. Overall, the session is somewhat limited in its likelihood to enhance the capacity of participants to provide high quality science education or to be effective leaders science education in the district(s).

Level 4: Accomplished, Effective Professional Development
Facilitation is skillful and participants are engaged in purposeful work (e.g., investigations, discussions, presentations, reading) designed to deepen their understanding of important science concepts; enhance their pedagogical skills and knowledge; increase their ability to use the

designated materials; or to enhance their leadership skills. The facilitator(s) implement the professional development session well and participants' contributions are valued, but adaptation of content or format in response to participants' needs and interests may be limited. The session is quite likely to enhance the capacity of most participants to provide high-quality mathematics/ science education or to be effective leaders of science education in the district(s).

Level 5: Exemplary Professional Development
Facilitation is skillful, and participants are highly engaged in purposeful work (e.g., investigations, discussions, presentations, reading) designed to deepen their understanding of important science concepts; enhance their pedagogical skills and knowledge; increase their ability to use the designated materials; or to enhance their leadership skills. The session is artfully implemented, with flexibility and responsiveness to participant needs/interests. The session is highly likely to enhance the capacity of participants to provide high-quality science education or to be effective leaders of science education in the district(s).

The Burlington Leadership Workshop was very successful and effective from the perspectives of the participants and the Lead Evaluator. The Advocates and Partners interviewed identified the Leadership Workshop in Burlington, IA (April 26-27, 2002) as the most effective and influential experience in Year 2. The Burlington sessions (3 half-days) were rated overall as 3H, 3H, and 4 (Please note from the capsule descriptions above that a rating of 5 is very difficult to achieve.). These sessions were well presented, contained ideas that address perceived weaknesses from Year 1 (2001-2002), and were practical. The preparation of the skeleton teacher resource binders (STRBs) for this workshop focused the Advocates' and Partners' preparation and attention on central issues of this LSC project and the inquiry module addressed. These STRBs appear to have been less useful to the other advocates and partners attending the sessions and preparing to facilitate the specific inquiry module in the pending summer workshop. The concept mapping session was identified as a very useful presentation and indications of its impact were apparent in the May-June workshops.

Nine half-day observations were made of the regional workshops (Unionville, MO, May 28-29, 2002; Edina, MO, June 3-4, 2002; and Centerville, IA, June 5-6, 2002). These workshops were much more consistent than in Year 1 in terms of topics covered, time allotment to tasks, and quality. The time devoted to each task and the quality of the experience were consistently satisfactory or good (capsule rating of 3H and 4). Participants suggested that they viewed the concept mapping, local scientists, module exploration, and preparation as meaningful experiences. Evidence of science content was apparent at the small-group work sites in the form of charts, concept maps, and talk. Efforts to make science content more central should be continued. The assessments of TRB experiences were mixed. Large-group presentations were focused and used sparingly. Participants appreciated the change of pace, the small-group work, and the de-emphasis of seat-time in large groups.

The Lead Evaluator had a concern about the variation in numbers of participants. It is unclear why the attendance and number of participants varied from less than 20 to nearly 100 at these summer workshops. The ratio of instructors to participants were somewhat more consistent than in Year 1, but the number of people to house, direct, and feed in the Centerville workshop should be considered. The difference in numbers of participants did not appear to influence the capsule ratings of these 3 workshops, but there must have been some negative effects—stress level, individual enjoyment, and learning. Participants from the Memphis, MO, area deciding to attend the Centerville workshop rather than the relatively small Edina, MO, workshop, compounded numbers in the Centerville. The Unionville, MO, workshop appeared to have the most reasonable number of participants and facilities of the 3 workshops observed.

ITV Sessions

The ITV sessions need consideration in terms of presenters, content, and presentation format. The participants need to be surveyed to determine more interesting and appropriate topics and more effective delivery strategies. It is unclear to the Lead Evaluator whether the participants understand the purpose of some sessions and whether the presenters understand their audience and the goals of this LSC project. Clearly the limitations of using volunteer scientists as presenters are apparent in the ITV sessions. But, the experience of having local scientists at the summer workshops demonstrates that scientists can bring an important dimension to elementary teachers' science literacy—career awareness, nature of science, habits-of-mind demonstrated by real scientists (passion, curiosity, etc.) and other personal and intellectual traits. It may be worthwhile to analyze the tapes of ITV sessions judged to be exemplar examples and to use these results to develop some design and delivery principles for the ITV presenters. An informal inventory of topics that were of interest to primary teachers involved specific topics addressed in their school's curriculum and applied science, environmental and health science topics. The latter set of topics appears to relate to issues of interest to them as adults and that have personal and social relevance.

The reduction in the number of required ITV sessions and a broadcast schedule that avoids winter weather and holidays should help address some concerns. A change in how sites report back to the broadcast node and the presenter could easily be modified. Also, the project staff needs to help presenters with visual aids and encourage the scientists to bring models and demonstrations. These supplemental devices might improve the holding power of the presentations. We might try providing participants with a presentation outline and related reading in advance.

The Science Co-op staff needs to consult Len Annetta concerning his feedback on the ITV sessions to cross-reference these comments and suggestions. The combination of technical problems and inefficient reporting strategies has exacerbated the negativism toward the ITV professional development activities.

Monthly Local Meetings

Local meetings are so variable that it would be impossible to provide any indication of central tendency. The least effective ones did not impress the participants enough to have them remember what had been done. It appears as if some of the meetings may not even happen. The most effective ones in terms of informants remembering what happened were task-oriented. In some schools this meant a local facilitator conducting a university-type course as a professional development activity in which participants were assigned books to read and then report back to the group. Others involved the production of a curriculum framework for science to include in the school district's school improvement plan. A few others started to address the issue of assessment of science learning and how the statewide assessment program may or may not influence their science program.

The examples of authentic teacher work should be reproduced in all or most of our local meetings. This component of our professional development network needs Science Co-op staff attention. It is likely unreasonable to expect the building administrator to have the expertise and time to prepare and conduct effective monthly meetings. Regional staff should be consulting with our local facilitators and attending these meetings to provide external expertise on curriculum frameworks, national standards, statewide assessment programs, and authentic assessment approaches for science. The Science Co-op staff may wish to identify a series of issues, activities, actions, and products that these monthly meeting could address and produce—science curriculum framework, materials distribution and management strategies, assessment strategies and instruments for their school.

Regional Meetings

The use of regional meetings is varied across the cooperatives. The leadership and planning meetings held after the Burlington workshop were highly regarded by the Advocates and Partners. It seems reasonable that regional meetings should be used as follow-up to any project-wide leadership workshop. These meetings could support and monitor preparation for the summer workshops and for any regional workshops planned and conducted by the Advocates ands Partners that were proposed for Year 3. In the original proposal we planned to get districts to hold common professional development days so that we could get teachers from several districts to attend 2 half-day workshops conducted by project staff, advocates and partners. Year 3 appears to be a reasonable time to introduce this component, but it will require support from the regional staff and field-based associates.

Staff Meetings and Interviews

It is still unclear who is responsible for different tasks and schools. Communications this summer appear to have started to address the gaps in the support and attention to the finer details of the project. It is necessary to improve our communications with the school and participants—email and web site are not the total answer. Likewise, we need to address the publication of the successes from the Science Co-op project in the small towns. Guest speakers for the school board, business organizations, and service club meetings, news releases with photographs, TV and radio interviews need to be arranged by the field-based associates for the project leaders.

The requirements of the project (TRBs, etc.) need continuous support and feedback over the year, not just at the end of the year for evaluation purposes. I think the TRB can serve as a focus for meaningful discussions between the field-based associates, advocates, partners, and participating teachers. Many of the weaknesses detected during the classroom observations may be detected and addressed by regular exploration of teachers' TRBs and instructional resources. The information detected by Joanne Olson's case study of Science Advocates and Science Partners could be replicated by regular conversations with teachers and used to help teachers reflect on their science instruction and to improve that instruction.

Year 1 Report Attachment

Science Co-op Evaluation for September 2000 - August 2001: Regional Summer Workshop and School Year Professional Development Activities

Introduction

This evaluation will focus on the leadership workshop and the 7 regional workshops, and on the ITV sessions, monthly regional meetings, and communications components of the Science Co-op Project. The focus of this report was defined by the data sources available to the lead evaluator - 7 formal professional development observations (Horizon Research Inc.), 5 informal professional development observations, 14 randomly selected science advocate interviews, 4 PI interviews, 7 site-leader summary reports, and attendance at staff planning (Cedar Rapids, IA; St. Louis, MO) and leadership planning (Ottumwa, IA) meetings.

Overview Year 1 to Year 2 Transition

Year 1 of the Science Co-op project used a large central summer workshop to help elementary and secondary teachers construct content-pedagogical knowledge and implement specific science modules that stress reform standards and principles. Science Co-op stresses a cascading leadership model in which science advocates and supporting science partners become the local support team to promote and facilitate science reform in their local school buildings and school districts, to develop customized science modules that utilize elementary teachers' strengths, interdisciplinary connections, and local resources (teacher resource binders, TRBs), and to assume increasing responsibility for the decentralized professional development tasks (Years 2-5). During Year 1 the science advocates and science partners needed to understand and value the NSES, become reflective practitioners, serve as exemplary models of inquiry teaching, and develop leadership and presentation skills.

The Year 1 summer workshop was delivered at a central site (St. Louis) by experienced Ph.D. science educators and school administrators. The PIs and project staff developed and delivered all large-group presentations dealing with the common aspects of the Science Co-op project goals, products, and instructional strategies. Topic-specific sessions were conducted by 7 content-pedagogical experts and support assistant teams dealing with living organisms, plants, earth materials, structure of matter, sound, nutrition and food chemistry, and environments. These workshops used the specific content and activities in the NSF-funded science modules to illustrate the elements of inquiry teaching and instructional strategies introduced in the large-group presentations. Special sessions were developed on-site for the science partners that addressed constructivist teaching approaches and support strategies to use with their science advocate(s). The secondary science partners were incorporated into the topic groups as observers and participants learning about professional development techniques with the elementary science advocates and about the NSF-funded inquiry modules. All professional development sessions were evaluated using the Horizon professional development observation rubric and participant feedback forms. Daily instructional staff meetings were held to consider participants' comments and needs, to reflect on the professional development activities, and to revise the next day's agenda as needed.

The evaluations of the Year 1 summer workshop indicated reasonable quality control of the large-group and topical sessions (Horizon capsule ratings of 3L, 3L, 3S, 3S, 3H, 4, and 5) and participant satisfaction (80% to 85% across the 7 topic sessions for the 5 days). The analysis of the daily feedback forms clearly indicated that the science advocates were able to identify the main ideas for each day and generally judged these ideas to be valuable, while identifying unexpected changes in schedule, specific large-group and sales presentations, and some meet-the-scientist activities as less valuable. Science partners were able to identify the main ideas and valued these ideas. They were willing to identify additional ideas and expectations involved in being an effective supportive partner. Advocates and partners' comments were frequently incorporated into the next day's agenda or addressed individually by the consultants in small groups. The satisfactory to high quality activities demonstrated effective professional development to the science advocates and science partners and prepared these lead teachers to teach specific inquiry modules using an interactive-constructivist approach with cross-curricular connections to language arts and mathematical and involving internet resources with support from their science partner. Furthermore, the evaluations demonstrated the importance for team-building activities to establish a supportive culture and lasting professional network and for the instructional staff to be well prepared in advance (low capsule ratings on the Horizon rubric were associated with lack of advance preparation in the later days of the week-long workshop).

Year 2 of the Science Co-op involved an increase in the numbers of elementary teachers participating and the use of distance delivery modes (Cedar Rapids Planning Meeting). The regional summer workshops introduced additional levels of complexity and difficulty involving staffing, facilities, materials, logistics, content, and quality control. The second cycle of the Science Co-op project was intended to begin implementing the cascading leadership model to decentralize responsibility and to increase the leadership role of the science advocates and science partners in the professional development activities for other elementary teachers from their regional cooperatives. This leadership apprenticeship was designed to be incremental and controlled to insure success and instructional effectiveness, while being flexible to address the advocates' and partners' development and the school districts' needs and science curricula.

Each regional workshop was headed by a Science Co-op staff member who was assisted by an external science education consultant, a local arrangements person, and several science advocates and science partners. Local facilities varied from elementary schools, high schools, and university/college conference centers. Each workshop was expected to have a common core of content, activities, and instructional time dealing with the project, inquiry modules, interactive-constructivist teaching, cross-curricular connections, and assessment, while the specific science modules explored and number of participants, science advocates, and science partners varied from workshop to workshop. Examination of the preliminary workshop schedules attempted to insure consistency across the 7 workshops in term of time distribution to presentations and module exploration. All workshops were to be evaluated by the participants, the advocates and partners, the project staff, and/or the lead evaluator.

The Science Co-op staff planned a template for the 2001 summer workshops in terms of an instructional approach, general content, time requirements, structures, and costs. The template was designed to insure that all teachers experienced a similar workshop. The goal was to implement one workshop at seven regional areas rather than implement seven different workshops. The template for the regional workshops aimed at consistency by setting minimum requirements, which consisted of: the learning centers approach for module exploration staffed by science advocates and science partners, total number of hours for the workshop (40 hours), number of hours for hands-on science modules (16-20 hours), number and content of large group presentations (children's literature springboard into inquiry, elements of inquiry teaching, writing-to-learn tasks, content reading strategies, mathematics connections, internet resources, and assessment techniques and resources), the staff and their roles prior, during and after the workshop, and the amount of money allotted per teacher for expenses.

The Science Co-op project was designed to involve several layers of support for elementary teachers implementing the state/national science reforms and the NSF-funded science inquiry modules across 40 school districts and 74 elementary school buildings (Note: The Normandy Cooperative of 1 school district with 10 elementary schools will delay implementing the 2nd cycle of the project until 2002, but the science advocates and science partner will remain active during the 2001-02 school year. This will mean that the Science Co-op project will involve 39 school districts and 64 elementary school buildings during 2001-02 project year.). The geographic distances were to be addressed by regional hubs in St. Louis, Ames, Iowa City, and Kirksville, by weekly interactive television sessions, by monthly regional meetings conducted by co-op staff, by frequent Internet communications, and by science advocate-partner pairs. The effectiveness of these support mechanisms was untested and they relied on technological and human resources of the highest quality.

Evaluation of the 2000-2001 Professional Development Activities

Leadership Workshop

A two-day leadership meeting was held at a central site (Ottumwa, IA) on March 29-30, 2001 (following a one-day staff planning/preparation meeting) to orient all science advocates and science partners to the summer workshop and their responsibilities and local follow-up meetings were held in May at the regional cooperatives to fine tune the organization to meet their specific needs. During the workshop, advocates and partners met daily with workshop leaders and staff. These meetings were beneficial based on the formative and summative evaluations. The feedback indicated that the regional meetings and the preparation for the workshop clarified the leadership roles for the advocates and partners. The evaluation of this leadership workshop was carried out formally in 2 half-day sessions (second session on the first day, first session on the second day) using the Horizon professional development observation rubric. The capsule ratings of these sessions were 4 and 3S. Ratings for design, implementation, pedagogy, leadership and culture (science content was not considered to be a central objective of this workshop) were considered to be satisfactory (3), good (4), or excellent (5). The focus and modeling provided during the workshop was most appropriate, but there was a tension within the large group and the lead teachers were unclear about the leadership expectations and many were unprepared to make full use of the small-group work (had not taught their module, had not developed their TRB, did not realize the project staff were demonstrating their instructional roles for the regional workshop, etc.). Teacher interviews indicated that the science advocates believed that the rules, roles, and expectations were being changed too frequently and that the new rules, roles, and expectations were not be clearly communicated. Clarity and effectiveness of communications will be discussed later.

Assertion: A more explicit workshop design that provides a clear big picture of the purposes and procedures as an advance organizer followed by specific experiences that unpack the component parts and are connected to the big picture may be more effective with these teachers.

Regional Workshops

Evaluation of the planned workshop-at-a-glance outlines and the actual post-workshop agendas for each of the seven regional workshops indicated that the core requirements were addressed (Appendix A). The total number of hours for the workshops ranged from 40 to 45, with 6 workshops scheduling either 40 or 41 hours and 1 workshop scheduling 45 hours (S. Everette, 2002 NARST Proposal). The total time for module exploration ranged from 17 to 23 hours during the workshops with a mean of 20.5 hours. The 5 large group presentations were accomplished in all seven workshops. One optional presentation of a guest scientist was conducted in 4 of the workshops.

Assertion: It is possible to offer a consistent workshop framework at 7 distant sites that meet common core requirements and address the unique needs and opportunities of the local cooperative. The critical question involves what degree of variability will result when the common framework is implemented in different contexts and physical situations.

Physical Facilities and Local Arrangements

A variety of physical facilities and local arrangements were used to accommodate the learning centers, large-group presentation, and nutrition breaks. The lead evaluator visited an elementary school, high school and university conference center. Only the Project Director was able to observe all 7 sites and facilities. The elementary school provided a library for formal presentations, a gymnasium for the module explorations, and a lunchroom and kitchen staff for breaks and lunches. These facilities were closely located with easy transit between all rooms. The high school provided a performance auditorium for large-group presentations, 7 classrooms and hallway for module explorations, and auditorium lobby and home economics room for breaks and lunches catered by an external agent. These facilities were spread across the main floor of the large high school. The university conference center provided a large auditorium for formal presentations, 4 large conference rooms for module exploration, and cafeteria and floor lobby for breaks and lunches catered by on-site staff. These facilities were spread across 3 floors and on a single floor. The conference center was also hosting several other large meetings and workshops.

Assertion: The physical facilities and local arrangements influence the flexibility and efficiency of the workshops. It appears that sharing facilities, isolated room arrangements, and breaks and lunch schedules driven by caterers/food services decreases the facilitators' flexibility and opportunities to respond to participants' needs. Furthermore, it made the supervision of the module explorations and the leadership of the science advocates and partners somewhat more problematic. In the future it is recommended that a large multi-purpose room or gymnasium with attached lunchroom and breakout areas should be secured for the summer workshops. Transport of modules and equipment needs to be revisited. This summer's approach of transporting modules and supplies was very labor intensive and costly. It may be possible to require the local district to provide the

modules they will be implementing the following year and the Science Co-op project pay for the replacement costs and supplies.

Timetable

Three summer workshops used a 5-day, 8 hour per day (5X8) schedule and four workshops used a 4-day, 10 hours per day (4X10) schedule. Many participants traveled 30-115 minutes (shared rides, car pools, etc.) on both ends of the workshop day. Observations indicated that the instruction efficiency (focus, time on task, etc.) decreased in all workshops during the later afternoon. This pattern of observations was worse in the 4X10 schedules that 5X8 schedules (direct observation were limited), but it might be caused by other factors (type of late p.m. activities, timing of breaks, leadership of activities. etc.).

Assertion: Avoid the 4X10 timetable for future workshops. The extended instructional schedule does not reflect best practice, cut down the learning quality, and prevents meaningful staff debriefing and planning meetings at the end of the day.

Resource Analysis

The number of advocates, partners and new participants and the target science modules were determined by the regional cooperatives. Some of the cooperatives were very large and included many different school districts and thus the number of advocates, partners, and modules were greater at those workshops (See table below).

Regional Workshop Data

Workshop	Union-ville	Edina	Columbus Junction	Ames	Center-ville	Mount Pleasant	Calmar
# of Advocates	8	3	3	9	19	4	13
# of Partners	7	3	3	4	6	2	5
# of Teachers	58	21	52	60	87	85	48
Ratio of Participants/ Lead Teacher	3.9	3.5	8.7	4.6	3.5	14.2	2.7
# of Science Modules	14	7	16	14	18	10	13
Ratio of Modules/ Advocates	1.8	2.3	5.3	1.6	1.0	2.5	1.0
Ratio of Modules/	2.0	2.3	5.3	3.5	3.0	5.0	2.6

Partners

Interpretation of these data indicate that the numbers of lead teachers, participants, and modules produced drastic variance in the instructional ratio calculated and likely in the cost of delivery. There does not appear to be a relationship to the capsule ratings (reported next), but the workshop facilitators' workload was noticeable. Fortunately, the physical facilities, local arrangements, and timetable of the large-ratio workshops appeared to offset some of the additional difficulties that arise form large workshop sizes and small instructional staffs. These interpretations need to be viewed in concert with the cost analysis data (lead teacher stipends, consultant expenses, local arrangement assistants, meal costs, duplicating costs, transport costs, etc.) provided by the project director.

Assertion: Somewhat less variability in the ratios of participants to lead teachers, modules to science advocates, and content topics to science partners should be implemented for future workshops. This will likely require earlier knowledge of participants and target modules to allow specific recruitment, selection, transfer of science advocates and science partners, and the splitting of large workshops.

<u>Instructional Design, Implementation, Culture, Content, Pedagogy, and Leadership</u>

Evaluation of the 7 regional summer workshops used the Horizon Research Inc. professional development observation rubric (2001), daily participant feedback, science advocate and science partner feedback, observations of several workshop sessions and site-leader summaries. The observation evaluations indicated that the general level of the professional development sessions varied within the satisfactory to good levels (3L , 3S, 3H, 3H, 3H, and 4) and the elementary teacher participants' feedback indicated that they were very satisfied with the experience. An analysis of the 5 formal observations based on a sample of convince revealed that the workshop design (4,4,4,4,4), implementation (4, 4, 4, 4, 4), culture (5,5,5,4,5), and pedagogical knowledge (4, 4, 4, 4, 4) were generally good to excellent , but science content (3, 3, 3, 3, 3), and explicit consideration of leadership (3, 3, 4, 3, 4) were satisfactory to good. Analysis of the daily feedback summaries completed by the participants indicated some degree of variation across workshops for specific site leaders and that most participants could identify the main ideas and expressed mixed value about these ideas, but they were generally satisfied with their summer workshop experience. The single most common concern was about the value of the SCASS evaluation CD (primary teachers) and the need for other forms of grade-appropriate assessments that encouraged learning and were reasonable to score. The daily responses from science advocates and science partners were somewhat surprising in what they identified as the main task/role/responsibility. It is essential that end-of-day debriefing sessions with advocates and partners reinforce their main roles and provide supervisory feedback on the professional development leadership. Based on limited observations, it appears that science partners are having the greatest difficulty identifying their responsibilities, staying focused, capitalizing on opportunities to take productive actions, and in contributing to the overall effectiveness of the workshops. Some lead teachers appeared to be sidetracked by clerical and lower priority tasks (photocopying, food, etc.). It may be wise to add a minimum wage staff member to handle these tasks and thereby keeping the lead teachers focused on pedagogical issues (advocates) and content and assessment issues (partners).

Informal observations indicated a good deal of off-task effort and seemingly undirected activities by some lead teachers (mainly science partners) during the summer workshops. Most science advocates very well focused and quality resources to the participants in their learning centers. More specific examples of the cross-curricular connections and strategies would be helpful and direct experience with teaching the assigned modules would improve the quality and creditability of the interactions between science advocates and participants. Tasks that focus the content-pedagogical knowledge and consolidated the self-exploration (wall charts, module trek, gallery walks, presentations) improved the participants' understanding and illustrated constructivist strategies that were appropriate for their classrooms.

Assertion: More explicit attention needs to be given the science concepts imbedded in the inquiry modules by the science partners, science advocates need to seek direct classroom experience with FOSS, Insights, and STC modules, and daily post-workshop staff meetings need to address quality and strategic issues of the professional development provided by the science advocates and science partners. The summary wall charts that specify and define the target concepts (activity, evidence, knowledge claim), the state or national standard associated with the concept, and the cross-curricular connections appeared to provide an opportunity for science partners to explicitly address the participants' conceptual understanding in a non-threatening manner.

<u>Support and Communication Mechanisms</u>

Teacher interviews revealed a positive assessment of the Science Co-op project and professional development opportunities, and specific concerns about ITV sessions, monthly meetings, and heavy reliance on electronic communications (web site, email). The content and level of the science ITV sessions and the lack of primary grade examples in the pedagogy ITV sessions was mentioned by several teachers. They believed that presenters should be provided with some typical questions asked by children about science or typical concerns expressed by primary teachers about cross-curricular strategies as organizers and framework for ITV presentations. Many teachers stated that the Internet is not part of their daily lives and that they infrequently (once a week) check their email or are able to access the Internet. They believe that a low technology back-up should be considered such as a weekly or biweekly newsletter send to the school district office for distribution by inter-school mail or to a building contact person for distribution via their mail boxes might help improve communications. They also suggested that the newsletter needed to focus on critical issues not be too frequent or long.

Assertion: The guest scientists and educators need to be provided some entry ideas into the Science Co-op classrooms by the Science Co-op staff, such as commonly asked questions by or misconceptions of primary and upper-grade children (Does a woodpecker's bill wear out?) or teacher concerns about content or pedagogy (When is reasonable to start explicit content reading instructions?). The Science Co-op project appears to have made some faulty assumptions about teachers' IT access and usage. The computer, Internet, and worldwide web are not part of many teachers' culture. Some teachers report that they do not have access to a computer except at the close of the day when the internet traffic is high and access to web sites are very slow.

Questioning Strategies Attachment

QUESTIONING STRATEGIES FOR CONSTRUCTIVIST LEARNING

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Questioning strategies can often be the key to a successful constructivist-based lesson. Questioning is an effective way for a teacher to find out what ideas or preconceptions the student is bringing to the lesson (Colburn, 1998). Questioning can also help to stimulate, extend and develop student's thinking. Productive questions provide a scaffold that encourages students to build their own understandings and help teachers to guide students toward a desired understanding (Martens, 1999). One challenge facing teachers when implementing constructivist-based teaching strategies is when students are unable to construct understanding of the concept being explored. The options for the teacher at this stage are to tell the students what they need to do or to know, ask a closed question that specifically addresses the concept, or ask a series of questions that provides a bridge between the activities and the student's understanding. Martens (1999) suggests six types of questions (attention-focusing, measuring and counting, comparison, action, problem-posing, and reasoning) that will move the student forward in the thinking process (Table 1). The questions are not meant to be used sequentially but rather the selection of the type of question is driven by the needs of the student.

Table 1: Productive Questions

QUESTION TYPE	PURPOSE	EXAMPLES
Attention-focusing	Draw student attention to significant details	Have you see…? What have you noticed about…? What are they doing? What does it feel/smell/look?
Measuring and counting	Encourage students to be more precise about their observations	How many…? How often…? How long…? How much…?
Comparison	Encourage students to analyze and classify	How are these the same or different…? How do they go together…?
Action	Encourage students to make predictions or observations based on events	What happens if…? What would happen if…? What if…?
Problem-posing	Assist students to plan and implement solutions to problems	Can you find a way to…? Can you figure out how to…?
Reasoning Questions	Encourage students to think about experiences and help them make sense of these experiences	Why do you think…? What is your reason for…? Can you invent a rule for…?

These questions are often asked by both teachers and other students during the activity part of a lesson and are meant keep students "on track" both in terms of thinking and behavior. The timing of these questions is important since the type of question asked by the teacher can either encourage the student or turn the student off. The attention-focusing questions can help those groups getting behind to become interested and involved again. The groups who finish early are ready for the reasoning questions that further their thinking and help them consolidate isolated ideas and build understanding.

Much has been written about the wait-time provided to students after the teacher has asked a question. Many teachers wait a second or less before moving to another student to answer or rephrasing the question (Rowe, 1996). Less wait-time encourages impulsive responses and simple recall answers by students rather than rational thinking and extended, higher-level responses. If the teacher were to extend the wait-time to three to five seconds it would allow the student thinking time. The students will provide more in depth answers that give them more confidence while providing the teacher with the raw material for further discussion. The variation in the kinds of questions that teachers ask increases as wait-time increases.

Asking the right type of questions and increasing wait-time are essential to assisting students in building understanding. However, Latham (1997) suggests that the best questioning strategies often begin with a keen interest by the teacher in what students think and valuing the answers that students provide.

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