DOCUMENT RESUME

ED 421 336 SE 061 529

AUTHOR	Luft, Julie A.
TITLE	Inquiry-Based Demonstration Classrooms: An In-Service Model for Science Teachers.
PUB DATE	1998-04-00
NOTE	14p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Diego, CA, April 13-17, 1998).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Demonstration Centers; Demonstration Programs; Educational Experiments; *Faculty Development; *Inquiry; Metaphors; Reflective Teaching; *Science Education; *Science Teachers; Scientific Methodology; Secondary Education; *Secondary School Science

ABSTRACT

This study explores how an Inquiry-Based Demonstration Classroom (IBDC) professional development program affects the extended inquiry instruction of secondary science teachers and how teachers view their extended inquiry practice while involved in the IBDC professional development program. To assess the impact of the program on participants' practice, each participant was observed enacting extended inquiry lessons. The observations of the inquiry lessons were recorded on the Extended Inquiry Observational Rubric (EIOR), then analyzed for changes in eight categories using a dependent t test. To supplement observational data, participants were interviewed throughout the year and asked to provide a metaphor that describes their instructional role while engaged in extended inquiry lessons. This study analyzes demonstration classrooms and provides additional information on the changes that secondary science teachers experience in their inquiry instruction as they participate in a professional development program that contains a demonstration classroom component. (Contains 16 references.) (DDR)

Inquiry-Based Demonstration Classrooms: An in-service model for science teachers

Julie A. Luft, Ph.D.
Secondary Science Education
Teaching and Teacher Education
University of Arizona
Tucson, AZ
luft@u.arizona.edu
520-621-6436

Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA, April 13-17, 1998.

Inquiry-based demonstration classrooms: An in-service model for science teachers

Science teachers have an articulated vision for science instruction in the classroom. According to the National Science Education Standards (National Research Council, 1996), science classes should provide students with opportunities to engage in student-directed inquires about scientific phenomena, refine their critical and scientific thinking skills, and learn to work collaboratively with their peers. Creating these science classrooms in our nation's schools will require the on-going professional development of science teachers. The Inquiry-Based Demonstration Classroom in-service program is one form of professional development that is conducive to the incorporation of standards-based practices in the science classroom (Luft & Pizzini, 1998); specifically, the practice of science as inquiry. The Inquiry-Based Demonstration Classroom in-service program consists of a traditional in-service program (awareness session, summer workshop, and follow-up) that is supplemented with visits to the classroom of a teacher who is modeling one form of inquiry practice.

Two previous studies of a demonstration classroom in-service program have explored the beliefs and practices of participants. Luft (accepted), in a study of teacher beliefs about the demonstration classroom in-service program, found that participating teachers addressed their instructional needs pertaining to problem solving, developed a view of the student in the context of problem solving, redefined their understanding of problem solving, reflected upon their own instructional practice, and engaged in a collegial and mentoring dialogue with peers. Luft and Pizzini (1998), in a study of the practices of participants involved in a demonstration classroom in-service program, found that participating teachers significantly increased the amount of time that students worked in cooperative groups, students significantly increased in their active participation in problem solving, and students significantly increased in their participation of generating their own problems and plans. While Luft and Pizzini observed change in teachers' behaviors, they did not specifically explore how the inquiry practice of participants changed.

This study continues the exploration of demonstration classroom in-service programs. It specifically explores how an Inquiry-Based Demonstration Classroom (IBDC) in-service program affects the extended inquiry instruction of secondary science teachers, and it explores how teachers view their extended inquiry practice while involved in the IBDC in-service program. To assess the impact of the IBDC in-service program on participants' practice, each participant was observed while enacting extended inquiry lessons. Observations of participants' inquiry lessons were recorded on the Extended Inquiry Observational Rubric (EIOR) (Luft, 1998b), then analyzed for change in eight categories using a dependent t test. To supplement observational data, participants were interviewed throughout the year and were asked to provide a metaphor that described their instructional role while engaged in an extended inquiry lesson. Metaphors were used to reveal the participants experience as they changed their instructional role, thus providing more information about the observed changes. This study contributes to the literature on demonstration classrooms and it provides additional information about the change that secondary science teachers experience in their inquiry instruction as they participate in an in-service program that contains a demonstration classroom component.

IBDC in-service program

The IBDC demonstration classroom program consists of a traditional in-service program that is supplemented with visits to a classroom enacting an extended inquiry. This model differs from the earlier Problem Solving Demonstration Classroom in-service program (Luft & Pizzini, 1998) in that in-service participants are encouraged to visit and coach one another in addition to observing a classroom in which inquiry is being enacted. The IBDC in-service program in this paper was comprised of the following:

Preprogram

The preprogram consisted of six days of training. During the spring, IBDC in-service program participants attended a workshop that provided an orientation to inquiry-based science instruction. During the summer, IBDC in-service program participants engaged in an extensive five-day workshop in which they explored a model of extended inquiry, experienced an extended inquiry lesson, and planned an extended inquiry lesson to enact in their classroom.

The model of extended inquiry utilized in this project was the Search, Solve, Create, and Share (SSCS) problem solving model (Pizzini, Huber, & Shymansky, 1988). There are four phases to the SSCS problem solving model. During **Search**, the first phase, students identify a researchable question. Students develop a plan and carry out an investigation during **Solve**, the second phase. In the third phase, **Create**, students examine the data collected and decide how to best present their results. A presentation of the entire problem solving process occurs during **Share**, the fourth phase. A SSCS problem solving cycle typically lasts for two weeks in a classroom and is consistent with the recommendations for student-centered inquiry stated in the National Science Education Standards (National Research Council, 1996). The term *extended inquiry* refers to an SSCS problem solving lesson that lasts three days or longer.

Classroom implementation

Throughout the school year (August-May), participants were asked to implement extended inquiry lessons in their classrooms. Participants were encouraged to implement extended inquiries prior to attending the demonstration classroom so that areas within the inquiry model that needed clarification could be observed during the demonstration classroom visit. A university science educator and a research assistant observed and assessed all participants who enacted extended inquiries in their classrooms.

IBDC visitations

Throughout the school year (August-May) participants could visit a secondary classroom that was engaged in an extended inquiry lesson. During the fall, a demonstration teacher (an expert in SSCS problem solving) enacted an extended inquiry lesson. During the spring, participants were encouraged to visit and coach one another as they implemented extended inquiries. IBDC in-service program participants were provided with four days of release time to observe the demonstration teacher and one another.

Each visit that a participant made consisted of a preconference, an observation, and a postconference. During the preconference, the demonstration teacher or observed participant discussed instructional decisions and lesson preparation. In addition, the demonstration teacher or the observed teacher provided suggestions for areas of observation (e.g. cooperative learning, unique role of the teacher, student communication, materials management by the students, or students refining questions). Copies of handouts, overheads, and materials critical to the extended inquiry lesson were shared at this time. During the observation, the participant took notes about the class, and observed the teacher and students. The postconference, or debriefing session, immediately followed the observation and lasted from fifteen to thirty minutes. The postconference provided an opportunity for the demonstration teacher or observed teacher to discuss the participants' observations and allowed participants to discuss and process the observed events that were most salient to them.

Follow-up sessions

There were three forms of follow-up provided to participants. One form of follow-up pertained to the participants' classroom implementation. Specifically, participants received feedback about their implementation of the extended inquiry lesson from the university science educator or research assistant. After observing a participant enact a lesson within the extended inquiry, the university science educator or research assistant provided feedback about the participant's instruction that was consistent the goals of the in-service program. Participants experienced between two to twelve observations with feedback.

The second form of follow-up came throughout the school year. Follow-up sessions, at different locations, were scheduled throughout the IBDC in-service program that addressed the expressed concerns of participants. During the four follow-up sessions, participants were provided information on peer coaching, cooperative learning, different types of research, and alternative assessments. In addition, a final session was devoted to processing the entire IBDC in-service experience.

The third form of follow-up occurred through e-mail discussions. The electronic discussions were primarily a forum for sharing ideas instead of providing feedback about lessons. Throughout the year, the research assistant moderated the electronic discussions by asking participants to share their current extended inquiries and by sharing her observations of participants' classes. Occasionally, participants would post questions to the group and fellow participants would reply.

An extensive discussion of the earlier version of the IBDC in-service program can be found in Luft and Pizzini (1998), Luft (1998a), Wilson and Pizzini (1994, 1995, 1996), and Pizzini, Wilson, and Veronesi (1995).

Methods

Participants

Fifteen secondary science teachers in a southwestern city participated in a year-long IBDC in-service program. Eight of the teachers had four to twenty years of teaching experience, while seven teachers were first to third year teachers. Eight were middle school teachers and seven worked in the high school. Eleven were life science or biology teachers, three were chemistry teachers, and one was a physics teacher. Inquiry instruction was important to all of the participants, yet only six participants indicated implementing any type of inquiry and two participants had previously used the model of extended inquiry in their classes. All participants received a stipend for participation in the in-service program, but none were paid to participate in the study. All participants consented to participating in the IBDC in-service program study.

Data Collection and Data Analysis

To assess the effects of the IBDC in-service program, a one-group pretest - posttest design (Campbell & Stanley, 1963) was used. Prescores represent the participant's first implementation of an extended inquiry, while postscores represent the participant's final implementation of an extended inquiry. Ten teachers implemented at least two extended inquiries during the IBDC in-service program. The ten teachers in this study participated in one to three demonstration classroom visits. They also attended planned follow-up sessions and were observed in their classrooms at least eight times.

The level of inquiry among participants was assessed through the Extended Inquiry Observational Rubric (EIOR) (Table 1). The EIOR was developed in reference to National Science Education Standard(National Research Council, 1996), the SSCS Implementation Rubric (Luft, 1998a), the Secondary Teacher Analysis Matrix (Gallagher & Parker, 1995), and the Constructivist Learning Environment Survey (Taylor, Fraser, & White, 1997). A complete description of the development of the rubric can be found in Luft (1998b).

The EIOR was used to evaluate the implementation of an extended inquiry model in participants' classrooms. During an extended inquiry lesson, an observer took extensive field notes and assigned a one to five value within each category of the EIOR. Each participant was observed four different days throughout the extended inquiry lesson by two primary researchers (the university science educator and the research assistant). Midway through the program and at the conclusion of the program, each participant received an overall score in the EIOR for each extended inquiry lesson implemented. The overall score was derived from a process of consensus in which the two primary researchers discussed their recorded observations and field notes and agreed upon each value. Participants' overall scores on the EIOR were analyzed with the dependent t-test in order to determine if significant change had occurred throughout the in-service program. In addition, written participant observations and field notes provided information about the process of change experienced by each participant.

Participants were also asked to provide a metaphor that described their instruction throughout the IBDC in-service program. Similar to Briscoe's (1991) study, the metaphor in this study was utilized as a means to capture the "sense making process" that science teachers engaged in as they learned an inquiry-based instructional methodology. According to Coffey and Atkinson (1996), metaphors can be used to understand how new meaning is learned.

Limitations

This study is concerned with the inclusion of classroom visitations to an in-service program. While all attempts were made to maintain a rigorous study, there are limitations that need to be acknowledged. First, the population in this study is small and composed of volunteers. Second, multiple comparisons were made (dependent t-tests) within one population of participants and the representative categories were examined as independent hypotheses. No adjustment was made in the alpha level, because type II error was considered as important as type I error (Schmidt, in press). Third, the lessons from participants may have been different than what occurred without a researcher present. These limitations notwithstanding, the design of the study and the use of the research methods lend confidence to the researcher in drawing conclusions from the data.

Results

The following categories were examined using the dependent t test: Cooperative Learning, Teacher as Guide, Assessment, Student Communication and Action, Inquiry Question, Designing and Conducting a Scientific Investigation, Gathering and Analyzing Data, and Sharing of Extended Investigations. These comparisons were completed to examine the following null hypothesis:

There was no significant difference between the implementation of individual categories, prior to and after the IBDC in-service program.

Table 2 reports the means and the standard deviations for the ten participants who completed at least two extended inquiries. Prescores represent the first extended inquiry lesson, while post scores represent the final extended inquiry lesson. Table 2 also reports the dependent t values and probabilities of the pairwise comparisons. During the calculation of the t-scores it was assumed that each category represented a different hypothesis that was worthy of consideration. This assumption acknowledges the concern for multiple tests within the same population. The results indicate that Cooperative Learning, Teacher as Guide, Assessment, Student Communication and Action, Inquiry Question, and Sharing of Extended Investigations were significantly different at the 0.01 level. Designing and Conducting a Scientific Investigation, and Gathering and Analyzing Data were significant at the 0.05 level.

The collected metaphors did not change substantially throughout the IBDC in-service program. Most participants consistently provided the same or a similar metaphor that described their instruction. The metaphor provided by participants allowed the researcher to understand the view the participants held about being a science teacher. A few of the collected metaphors included: a tour guide, a bus driver, an actor on the stage, a student, a wandering river, and a leader of an expedition.

Conclusions

Discussion

The participants in the IBDC in-service program did change their inquiry practice. Specifically, participants created the inquiry environments in their science classrooms that are recommended in the National Science Education Standards (National Research Council, 1996). The changes demonstrated by participants in this project may be attributed to the structure of the in-service program, which provided various follow-up opportunities including observations of peers.

The in-service program may have been successful because of the observational component. During the observational component of the in-service program, participants could observe an aspect of inquiry that was of personal importance and then process the observation with peers or the demonstration teacher. The actual observation of the demonstration teacher or peers possibly provided both general skills and specific skills to observing participants. General skills are implemented throughout the extended inquiry lesson and consist of group management techniques, processing strategies, and on-going assessment procedures. Specific skills are implemented during specific phases of the extended inquiry and consist of techniques to represent data, lessons to generate questions, or processes to assess data. Thus the observation may have provided participants with general skills and specific skills which addressed their own needs about inquiry practice. For example, as Phil observed the demonstration teacher he saw how she had the student groups process their individual roles, and he focused on how she assisted students in developing a researchable question.

The observations were enhanced by opportunities to process what was observed in the class. After an observation was concluded, participants had the opportunity to socially construct their understanding of extended inquiries in science with the demonstration teacher or their peers. For participants, social negotiation continued to occur through scheduled follow-up sessions, on-line electronic conversations, and during visitations by the university science educator and the research assistant. In this program, observing the demonstration teacher or peer provided an event for participants to assess and refine, while evolving their own personal notion of extended inquires.

While the participants in this study did change their practice, they did not alter their metaphors. In this study, the most participants' metaphors did not change, but the metaphors were expanded upon by the teachers. For example, Susan described herself as a "guide" at the beginning of the program. In describing her role of tour guide, she did not specifically address how she was a guide to the students. At the conclusion of the IBDC in-service program, she still viewed herself as a guide, but she could more clearly define the practices (e.g. questioning, pausing, observing, discussing) that she enacted to make her a guide. Participants expanded descriptions may have been a result of the varied forms of follow-up which encouraged a personal construction of the extended inquiry practice.

Importance

The IBDC in-service model provides participants with a variety of avenues to learn about inquiry, including the opportunity to observe a "live" instructional situation with students. Science teachers can observe how another teacher handles the espoused in-service methodology and they can observe the effect of instruction on students. In addition, participants have ample opportunities to socially negotiate the observation and construct their understanding of inquiry instruction with their peers and in-service staff. The performances that are observed by the participants are not staged or presented through the eyes of another (as in video), instead they are open to interpretation by the observer with the hopes that the observer will focus on some aspect of instruction when it is important to his/her instruction.

This study suggests that the opportunity to observe another teacher and the opportunity to discuss practice may be important as science teachers learn to implement extended inquiry methodologies. The IBDC in-service program may assist teachers in implementing inquiry and clarifying their roles during inquiry lessons.

References

Briscoe, C. (1991). The dynamic interactions among beliefs, role metaphors, and teaching practices: A case study of teacher change. Science Education, 72(2), 185-199.

Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNally & Company.

Coffey, A., & Atkinson, P. (1996). Making sense of qualitative data. Thousand Oaks, CA: Sage Publications.

Gallagher, J. & Parker, J. (1995). Secondary science teacher analysis matrix. Published document, Michigan State University.

Luft, J. A. (1998a). Alternatively assessing an in-service program. School Science and Mathematics, 98(1), 26-34.

Luft, J. A. (1998b). Final Report of the PSDCB in-service project. Phoenix, AZ: Eisenhower Mathematics and Science Program, Arizona Board of Regents.

Luft, J. A. (preliminary acceptance). Teachers' salient beliefs about a problem solving demonstration classroom in-service program. Journal of Research on Science Teaching.

Luft, J. A., & Pizzini, E. L. (1998). The demonstration classroom in-service: Changes in the classroom. Science Education, 82(2), 147-62.

National Research Council (NRC) (1996). National science education standards. Washington, DC: National Academy Press.

Pizzini, E. L., Huber, R. A., & Shymansky, J. A. (1988). Science odysseys for the journeys in science program. River Forest, NJ: Laidlaw Educational Publishers.

Pizzini E. L., Wilson, J. L., & Veronesi, C. (1995). A study of the perceptions of demonstration teachers in Iowa relating to the development and implementation of problem solving demonstration classrooms. Iowa Educational Leadership, 7(1), 35-43.

Schmidt, F. (in press). Statistical significance testing and the cumulative knowledge in psychology: Implications for the training of researchers. Psychological Methods.

Taylor, P., Fraser, B., & White, L. (1997). Constructivist learning environment survey. In Salish I Research Collaborative: Instrument Package User's Guide. Iowa City, IA: University of Iowa.

Wilson, J. L., & Pizzini, E. L. (1994). A new perspective for science in-service: Problem solving demonstration classrooms. Iowa Science Teachers Journal, 30(3), 3-11.

Wilson, J. L, & Pizzini, E. L. (1995). Considerations for the development of demonstration classrooms in Iowa. Iowa Educational Leadership, 7(1), 29-34.

Wilson, J. L., & Pizzini, E. L. (1996). A paradigm for developing a demonstration classroom program. In J. Rhoton and P. Bowers (Eds.), Issues in Science Education (pp. 214-220). Arlington, VA: National Science Teachers Association.

Table 1

Extended Inquiry Observational Rubric (EIOR) *

Topics	5	4	3	2	1
Cooperative Learning	Cooperative learning is integrated throughout the inquiry lesson. Specifically, groups of students have roles (defined or undefined); there is positive inter-dependence, individual accountability, interpersonal and small group skills, and group processing throughout the inquiry lesson.	Cooperative learning is frequently integrated into the inquiry lesson. A majority of cooperative learning elements are consistently evident, or all aspects of cooperative learning are utilized frequently.	Cooperative learning is partially integrated into the inquiry lesson. Some elements of cooperative learning are present, or aspects of cooperative learning are utilized periodically.	Cooperative learning is occasionally integrated into the inquiry lesson. A few elements of cooperative learning are apparent or utilized by the teacher.	Throughout a majority of the inquiry lesson, students are working independently, or working independently in groups.
Teacher as Guide	The teacher often guides students by listening, observing, and questioning. Teacher responses are primarily goal-orientated, emerge from students' responses or work, and they are used to guide students' investigation.	The teacher frequently guides students by listening, observing, and questioning. Teacher responses frequently emerge from students' responses or work, and they are used to guide the investigation. Goal-orientated statements may occur.	The teacher occasionally guides students by listening, observing, and questioning. The responses are primarily teacher-directed, and often clarify students' ideas or direct students' ideas. Goal-orientated and guiding statements may occur.	The teacher-student interaction is primarily teacher initiated. The teacher responses are primarily about the correctness of the students' ideas, primarily knowledge or comprehension questions, or directive (e.g. about connections and applications the student should make about the topic). Goal-orientated and guiding statements may occur.	The teacher-student interaction throughout the lesson is predominately comprised of low-level and/or directive statements.
Assessment	The assessment is integrated throughout the inquiry lesson; it takes on multiple forms; and it provides summative, formative, educative, and evaluative feedback.	Different forms of assessment occur frequently throughout the lesson. The assessment provides information that may be summative, formative, educative, or evaluative.	The is assessment occurs periodically throughout the lesson. The assessment primarily captures students' understanding, students' abilities and/or students' knowledge.	The assessment is occasional, occurs in one or limited forms, and/or primarily represents students' knowledge.	The assessment has primarily one form that has an emphasis at the conclusion of the lesson.
Student Communication & Action	Student to student interactions and actions are commonly student-initiated, reflective, and directed towards understanding and planning.	Student to student interactions and actions are frequently student-initiated, reflective, and directed towards understanding and planning.	Student to student interactions and actions are periodically student-initiated, reflective, and directed towards understanding and planning.	Student to student interactions and actions are occasionally student-initiated, reflective, and directed towards understanding and planning.	Student to student interactions and actions are infrequent and often depend upon teacher intervention. Occasionally, students may ask questions that are directed towards understanding.

Inquiry Question	Student groups identify and refine questions that can be answered through an investigation, address a concept, and the question is relevant to the student group. The inquiry question directly relates to the question generating experience.	Student groups identify a question that can be answered through an investigation and addresses a concept. Most questions are refined and relate to the question generating experience. The selected questions are relevant to the student group.	Student groups identify a question that can be answered with an investigation. Few questions are refined, address a concept, and/or few relate to the question generating experience. The selected question may or may not be relevant to the student group.	Most student groups identify a question that can be answered with an investigation. Some question's are refined and/or some relate to the question generating experience. The selected question may or may not be relevant to the student group.	Refined questions are provided (directly or indirectly) to all student groups, and/or a majority of the questions pertain to skill acquisition/print research.
Designing and Conducting a Scientific Investigation	Developed investigations align with the selected question. Investigation procedures are developed by the students and they are thorough, yet subject to revision during the experiment. Appropriate tools and techniques are specified for data collection, and the data collection scheme collects all of the information that is relevant to the investigation.	Developed investigations frequently align with selected questions. Investigation procedures are developed by students and most are thorough or comprehensive. Appropriate tools and techniques are specified for data collection, and the data collection scheme collects most of the information that is relevant to the investigation.	Most investigation procedures align with the identified question. Most procedures and data collection schemes are complete. Tools and techniques are specified for the data collection. The data collection scheme collects most of the data that is relevant to the investigation.	Most investigation procedures align with the identified question. Tools and techniques are specified for the data collection. The procedures and data collection schemes are preliminary and/or are unrevised.	Most investigation procedures align with the identified question. Procedures and data collection schemes are complete as a result of teacher direction.
Gathering and Analyzing Data	Students are attentive to collecting accurate data. Students examine the data in different ways, they develop explanations from the data, and they create appropriate graphical representations. Students think critically and logically about the relationship of evidence and explanation.	Students are attentive to collecting accurate data. Most students examine the data in different ways, develop explanations from the data, and create appropriate graphical representations. Most students think critically and logically about the relationship of evidence and explanation.	Most students are attentive to collecting accurate data. Most students examine the data different ways, develop explanations from the data. Graphical representations may or may not be appropriate. Some students think critically and logically about the relationship of evidence and explanation.	Some students are attentive to collecting accurate data. Most students make basic analyses, with graphical representations that may or may not be accurate. Some students may or may not be aware of the relationship between evidence and explanation.	Students are focused on collecting data. Analyses are basic, and graphical representations may or may not be accurate. Some students may or may not be aware of the relationship between evidence and explanation.
Sharing of Extended Investigation	Students communicate the process of their investigation, explain their method of analysis, discuss logically their argument, identify limitations of the study, and respond to comments or questions.	Most students communicate the process of their investigation, discuss their analysis and conclusions, identify limitations of the study, and respond to comments or questions.	Most students communicate about the process and the conclusions of their investigations. Basis analyses and limitations are present, and students' responses to questions or comments are simplistic.	Most students communicate about the basic and fundamental processes that were utilized in the investigation. They may or may not identify limitations and respond to questions.	Most students have difficulty in communicating the process of their investigation.

* Extended Inquiries will be defined as any investigation that lasts three or more classroom periods.

Table 2 Means, Stand Deviations, and t-values (2 tailed, 0.10) of Extended Inquiry Implementation

Component (n=10)		Prescores	Postscores	t-value (df=9)
Cooperative Learning	M	2.30	3.00	3.28**
	SD	0.67	0.47	
Teacher as Guide	M	2.40	3.10	3.28**
	SD	0.84	0.56	
Assessment	M	1.70	2.30	3.67**
	SD	0.67	0.48	
Student Communication and Action	M	1.70	2.30	3.67**
	SD	0.48	0.67	
Inquiry Question	M	2.00	2.70	3.67**
	SD	0.67	0.67	
Designing Conducting a Scientific Investigation	M	2.20	2.60	2.45*
	SD	0.63	0.52	
Gathering and Analyzing Data	M	1.70	2.10	2.45*
	SD	0.48	0.74	
Sharing of Extended Investigation	M	1.90	2.50	3.67**
	SD	0.57	0.70	

Note. $*p \leq .05$. $**p \leq .01$.

SE061529

ERIC®

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Inquiry-Based Demonstration Classrooms: An in-service model for science teachers	
Author(s): Julie A. Luft	
Corporate Source: University of Arizona	Publication Date: April, 1998

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1	Level 2A	Level 2B
[X]	[ ]	[ ]
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature:	Printed Name/Position/Title: Julie A. Luft, Assistant Professor	
Organization/Address: Teaching and Teacher Education, University of Arizona, Tucson, AZ 85721	Telephone: 621-6436	FAX: 621-7877
	E-Mail Address: luft@u.arizona.edu	Date: 4/6/98

ERIC

(over)

ERIC®

Clearinghouse on Assessment and Evaluation

University of Maryland
1129 Shriver Laboratory
College Park, MD 20742-5701

Tel: (800) 464-3742
(301) 405-7449
FAX: (301) 405-8134
ericae@ericae.net
http://ericae.net

March 20, 1998

Dear AERA Presenter,

Congratulations on being a presenter at AERA[1]. The ERIC Clearinghouse on Assessment and Evaluation invites you to contribute to the ERIC database by providing us with a printed copy of your presentation.

Abstracts of papers accepted by ERIC appear in *Resources in Education (RIE)* and are announced to over 5,000 organizations. The inclusion of your work makes it readily available to other researchers, provides a permanent archive, and enhances the quality of *RIE*. Abstracts of your contribution will be accessible through the printed and electronic versions of *RIE*. The paper will be available through the microfiche collections that are housed at libraries around the world and through the ERIC Document Reproduction Service.

We are gathering all the papers from the AERA Conference. We will route your paper to the appropriate clearinghouse. You will be notified if your paper meets ERIC's criteria for inclusion in *RIE*: contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality. You can track our processing of your paper at http://ericae.net.

Please sign the Reproduction Release Form on the back of this letter and include it with **two** copies of your paper. The Release Form gives ERIC permission to make and distribute copies of your paper. It does not preclude you from publishing your work. You can drop off the copies of your paper and Reproduction Release Form at the **ERIC booth** ~~**(424)** or mail to~~ our attention at the address below. Please feel free to copy the form for future or additional submissions.

Mail to:

AERA 1998/ERIC Acquisitions
University of Maryland
1129 Shriver Laboratory
College Park, MD 20742

This year ERIC/AE is making a **Searchable Conference Program** available on the AERA web page (http://aera.net). Check it out!

Sincerely,

Lawrence M. Rudner

Lawrence M. Rudner, Ph.D.
Director, ERIC/AE

[1]If you are an AERA chair or discussant, please save this form for future use.

CUA

The Catholic University of America