DOCUMENT RESUME

ED 390 837 SP 036 400

AUTHOR	Young, M. J.; And Others
TITLE	Symposium: A New Observation Tool for Looking at Inquiry-Based Teaching and Learning.
PUB DATE	Apr 95
NOTE	33p.; Papers presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 18-22, 1995).
PUB TYPE	Collected Works - General (020) -- Speeches/Conference Papers (150) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Classroom Observation Techniques; Classroom Research; College Instruction; Corporate Education; Elementary School Teachers; Elementary Secondary Education; Faculty Development; Higher Education; *Inquiry; *Learning Processes; Mathematics Education; *Observation; *Program Evaluation; Science Education; Secondary School Teachers; *Teaching Methods; Technology Education

ABSTRACT

This document comprises four papers from a symposium on using an inquiry-based observation tool for assessing teaching and learning on various educational levels. The first paper, "Introduction, and Overview and Use of the Tool for K-12 Science, Mathematics, and Technology Program Evaluation" (M. Jean Young), presents an overview of the tool including a review of the literature, a discussion of how the tool was edited and revised through extensive use, and a brief description of training others to use the tool. The second paper, "Using an Inquiry-based Observation Tool for Assessing Quality of K-8 Staff Development Program in Science and Mathematics" (Belle Brett), examines the Teachers' Academy for Mathematics and Science in Chicago, an independent institution focusing on the professional development of Chicago's public school elementary teachers, specifically in the area of science and mathematics, and its "Intensive Teacher Enhancement" strand. This strand, only one of several designed to promote systematic reform in science and mathematics in Chicago's schools, is a 3-year inservice program in mathematics and science. The third paper "Using an Inquiry-Based Observation Tool to Identify Effective Components of a University Course" (Nancy Lemire), describes a project using the Classroom Observation Protocol for Inquiry-based Teaching and Learning tool to determine if the behaviors associated with inquiry-based teaching and learning were present in a college course entitled "Critical Thinking." The fourth paper, "Using an Inquiry-based Observation Tool for Benchmarking in a Corporate Educational Department" (Susan E. Squires) describes adaptation of the protocol for use in evaluating a course for human resources specialists. Data gathering forms, along with instructions for completing the form and analyzing data, are included. (ND)

Symposium: A New Observation Tool for Looking at Inquiry-Based Teaching and Learning

By: M.J. Young, B. Brett, S. Squires, N. Lemire

American Educational Research Association,
Annual Meeting, San Francisco,
April, 1995

If you have questions/comments regarding the attached Classroom Observation Protocol, contact:
M. Jean Young, MJ Young & Associates, 4740 E. Sunrise Drive, #212, Tucson, AZ
Telephone, (520) 577-3457; Fax (520) 577-5527; email JYOUNG@DATA.BASIX.COM

Introduction, and Overview and Use of the Tool for K-12 Science, Mathematics, and Technology Program Evaluation

M. Jean Young
National Center for Improving Science Education

Inquiry-based teaching and learning is an emerging paradigm at the core of many educational reform efforts in the United States and elsewhere. Inquiry-based teaching and learning puts learners in the active role, constructing their own learning, while the teacher acts as facilitator. This learning may take place in a variety of modes (e.g., small group hands-on work, whole group discussion, one-on-one teacher-student dialogues, individual projects) and may take place in many different settings from K-12 schooling to corporate education.

The current wave of reforms in education and education-related settings brings with it new calls from the broader community, administrators and program managers, government officials, and funders, for accountability and evidence of movement toward inquiry-based teaching and learning. Assessing the complex and versatile nature of this paradigm requires a new methodology that can operationalize its many facets.

Through our pilot work with a new observation tool for assessing inquiry-based teaching and learning, we have demonstrated that we can collect valid and reliable information in a variety of settings. The tool is easy to use, and non-evaluators can be trained to use it in a minimum amount of time. It is adaptable for use in diagnosing areas for improvement, benchmarking, documenting evidence of inquiry-based learning, assessing teaching quality, and identifying components of inquiry-based teaching that make a difference. We believe it is a valuable contribution to the educational and evaluation communities and anyone who needs to make observations of these new learning modes.

In this paper, I present an overview of the development of the tool including a review of the literature, a discussion of how the tool was edited and revised through extensive use, and a brief summary of our experience training others to use the tool, which involved developing inter-rater reliability among users with divergent backgrounds. Next B. Brett, S. Squires, and N. Lemire present examples of how the instrument has been adapted and is currently being used in various settings: assessing quality of K-8 staff development program in science and mathematics; identifying effective components of a university course; and, benchmarking in a corporate educational department.

Development of the Inquiry-Based Observation Tool

In inquiry-based as well as more traditional classes, students may be seen to exhibit similar behaviors such as working on laboratory investigations in small groups. When inquiry is discussed in the literature intent rather than specific kinds of activities or behaviors are generally mentioned. For example, the intent of a laboratory investigation in a traditional classroom may be for students to follow a procedure in order to answer questions while in an inquiry-based classroom the intent may be for students to solve a problem.

Our inquiry-based observation instrument originated in a conversation about how evaluators could assess whether or not inquiry was going on in a classroom. Specifically, what makes inquiry-based classes *look* different? The particular context being discussed was to show evidence of inquiry-based teaching and learning in classrooms of teachers who had participated in science, mathematics, and technology teacher enhancement programs.

Since an intended outcome for current science, mathematics, and technology teacher enhancement programs is to move teachers from a more traditional approach to more inquiry-based teaching, it seemed reasonable to start thinking about an instrument to look at inquiry-based teaching and learning in terms of a continuum between two opposite dimensions of behavior, one dimension being "traditional" the other being "inquiry-based." Since teachers have been using "traditional" methods for decades, the behaviors are well-defined. We conducted a literature review to develop our initial set of behaviors for "inquiry-based." We then developed an instrument that ws later revised and edited through numerous iterations into its present form (see Appendix).

Need for a New Instrument

The inquiry-based tool was initially developed at the National Center for Improving Science Education (NCISE) for use in exploring outcomes of the Department of Energy's Teacher Research Participation (TRP) program. One goal of the TRP program calls for teachers to transfer the knowledge gained from participation in the program to their students. This knowledge is described as "awareness and knowledge of the scientific research process." Exactly what an evaluator might look for to find whether or not their knowledge was transferred to the classroom was unclear. We needed to specify what such terms as "scientific research process" might look like in a classroom.

In developing a classroom observation protocol of which the continuum was a part, we first looked at instruments and protocols developed as part of the Expert Science Teaching Evaluation Model (Burry, 1992) in particular the Science Classroom Observation Record, which was developed to focus on constructivist teaching and learning. We also looked at instruments developed for the *Reform Up Close* study (Porter, Kirst, Osthoff, Smithson, & Schneider, 1993). While these instruments as a whole were useful, they did not specifically address our purposes. We were looking for an instrument that would: provide a snapshot of classrooms prior to a program invention to compare with the same classrooms after the program; look at observable behaviors versus making inferences; and be appropriate for use by a variety of different observers with diverse backgrounds. Therefore, while we used many items and ideas from Burry and from Porter et al., the heart of our tool became a typology, a continuum rating scale with more inquiry-based practices on one end and more traditional practices on the other. The typology allowed us to focus directly on inquiry-based teaching and learning. We refer the reader to the Burry and Porter et al. studies for a review of the other parts of the observation tool which relied heavily on their work. The following is a discussion of the literature as it relates to the development of the typology.

Literature Review

Overall, educators agree that science should be taught in schools in ways that reflect actual practice of scientists.(Tobin, Tippins, & Gallard, 1994), i.e., scientific inquiry. As Kober (undated, p. 6) says,

> *"Young people build critical thinking skills and scientific habits of mind when they are allowed to become scientists--rather than simply studying science--by modeling the processes of inquiry and exploration that real-life scientists use to discover new knowledge.""*

But what does actual practice looks like in the classroom? The National Standards in Science Education (May, 1994) presents a comprehensive statement of inquiry teaching and learning as:

> *"proficiency in conducting inquiry including the use of scientific modes of reasoning, and the ability to apply and to communicate scientific knowledge; scientific understanding of concepts, laws, theories and models; understanding of the interdependent relationship of science and technology; and understanding of the influence of science on societal issues both contemporary and historical."*

To operationalize this statement, in order to develop an observation tool, we used aspects of a teaching model that is consistent with science and technology teaching and learning that incorporates actual scientists' practice (National Center for Improving Science Education, 1991). We also used specific strategies that are delineated in the National Science Education Standards Sampler (May, 1994).

As a result of the literature review, we were able to pinpoint the separate behaviors that distinguish teachers who support inquiry-based teaching and learning and resultant student behaviors:

- The teacher acts as a facilitator by asking students open-ended questions, encouraging students to explain and predict in order to increase their understanding, and by asking probing questions that encourage discussion.

- A teacher gives students open-ended problems to solve or questions to answer through doing an investigation.
- Teachers use forms of assessment consistent with inquiry-based learning when they test for understanding and ability to inquire/solve problems.
- When students engage in inquiry-based learning, they use reasoning to answer questions or solve problems in order to gain conceptual understanding and/or explore cause-effect relationships in understanding principles.
- Students may be answering their own questions through experiments they have designed and/or through individual and group projects.
- Students address one another and often seek help from one another versus always looking to the teacher for answers.

When the teacher does *not* incorporate inquiry-based learning, students generally follow a procedure to solve a problem or follow a procedure to confirm, versus explore, a concept or principle through laboratory investigations. Assessment is accomplished through short-answer tests that seek knowledge of facts and definitions. In a classroom where the teacher does not act as a facilitator, students mainly address the teacher, the teacher provides knowledge generally through lectures, and recitation versus discussion defines student-teacher interactions.

<u>Initial Use and Revisions of the Tool</u>
The tool was used in classrooms of ten teachers who were selected to be visited before participating in the program and one year later, after participating in the program. During the pre-program observations, inter-rater reliability was established between the two observers who made the classroom visits. (We are not going to elaborate further on the methods here since the current version of the instrument is very different than the version initially used.)

After its initial use, other evaluators were made aware of the instruments' apparent effectiveness as a tool to discern the extent to which inquiry was going on in the classroom (see examples that follow this background section). This interest resulted in further developing and revising the instrument and establishing its effectiveness for use in contexts other than science, mathematics, and technology education.

During post-program observations of classrooms a year later, we tested out several versions of the classroom observation protocol which resulted from feedback and input from evaluators using the tool in other contexts. Where teachers taught the same subject more than once, different versions of the protocol were used separately for the two or more classes and later compared in terms of quality and quantity of data obtained. After each visit the protocol was revised, and then consolidated into other versions.

In analyzing data obtained using the tool, we were able to see that many of the teachers whose classrooms we observed moved toward using more inquiry-based strategies after participating in the program than before participating. Since these outcomes are based on data from a few teachers in our pilot study we present them here only as an indication that the instrument has *potential* for use in evaluating teacher programs that promote inquiry-based teaching and learning.

Training Others to Use the Tool

The current version was developed after training two dozen Department of Energy Precollege program staff to use the instrument. The precollege staff were trained in the use of the instrument to make classroom visits before and after teachers participate in their National Teacher Enhancement Programs (NTEP). It was essential during the training to establish inter-rater reliability among the staff members because the data collected would be compiled into one report from information collected on the nine different programs that make up NTEP.

Using three videotapes supplied to us by Ann Roseberry of Technical Education Research Centers (TERC), we were able to have trainees fill out the instrument using the same example, discuss their answers, discuss the definitions provided in the instructions to the protocol, then apply their knowledge to a new example. After showing the second and third videotapes, we determined inter-rater reliability.

To establish inter-rater reliability we used a system of quadrants whereby we divided the typology continuum into eighths then counted responses that fell into any given quadrant (two adjacent eighths). We were able to get a 70% or, usually, greater inter-rater reliability on all but two items. We then changed the definitions of these two items to match a shared understanding among the trainees. Since the trainees included Ph.D. scientists, teachers, program managers, engineers, and school administrators, we felt the instrument was particularly robust in terms of background necessary to use the instrument. We would like to note here that the insights and feedback from this group of trainees was especially helpful in enabling us to further develop our tool to provide observational evidence of inquiry going on in science, mathematics, and technology classrooms.

References

Burry, J. (1992). *Teaching for meaningful understanding: Expert Science Teaching Evaluation Model (ESTEEM) manual.* Western Michigan University: Center for Research on Evaluation Accountability and Teacher Evaluation.

Kober, N. (Undated). *EDTALK: What we know about science teaching and learning.* Washington, D.C.: Council for Educational Development and Research

National Center for Improving Science Education. (1991). *The high stakes of high school science.* Andover, MA: NCISE.

Porter, A.C., Kirst, M. W., Osthoff, E.J., Smithson, J.L., & Schnieder S.A. (1993, July Draft). *Reform up close: A classroom analysis.* University of Wisconsin-Madison: Wisconsin Center for Education Research

Tobin, K., Tippins, D.J., & Gallard, A. J. (1994). Research on instructional strategies for teaching science. In D.L. Gabel, *Handbook of research in science teaching and learning: A project of the National Science Teachers' Association.* New York: Macmillan.

Using an Inquiry-Based Observation Tool for Assessing Quality of K-8 Staff Development Program in Science and Mathematics

Belle Brett
National Center for Improving Science Education

The National Center for Improving Science Education (NCISE) received a grant from the Department of Energy to provide an impact assessment of the Teachers' Academy for Mathematics and Science in Chicago (TAMS). TAMS is a free-standing institution focusing on the professional development of Chicago's public school elementary teachers (K-8), specifically in the areas of science and mathematics. TAMS "Intensive Teacher Enhancement" strand, which is only one of several strands designed to promote systemic reform in science and mathematics in Chicago's schools, is a three-year inservice program (one and one-half years each in mathematics, followed by science). It includes direct instruction, either at TAMS or on site, and follow-up classroom support both during instruction and after. At the time of our study, 42 schools had been involved in the intensive program.

Because both the organization and it programs had been somewhat in flux since its inception in 1990, we decided that an impact evaluation would be premature. In addition, our ability to look at even short-term teacher and student outcomes was limited by our budget and lack of other data needed for analysis of TAMS' teacher participants and their students. Thus, we decided to examine the organization's history and progress and assess the quality of its programs.

One key area for examination was the actual instruction delivered by TAMS' staff to teacher participants. We interviewed all mathematics staff (the director, the three in-house instructors, four "implementation" specialists who did follow-up in the schools, and a key consultant who also taught at TAMS) and most of the science staff (the coordinator and nine of the twelve instructional staff).

We observed nine classes taught by fourteen different instructors (four classes were co-taught by two or more instructors): four mathematics classes (two geared towards grades K-3 teachers and two towards grades 4-8), four science classes (three aimed at K-3 teachers and one 4-8), and one class offered by TAMS' Resource Center. In some cases the interviews took place before the interviews and in some cases after because of scheduling.

After considering various possibilities and reviewing the literature, we decided to use an observational protocol to guide our viewing, both in the instructional classes and in the schools. Since one of TAMS' objectives is to help teachers develop their skills in using inquiry, we agreed to help pilot test an earlier version of the Classroom Observation Protocol for Inquiry-Based Teaching and Learning. The Protocol covered several key facets that were in alignment with TAMS' instructional model.

Because we were interested in assessing program quality and not just the degree to which certain focused teacher and student behaviors were traditional or inquiry-based, we developed an additional tool based on a variety of other classroom observation instruments as well as a staff development template incorporating elements of effective practice and developed by NCISE. The new instrument both built upon and complemented the Protocol. It covered a broader range of behaviors associated with good teaching(e.g., pacing, clarity of explanation) and a numerical scale from 1-7 that indicated the degree to which the effective behavior was present. Thus, in contrast to the Protocol, there was a "good" end of the scale. This instrument was reviewed by several individuals and modified slightly after the first set of visits.

The usual procedure for use of both protocols was that one person took extensive field notes of dialogue while the other captured behaviors. The observers would try not to communicate with each other in class sessions and often sat in different places to obtain different perspectives. During group activities, the observers sat in or observed different groups. At breaks, the observers informally chatted with the instructors and/or participants. Observation time averaged two to two and one-half hours. (Classes lasted anywhere from three hours to a full day.) As soon as possible after the session, in cases where more than one person observed, each observer completed the scales of the observation instruments. Then both met and came up with a third version, a consensus.

The Classroom Observation Protocol for Inquiry-Based Teaching and Learning was completed for seven out of nine observed session of TAMS' instructors teaching teachers. (Therefore, "students" referred to below, are TAMS' teacher participants.) For three of these--a K-3 science class, a K-3 mathematics class, and a 4-8 mathematics class--the Classroom Observation Protocol was completed by two observers. One of the observers was an administrative assistant with NCISE, with no previous classroom experience or background in science education. A further challenge was presented by these classes than one might find in the usual classroom in that they were co-taught. There was the danger, therefore, that the two different instructors might teach in different ways and thus present confounding data. Nevertheless, with minimal training, the inexperienced observer was able to achieve high inter-rater reliability for all classes, using the quadrant system described previously, with a more experienced observer/evaluator with classroom teaching experience.

Inter-rater reliability was achieved on all but two items in two classes, and three items in one class. In the latter case, agreement level of two items fell within one and one-half quadrants. Greatest confusion arose when behaviors were minimally demonstrated or maximally demonstrated. For example, with "students ask mainly procedural questions" versus "students ask questions to clarify conceptual understanding," the student didn't ask many questions at all in two classes. Although they had a great deal to say, it was not in the form of questions. Thus, possibly there were not enough data to make a good judgement. Alternatively, the inexperienced observer, who had marked towards the end of the scale with "procedural questions" admitted that because there was not a lot of data, her tendency was to mark toward the left hand side. This type of error in scoring is a possible hazard in bipolar scales.

Conversely, the "teacher talks" versus "student talks" item was problematic in that both teachers and students talked a great deal, thus making it harder to gauge the actual proportion. As an experienced observer, I find that scripting a class helps me to find the evidence for this kind of question. However, we generally do not recommend this procedure for inexperienced observers as they are likely to miss a great deal. With two observers, one person can script.

In the K-3 mathematics class, there was disagreement about a third item—students using versus not using evidence to support claims. In this instance, the inexperienced observer felt that her lack of knowledge of the subject matter inhibited her judgment in distinguishing the extent to which she felt evidence was being presented. On the whole, lack of content knowledge was not a problem in noting whether inquiry exists. Fortunately, most people have had experience themselves in classrooms to be able to readily pick up on the milieu for observational purposes.

Conditions under which the observations are made might also influence reliability. The K-3 science class took place in a noisy gymnasium and then was moved to the library where the intercom and fire bell constantly interrupted the class. This somewhat more chaotic environment was in contrast to the controlled conditions of classes taught at TAMS. New observers need to be alerted to factors that might affect their responses. They also need to be encouraged to not let one event dominate their perceptions. In one instance, the inexperienced observer noticed one unfortunate interaction during a small group exercise between an instructor and a teacher participant. This observations caused her to score the teacher on one item somewhat differently from me. conversely, had I witnessed the incident I might have changed my own assessment on that one item. Awareness of the subjectivity of observation ca help to compensate for that very subjectivity. We advocate the use of marginal notes to explain responses where the observer was unclear about the appropriate responses. In addition, the use of two observers, although not critical, increases the validity and reliability of the instrument. We found that by completing the Protocols ourselves first, we were each able to score the sessions based on our own perceptions, without the undue influence of one observer. Then, each could make his/her arguments during the consensus discussion. In all cases, consensus was easy to achieve—in most cases a score somewhere between the two marks was agreed upon, in a couple of cases, an argument was sufficiently convincing that the new mark was close to one of the together of the two observers. Since our study was qualitative, all data collected were reviewed—both of the observers completed the instruments, as well as the consensus scales.

Fortunately, we found the Classroom Observation Protocol for Inquiry-Based Teaching and Learning to be a fairly low inference tool, in which behavioral evidence is paramount. Thus, even with one observer, it can provide reliable, quantifiable data, with minimal training and experience, for an activity that is often quite subjective.

Using an Inquiry-Based Observation Tool to Identify Effective Components of a University Course

Nancy Lemire
Vermont College of Norwich University

In the spring of 1994, I designed a student research project in which I used the Classroom Observation Protocol for Inquiry-based Teaching and Learning tool. Part of my project was to determine if the behaviors associated with inquiry-based teaching and learning were present in a college course entitled "Critical Thinking."

As part of the University System of New Hampshire, The College for Lifelong Learning's mission is to deliver innovative learner-oriented programs of higher education. One component of this learner-oriented approach is the implementation of a core curriculum requiring all students to complete the Critical Thinking course.

Although the outcomes for the Critical Thinking course were clearly defined by the college, for example, "to view the integrating of skills and the synthesizing of ideas as a characteristic of an effective problem-solver, the process or strategies for attaining these outcomes were not clear. I needed a way to identify the behaviors associated with inquiry-based teaching and learning in order to determine evidence of these behaviors in the classroom and if these behaviors were related to the proposed outcomes for the course.

The classroom observation tool designed by NCISE was easily adapted for my purposes. As I familiarized myself with the tool, I found the behaviors listed on the typology were consistent with those in the literature regarding inquiry-based teaching and learning. I operationalized definition for the typology using the definitions provided in conjunction with my own definition. For example, in the section related to student behavior, "students ask mainly procedural questions" versus "students ask questions to to clarify conceptual understanding," I wanted to be more specific regarding who the students were directing questions to. I added "of teacher" to each of these behavior definitions.

I used all sections of the tool except for the section designed for observing laboratory or hands-on learning. This section was not used because the Critical Thinking course did not include these elements. The omission of this section did not affect the data gathering capacity I required for this project in any negative way. Further, I believe that the division of the tool into sections has created an instrument adaptable to many classroom environments.

I observed three Critical Thinking classes each led by a different instructor during the spring semester of 1994. I made three observations in each of the three classes, one at the beginning of the semester, one at mid-semester, and one at the end of the semester. Each observation consisted of a time period of three and one-half hours (the duration of the class). At the end of this time period I scored by observations on the continuum provided for each set of behaviors or strategies. I used the suggested percent system in scoring my observations (i.e., score according to the approximate percent of time the behavior or strategy was observed to occur), and identified the mid-point of each line as 50 percent. For example, if the students interacted with each other 75 percent of the time, I placed and "X" halfway between the mid-point and the end of the line on the side where that behavior was listed.

Once all observations were completed. I began the job of interpreting the observation sheets. My first task was to look for evidence of the behaviors associated with inquiry-based teaching and learning--if they were occurring and how often. This was accomplished without having to read pages and pages of notes. I could look at the scores I gave each pair on the typology and calculate approximate percentages of class time these behaviors occurred, or did not occur.

Scoring separate pairs of behaviors/strategies for each of the three Critical Thinking classes allowed me to compare and contrast patterns of behavior between classes. I was also able to determine whether or not changes in behavior occurred from the beginning to the end of the semester.

As a graduate student and a novice at data collection and interpretation, I found the design of the tool uncomplicated and easy to use. It delineated the behaviors associated with inquiry-based teaching and learning providing me with the framework necessary to collect information focused solely on the elements of interest. The separate section devoted to discussions allowed to compare that particular class activity between classes, and with the general classroom behaviors. I found the separate sections devoted to particular classroom activities especially useful in interpreting when and where inquiry-based behaviors were evident.

Having used the instrument somewhat early in its development, I was somewhat hampered by the lack of clarity and specificity of the definitions for each set of behaviors/strategies. In addition, I would have found it helpful to have separate sections involving the assessment or evaluation of the student's learning while participating in any given class.

Using an Inquiry-Based Observation Tool for Benchmarking in a Corporate Educational Department

Susan E. Squires
Arthur Andersen and Co., SC

Goal-based training is an emerging variation of inquiry-based teaching and learning used by the more innovative corporate education programs. At Arthur Andersen's Center for Professional Development this style of teaching and learning has been used for several years. The role of training has shifted from providing information to a focus on skill development in problem solving just as there is a shift in emphasis in the workplace toward the role of the worker as problem solver.

Goal-based training provides a hands-on experience for the learner by creating an environment that simulates and actual business situation that might be encountered back in the home office. The learner is then provided with a business problem and is asked to provide possible solutions. Coach/facilitators and an array of learning materials are made available to the learners to use as they wish. Actors may also be used to represent business clients or office staff. Therefore, as with other inquiry-based teaching and learning, the learner takes an active role in constructing their own learning.

The Classroom Observation Protocol for Inquiry-based Teaching and Learning tool was adapted for use in evaluating a course for human resources (HR) specialists. The goal of the course was to introduce staff to more proactive, inquiry-oriented roles for the HR professional: consultant and strategist. Sixteen students participated. They were divided into four groups and sent to four separate classrooms where a simulation of a human resource office was recreated. The task of the evaluator was to observe the interactions and activities in each of the classrooms and document evidence of learning new human resource roles (consultant and strategist) as the participants attempted to solve a human resource problem. The two new roles encourage the active use of inquiry where as the traditional role of the human resource staff, providing services, does not. In conducting the evaluation, I had the assistance of three other observers who I oriented to the principles behind the inquiry-based observation tool.

Using the inquiry-based observation tool as a foundation, I broke the evaluation process into three components:

- observation and recording;
- analysis of the occurrences and frequency of inquiry over time; and
- placement of analyzed observations on the inquiry-based observation tool (the typology).

To record initial observations an open-ended tool was created that focused on the items listed in the typology (see below, *Human Resources in Our Business: Some Things to Look For* and, attached *Human Resources in Our Business: Observation Record Sheet*). I had some concern that the other observers, with whom I was working, had a minimal amount of training to use the tool and might leap to conclusions about what was happening in the classroom. The open-ended tool was designed to record actual observations rather than record an interpretation of the observation. Even with this precaution I did find that one observer tended to interpret observations.

Once the observations were recorded these documents were analyzed evidence of inquiry and non-inquiry behaviors/activities and the frequency of occurrence of each was counted (see attached, *Human Resources in Our Business: Day 1*).

Finally, the types and frequency of inquiry and non-inquiry evidence was compared over time to demonstrate increase in inquiry-based learning among participants (see the attached *Final Results* chart).

Findings indicated an increase in staff ability to use inquiry and by definition take on the new HR roles providing evidence to the course designers that their goals for the course had been successfully met.

HUMAN RESOURCES IN OUR BUSINESS: Some Things to Look For

• Coach seeks facts	Coach seeks understanding
• Participant seeks facts	Participant seeks understanding
• Coach begins interaction	Participant begins interaction
• Coach talks/participants listen	Participants talks/coach listens
• Participants interact with coach	Participants interact with each other
• Coach uses materials as a resource	Participants use materials as a resource
• Participants use coach as a resource	Participants use each other as a resource

HUMAN RESOURCES IN OUR BUSINESS

Observation Record Sheet

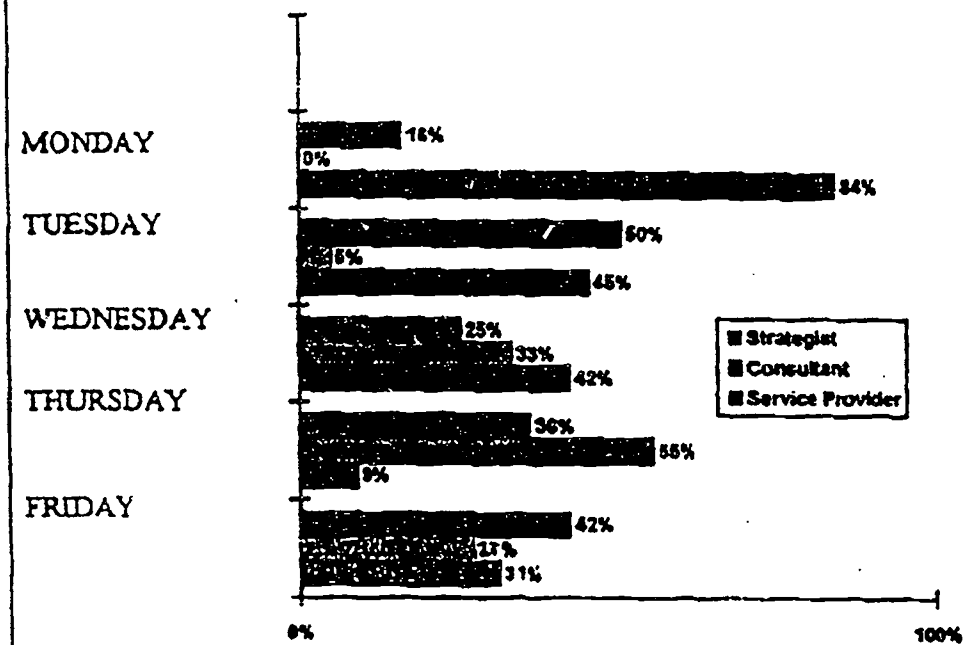
Event#: Date: Name of Observer:

Interaction (Circle One)	Process (Circle One)	Quotes and comments (Include Environmental Factors)
Coach-Coach coach-Participant Participant-Participant Coach-Cameo Participant-Cameo Coach-EA Participant-EA Provide details in the space below.	Coaching Communicating Preparing Using Materials Problem Solving Reflecting Organizing Teaming Synthesizing Provide details in the space below.	Use the space below to record exemplary quotes or observations of special interest.

HUMAN RESOURCES IN OUR BUSINESS: Day 1
Observation Summary of Participant Role Playing

	Service Provider Role	Consultant Role	Strategist Role
Tasks/ Outcomes	Each participant kept to own work, there is no real communication among them 5 OBSERVATIONS	NO OBSERVATIONS	Group began to brainstorm strategy for approaching from memo 2 OBSERVATIONS
Relationship	1 participant asks for HR information from EA (files) 4 participants in group meeting asked factual questions 5 OBSERVATIONS	NO OBSERVATIONS	Coach steered recruiting person into prioritizing and looking at different angles to solve problem. Participant sought out another HR participant to get guidance on how they would solve problem. 2 OBSERVATIONS
Process	Director is scheduling a meeting with counterpart, but does not include any other of her team 2 OBSERVATIONS	Team discussed three possible solutions to the merger problem 2 OBSERVATIONS	Team identified the impact on the structure this merger will bring 1 OBSERVATION

Final Results

TOPIC	KEY FINDINGS
Observation Summary of Participant Roles 	Participant Roles by "Day"  There were 124 separate observational events recorded over the duration of this course. Using the indicators provided in the HRB Observation Guide, the role of participants during each event was classified as either Service Provider, Consultant, and/or Strategist. Findings from the observational data indicates that over the time of this course participants increasingly engaged problem-solving and inquiry behavior that is reflective of the target roles of Consultant and Strategist. On the first morning participants primarily engaged in the role of Service Provider. From "Tuesday" to "Thursday" new roles were explored. By the end of the course a balance between the three HR roles was achieved. Participants were demonstrating evidence of using inquiry/problem-solving skills.

BEST COPY AVAILABLE

INSTRUCTIONS FOR FILLING OUT THE CLASSROOM OBSERVATION PROTOCOL

Try to schedule your visit to coincide with the main purpose for your visit. For example, our experience has shown that to ascertain the extent to which inquiry is part of the learning process, observing during a discussion of a previously-conducted experiment or hands-on exercise provides the best data.

During your visit collect any worksheets, lab sheets, other hand-outs or work associated with the lesson.

PRE OBSERVATION DATA
If possible, try to fill this out prior to observing classes.

Class period or time of class:
Note the time and/or class period(s) you will be observing classes. Ask the teacher how often s/he teaches science and to what extent science is a *regular* part of the day or week.

Topic or topics:
Ask the teacher to tell you the names of the topic or topics that will be addressed in the class(es) you will be observing.

Placement of class or lesson within the unit of study:
Note whether the topics taught are somewhat in the beginning, middle, or end of the unit of study.

Placement of class or lesson with the NCISE teaching model:
Note which stage the class or lesson represents. Note also the extent to which the teacher reports s/he is cognizant of and/or follows the model.

Purpose (objectives):
Ask the teacher to list the objectives for all the classes you will be observing. These may or may not be the same as "Intended Outcomes" below. Often teachers will state some formal objectives for "Purpose" then tell you what he or she expects students to get out of the lesson in "Intended Outcomes."

Intended outcomes:
(See above)

Materials Used (teacher-made, manufactured, district or department-developed?):
Ask the teacher to describe what materials he or she will be using to teach the lesson. These materials may include anything from textbooks to overheads to worksheets to a computer program. Be sure to try to get a copy of any materials used such as student worksheets or reports.

The materials can be characterized in a variety of ways. Record here the extent to which the materials may support the program goals (e.g., Do the materials promote development of thinking skills?)

How students will be assessed (for this lesson):
Ask the teacher what methods are planned, and try to get a copy of any assessment tools/instruments.

CLASSROOM ACTIVITIES

As you are observing the class, take notes on what you observe in the appropriate boxes. If you like to write extensive notes and/or you have arranged for one observer to take notes and the other person to fill out the protocol, write on the back of the Classroom Activities sheet.

Introduction to Lesson:
Describe how the teacher starts the lesson (e.g., gives a content overview, relates the content to previous work or to *science*). While it is assumed the student grouping will be whole class, there may be an occasion where it is not. Fill in the amount of time (Duration) the teacher introduces the lesson.

Activity/Task:
Describe the content and the nature of the lesson or classroom activities including the method of teaching, how/if students are grouped/interacting. It is particularly important to note if the lesson/activities relate to what the teacher experienced over the summer (process as well as content). Describe what the students are doing e.g., listening and taking notes, writing answers to questions. Describe how the teacher is interacting with the students, and how the students are interacting with one another.

If several activities are occurring at the same time indicate so at the bottom of the page. If more room is needed for notes, write on the back of the sheet.

OTHER OBSERVATIONAL DATA

Fill this out during the classroom observation.

1 - Description of the classroom:
Describe how the seating is arranged, number and kind of windows and lights, describe/list any special equipment or materials. Note especially if there are separate areas for different activities (e.g., a "library" with a place for students to sit). Describe what is on the walls, especially bulletin board displays. Give an overall general description of the size of the room, e.g., 'large' is sufficient.

2 - Teaching aids/materials (per activity/task if appropriate):
All materials including chalkboard, overhead projector, teacher-made handouts, textbook, should be listed.

(Page 3, Notes on filling out the classroom observation form)

3 - Assessment strategies used (per activity/task if appropriate):
If during the observation the teacher uses some form of assessment strategies, record them. For example, a teacher may circulate among students doing work in small groups and make notations on a checksheet.

4 - Time not devoted to teaching and nature of non-academic or procedural activity (e.g., management, announcements, discipline); description of non-instructional event:
Give approximate percent of time or actual time not directly devoted to instruction (teacher instruction, self-instruction, student-to-student instruction). Non-instructional time may be a variety of things including stopping to discipline students, talking about last nights' ballgame, or listening to announcements over the intercom.

STUDENT DATA

Complete items 1 and 2 when appropriate, e.g., you may get the data on number of minorities from the teacher after the observation, or, you may make that assessment yourself during your observation.

1 - Number and gender of students; number of minorities/majority:
Record the total number of students present during most of the class (it is expected that occasionally a student will enter or leave during the class period). Record the number of females and males. Under certain circumstances figuring minorities is not always easy, partly because of students with varied racial and ethnic backgrounds. An estimation is acceptable. You may want to get this information from the teacher prior to the classroom observation.

2 - Describe the content of a student's journal or notebook for the class.
Find out from the teacher if the students are expected to keep a journal or notebook. If the teachers gives you permission, ask one of the students if you can look at his or her notebook. Record the kinds of entries, the number of pages, and especially note if there is any evidence of problem solving, data collection and analysis, self-evaluation or other type of critical thinking.

OPERATIONAL DEFINITIONS FOR STUDENT BEHAVIORS

The continua include undesirable student behaviors on the left and desirable student behaviors on the right. For each indicate the degree or percentage of desirable and undesirable behavior.

- **most students off task** = 50% or more of the students are not on task for at least 50% of the class period.

most students on task = 90 - 100% of students are on task for the entire class period (100% of the time).

- **students interact with each other around procedural issues** = they are asking one another such things as, "What did he say?" or, "Do we answer questions 5 and 6 or just 6?"

  students interact with each other around content issues = students are actively interacting around the lesson or topic. In some cases students may seem off topic because they are talking about a related issue. Even if the issue is not directly related it should be considered as interacting around content issues.

- **students are hesitant to enter into the discussion/activity** = students do not actively engage in discussion or engage in an activity and are likely only to answer direct questions posed by the teacher. You may see body language that corroborates their reluctance.

  students actively and enthusiastically participate in the discussion/activity = during a discussion, students are probably calling out answers and/or engaging one another in some point of discussion such as arguing with one another around an issue. During an activity, students are actively engaged.

OPERATIONAL DEFINITIONS FOR TYPOLOGY

The typology is meant to capture, in retrospect, the observer's overall interpretation of where the teacher's practice may fall on each of the continua. The items in the left column are generally more 'traditional' and the items in the right column generally reflect more inquiry. *No value judgment of the teacher is intended.* Value judgements should be left to REFLECTIONS AND INTERPRETATIONS. Each item is intended to refer to something that might be transferred from the teacher's participation in the program to their classroom practice. Place an 'x' on the spot you feel best indicates what you observe for that class/lesson. You might think of the line in terms of percent, e.g., if the teacher acts like a source of knowledge for 40% of the time and is a facilitator 60% of the time put the 'x' to the right of the half-way point toward 'facilitator'.

Write any explanatory notes in the margin or indicate "N/A" if the continuum is not applicable to the classroom you observed. For example, the continuum in the *Discussion* section, "teacher helps students reason through the thinking process — teacher provides reasoning" is not applicable in cases where there is no attempt to bring students' understanding or thinking about a subject/idea to a higher level. In this case record both 'N/A' and a brief comment about the nature of the discussion.

(Page 5, Notes on filling out the classroom observation form)

Students:

- **look for correct answer** = students do an activity or engage in discussions and focus on "getting the correct answer" (as opposed to "seek truth").

  accept or revise their "hypotheses" based on evidence = students have developed some ideas prior to the current lesson, perhaps through a classroom activity. This was their prior idea; it may even have been an hypothesis they developed. Now, they use new evidence, either direct or though a discussion, and revise their idea based on that evidence.

- **do not reflect on others' ideas** = students do not build on what other students say nor refer to what other students might be saying; neither do they act on other students' ideas and/or suggestions.

  reflect on others' comments/ideas = students relate to what others' say through discussion or taking some action. Students build on what other students say but may not directly acknowledge them by name.

- **seek information to complete the assigned work** = students may ask questions about procedure such as asking the teacher or other students if they should finish the exercise for homework, or, may ask direct questions about how to answer a particular question in order to complete an assigned task.

  seek clarification of conceptual understanding = students ask the teacher or other students for explanations and clarifications of the questions asked in order to better understand the content. During a discussion a student may relate an experience s/he has had related to the topic in order to fit this information into his or her conceptual understanding of the topic.

Teacher Role:

- **source of knowledge** = teacher is the "sage on the stage" and neither seeks nor acknowledges student input. The teacher may ask students questions but only in order for them to relate facts or content-specific information.

  facilitator = teacher seeks input from students and encourages students to explain, predict, describe, etc. in order to increase their and other students' understanding. The teacher will often seek a student's misunderstandings and ask other students to offer a better/different explanation, prediction, etc. versus "correcting" a student. In laboratory or hands-on activities, the teacher will offer suggestions and/or work with the students to find solutions or work out problems.

(Page 6, Notes on filling out the classroom observation form)

- **questions/comments ask for memory/fact** = teacher looks for the correct answer around a fact such as asking for a definition. The teacher generally asks short answer questions that require memory.

  questions ask for comprehension/opinion = teacher asks probing questions and/or encourages discussion which requires student understanding. (Understanding = the student can apply what they know to a new situation by explaining, giving examples, predicting, and interpreting.) The teacher generally asks questions that require processing, however, the processing may not be in the form of a direct question. Look for implicit and well as explicit questioning.

<u>Classroom Activities</u>:

- **algorithms** = procedural steps or formula to solve problems and/or answer questions. This is most often seen in mathematics classes where students are taught to use a specific procedure to solve mathematics problems. In science class it is often seen in 'cookbook' laboratory manuals.

  heuristics = use of overall strategies or plan to solve problems and/or answer questions. This can be seen wherever students are asked to use critical thinking skills. (Critical thinking skills include problem solving, evaluation, decision-making, deductive and inductive reasoning.)

- **abstract** = the content may be of academic interest but is not directly related to a student's everyday experience. Students usually perceive the content as something they must learn in school, and may have to know to pass a test, but isn't anything they would have to deal with in their 'real-life.' (Note: it is students' perceptions that count, therefore, to make this entry, you have to talk with students or base your judgment on something said in class.)

  connected to real-world = the content is perceived as relevant to something in the students' lives or to the understanding of something in the real-world. It may also be related to something that exists in the real-world, such as something the teacher experienced at the Lab, but is not directly part of the students' experiences.

- **prescribed program** = students/teacher use(s) the assigned textbook or some part of a commercially prepared textbook package such as worksheets. If the prescribed program promotes compiling materials, place and 'x' in the position that best describes the proportion of prescribed versus compiled. Note that the Pre Observation Data sheet has a place for characterizing the materials.

compiled = students/teacher use several different kinds of materials such as another textbook, books, magazines, audio-visual, computer materials compiled by the teacher.

<u>Discussions</u>: note whether or not this is more like 'recitation' than 'discussion.'

- **closed questions** = no matter who talks with whom, the discussing group seeks to determine the right answer, which is usually a fact. (Note: the "questions" may be implicit. This continuum is meant to capture the overall tenor of the discussion as being closed or open.) A typical closed question is, "What is 4 x 4?", or "What are the temperature and moisture conditions that define a desert?"

  open-ended questions = no matter who talks with whom, members of the discussing group are seeking possible explanations/causes/descriptions/ understandings. A typical open-ended question is, "What do you think might happen if...?", or "If you got a '4' for the answer and I got a '6', why might our answers be different?"

- **teacher seek's facts** = the teacher encourages students to determine 'the' answer to a question or 'the' solution to a problem.

  teacher seeks student understanding = the teacher seeks students' understandings and misunderstandings, often as a way to determine class, and individual progress (perhaps as a form of assessment).

- **students do not use evidence to support claims** = students give factual answers or read facts off a workbook or lab page without further explanation.

  students use evidence to support claims = students provide data or collaborating evidence to support what they are saying. For example they might say, "I saw that the longer the water was heated the higher the temperature got which explains that ..."

- **teacher talks** = amount of time teacher talks during the discussion.

  students talk = amount of time students talk during the discussion. (Note also the number of students who are doing the talking.)

(Page 8, Notes on filling out the classroom observation form)

- **students talk only to teacher** = the 'discussion' may be characterized as more of a recitation when the interaction is between teacher and students, however, the continuum suggests that there is probably some mixture among students talking with the teacher and talking to another.

  students address one another = students turn toward and talk with one another without the teacher as a mediator. (Note: this is to be taken literally. Students may refer to what one another has said without talking directly to that student. This kind of interaction is captured in another continuum.)

- **teacher provides reasoning** = teacher may help students understand a topic/principle/idea through providing them with the reasoning behind what they are telling students.

  teacher helps students reason through thinking process = teacher asks for students' reasoning, encouraging them to support and contradict one another through discussion. At both ends of this continuum, student understanding may reach a higher level, but this end of the continuum is intended to capture the *constructivist* approach whereby students are helped in their understandings starting from their own perspectives/observations.

For laboratory/Hands-on/Fieldwork

- **students follow a procedure to answer a question or conduct an investigation** = this refers to what educators often call "cookbook" investigations.

  students answer a question or solve a problem using open-ended instructions = this refers to anything that is more inquiry-oriented.

- **students take measurements or determine facts to answer questions (one answer** = the results of the investigation are a series of one right answers even though the students may be taking measurements and even collecting other data.

  students collect and manipulate data in order to answer questions (several possible answers) = there is no one answer but several answers that are appropriate because students are collecting and manipulating data related to a phenomena.

Classroom Observation Protocol
Pre Observation Data

Teacher ________________ Date ________________

School ________________ Grade/Level ____________

Observer ________________ Lab/Program ______________________

(Fill this out prior to observing classes.)

Class period or time of class:

Topic or topics:

Placement of class or lesson within the unit of study:

Placement of class or lesson within the NCISE teaching model (1-Invite; 2-Explore, Discover, Create; 3-Explanations and Solutions; 4-Take Action):

Purpose (objectives):

Intended outcomes:

Materials Used (teacher-made, manufactured, district or department-developed; characterization of materials):

How students will be assessed (for this lesson):

CLASSROOM ACTIVITIES

Teacher: Date:

(Fill this out as you are observing classes)

Introduction to Lesson: provides introduction/motivation/"invitation"; explains activity and how it relates to previous lessons; assesses students' prior knowledge

Student Grouping __________ Duration ______________

First Activity/Task: Content; nature of activity, what students doing, what teacher doing; interactions.

Student Grouping __________ Duration ______________

Second Activity/Task: Content; nature of activity, what students doing, what teacher doing; interactions.

Student Grouping __________ Duration ______________

Third Activity/Task: Content; nature of activity, what students doing, what teacher doing; interactions.

Student Grouping __________ Duration ______________

State whether activities are sequential or are different activities/tasks done at the same time:

OTHER OBSERVATIONAL DATA

Teacher: Date:

(Fill this out as you are observing classes.)

1 - Description of the classroom:

2 - Teaching aids/materials (per activity/task if appropriate):

3 - Assessment strategies used (per activity/task if appropriate):

4 - Time not devoted to teaching and nature of non-academic or procedural activity (e.g., management, announcements, discipline); description of non-instructional event :

STUDENT DATA

Teacher: Date:

(Fill this out during/after the classroom observation.)

1 - Number and gender of students; number of minorities/majority:

2 - Describe the content of a student's journal or notebook for the class.

Use pages 3-4 of *Instructions for Filling Out the Classroom Observation Protcol* for operational definitions of student behaviors.

Student Behaviors:

most students off task	________________	most students on task
students interact with each other around non-academic or procedural issues	________________	students interact with each other around content issues
students are hesitant to enter into the discussion/activity	________________	students actively and enthusiastically participate in the discussion/activity

TYPOLOGY: INQUIRY-BASED TEACHING AND LEARNING

Teacher: Date:

(Fill out after the classroom observation.)

Use pages 4-8 of *Instructions for Filling Out the Classroom Observation Protocol* for operational definitions for typology.

Students:		
look for correct answer	————	accept or revise their "hypotheses" based on evidence
do not reflect on others' ideas	————	reflect on others' comments/ideas
seek information to complete the assigned work	————	seek clarification of conceptual understanding

Teacher Role:		
source of knowledge	————	facilitator
questions/comments seek memory/ facts	————	questions/comments seek comprehension/ opinion

Classroom Activities:		
algorithms	————	heuristics

Emphasis:		
abstract	————	connected to real-world

Materials:		
prescribed program	————	compiled by teacher

Teacher: Date:

For Discussions

Amount of Time Observed:

Percent of students contributing to the discussion:

closed questions	________________	open-ended questions
teacher seeks facts	________________	teacher seeks student understanding
students do not use evidence to support claims	________________	students use evidence to support claims
teacher talks	________________	students talk
students talk only to teacher	________________	students talk to one another
teacher provides reasoning	________________	teacher helps students reason through thinking process

For Laboratory/Hands-On/Fieldwork

Amount of Time Observed: Part of a project (Yes, no):

Grouping (pairs, threes, fours):

Cooperative/collaborative (yes, no):

students follow a procedure to answer a question or conduct an investigation	________________	students answer a question or solve a problem using open-ended instructions
students take measurements or determine facts to answer questions (one answer)	________________	students collect and manipulate data in order to answer questions (several answers possible)

REFLECTIONS AND INTERPRETATIONS

Teacher: Date:

(Fill this out as soon as possible after the classroom visit.)

1 - Overall, what happened during the classroom observation (e.g., which stage of NCISE model was the teacher using and how effective was its implementation)?

2 - What didn't happen (e.g., students didn't grasp the idea of the lesson)?

3 - Alternative ways instructor might have handled the lesson/question/situation:

4 - Characterize students and their attitudes toward the subject matter and the teacher:

5 - Notable non-verbal behavior:

6 - Surprises/concerns, especially related to the program goals (e.g., the teacher didn't appear to be using the science immersion method):