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ABSTRACT

Ten two-person teams made up the primary target population for the Leadership Training Program (LTP) described in this report. The back home activities of the team members were studied for nearly three years following the LTP. A brief resume of the design and conduct of the LTP is given. Training of the college teams took three weeks and included the following ingredients: approximately 30 hours of what might be called a social science laboratory; the training by the college teams of public school teams consisting of administrators and teachers who were to implement either Science a Process Approach or the Science Curriculum Improvement Study the following fall; micro-teaching of ghetto children; and video tape analysis of teaching. Data on post LTP activities by participants were obtained through questionnaires, interviews, site visits, tape recorded reports, group meetings of participants, joint participation in other programs, and talks with administrators. Through the natural migrations that mark college people's lives, some of the teams broke up as individuals moved to new institutions. Each individual is followed for a period in the new setting to determine whether he transfers any of the relevant behaviors connected with plannned change. (Author/PR)

THE FATE OF TEN SCIENTIST-SCIENCE EDUCATOR TEAMS THREE YEARS AFTER PARTICIPATION IN A LEADERSHIP TRAINING PROGRAM*

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Abstract. Ten two-person teams made up the primary target population for the LTP described in this report. The back home activities of the team members were studied for nearly three years following the LTP. A brief resume of the design and conduct of the LTP is given. Training of the college teams took three weeks and included the following ingredients: approximately 30 hours of what might be called a social science laboratory; the training by the college teams of public school teams consisting of administrators and teachers who were to implement either Science a Process Approach or the Science Curriculum Improvement Study the following fall; micro-teaching of ghetto children; video tape analysis of teaching.

Data on post LTP activities by participants were obtained through questionnaires, interviews, site visits, tape recorded reports, group meetings of participants, joint participation in other programs, talks with administrators.

Through the natural migrations that mark college people's lives, some of the teams broke up as individuals moved to new institutions. Each individual is followed for a period in the new setting to determine whether he transfers any of the relevant behaviors connected with planned change.

* Credit is due to Dr. Frances Lawlor and Mrs. Lois Arnold who helped prepare the data for reporting, and to the staff and participants from whom the author learned so much.

Introduction

Over the last ten years, the National Science Foundation (NSF) has supported development of courses in science and more recently in other fields for use in elementary and secondary schools. During this time it became apparent that if these programs were to get any kind of a hearing some plans for dissemination would have to be developed. The general objective of the Resource Personnel Workshops (RPWs) was to create a body of resource leaders--people who could and would help communities learn about and try out new programs, and who would take the initiatives necessary to get supporting course changes within the colleges.

The intent of the investigation described in this paper was to study how knowledge and skills from the social sciences might be applied profitably to the following aspects of one RPW, called in this case a Leadership Training Program (LTP):

a. Conceptualizing the problem.
b. Patterns of recruitment.
c. Diagnosis of the participants' situations and expectations.
d. Program design.
e. Program management.
f. Follow-up.
g. Evaluation.

The data reported came from a 2½ year study of the activities of participants who attended an LTP at Teachers College, Columbia University from June 10 to June 30, 1968. Throughout the 2½ year period following the LTP, communications were maintained with participants by means of follow-up meetings, tape recordings, phone calls, letters, and joint participation in programs of one kind of another.

I. CONCEPTUALIZATION OF THE PROBLEM

1a. Knowledge and Skills of a Change Agent Have Priority Over Content. The general problem was to create a body of people who could and would function effectively to bring about change in elementary science and in the training which teachers get in college. While two courses, the Science Curriculum Improvement Study (SCIS), and Science - A Process Approach (SAPA), happened to be the vehicles of training selected for the Columbia LTP, it was conceivable that participants might develop interest in other vehicles and that new ones might be created over the coming years. Therefore the training objectives ought to focus primarily on developing knowledge and skills connected with implementation generally.

1b. The Two Implementation Vehicles Require People to Undergo Concept and Habit Changes. Both SCIS and AAAS, like many other implementation vehicles which might have been chosen, require that children be exposed directly to phenomena, speculate about them and be given some latitude in interpreting results of their own investigations. They introduce three factors relevant to implementation: A technology having to do with the acquisition, use and management of equipment; a different pattern of teacher-pupil verbal interaction(1)(2); a non-traditional view of what is important for children to learn. Thus, at the school level, LTP participants must understand that efforts to change could arouse strong feelings. If changes of similar magnitudes are also to occur in the colleges, and we assumed that was necessary, then participants might also expect avoidance behavior and arousal of strong feelings from college people as well.

1c. Barriers to Communication and Collaboration Have To Be Bridged. Every profession has its own special language and conventions. The specialized terminology condenses speech about the content and operation of the profession into economical packages. People who hear the words and share the same meanings or experiences that the words label understand the content of a communication. People who do not know to what the words refer do not understand the meaning in the message. As the language of a profession becomes more specialized and the meanings packed into certain words become more compacted, communication between the members of different professions becomes increasingly difficult. Isolation not unlike that which one can observe between two adjacent species in an ecological niche is accomplished by the increasingly "foreign" aspect the language of each group acquires. Communication of meaning within the group goes on with relatively great facility, but passes only with very great difficulty between groups. Inside each group, subspecies develop, and as they exploit one intellectual niche with greater and greater energy and efficiency, they isolate themselves from the bigger herd, usually inadvertently, by their language conventions as well as by their conceptual inventions.

Specialization of roles and strongly held norms serve to convey a kind of permanence to the system of relationships. Eventually a "we-they" view of the world develops. The more specialized and restricted the functions of such groups become, the less likely are

they to survive in the face of major changes in the world around them. (See for example (4), Schwab.)

Each sub-group holds stereotypes of people in other professions. Scientists, for example, sometimes say science educators are people who could not make it in science, who do a low quality of work, and who have no idea of how to do research or to teach people to teach. Science educators, for their part, sometimes think scientists are narrow-minded, asocial and self-serving, and that they know nothing about teaching. When the performance fits the facts, the stereotype is true; when performance does not correspond to the facts, the stereotype is false. So stereotyping is a process in which people make judgments, and develop expectations, likes and dislikes, based solely on reputation. Such people usually have insufficient knowledge of the role requirements.

Most operate in several roles. A man may play father and husband roles at the start of the day, college professor and researcher roles later in the day. Each role has associated with it some set of expectations which, if seriously violated, can produce trouble. Scientists, science educators, and public school personnel all occupy different roles. Each role has some set of performances ascribed to it. But when, for example, a scientist engages in activities which might normally be done by a science educator (or at least not normally done by a scientist), he often receives punishing communications from other scientists in his department. To break the norms for behavior associated with a particular role is to risk ostracism. There is much evidence among scientists who have worked on new programs, including those in the LTP described in this paper, that engaging in the kinds of change activities desired by the LTP constitutes a violation of norms. Norms are regularities of learned behavior ((3) p. 48. To state a norm, one specifies the category of person (e.g., a scientist), the kind of behavior (e.g., teaches a science course to teachers), and the circumstances or situation (e.g., over in the education department). The example just given would represent a violation of a norm among scientists which might be stated something like the following: a good scientist should be teaching science to science majors, preferably majors in his own specialty.

Between groups, then, there are <u>barriers</u>. Some of the barriers are physical and economic. More are psychological and linguistic in origin. Barriers frequently rest on mounds of misinformation and ignorance. All features of LTP planning should reflect the necessity to identify the <u>barriers</u> and to bridge them in one way or another.

II. RECRUITMENT

2a. The Scientist-Science Educator Problem. The primary target groups in this LTP were scientists and science educators located in colleges and universities where teacher training was going on. While science educators were an obvious target group, it may not be immediately apparent why scientists should be included. In particular, an effort was made to recruit scientists who had some responsibility for teaching science courses for non-majors. Most prospective elementary teachers take 9-12 semester hours of such courses. Neither the content nor the philosophies that seem to dominate these courses provide support for the new science programs (SCIS and SAPA in this case). Most college courses still convey an image of science as a fixed body of knowledge. Students get little direct experience in the processes deemed relevant to science viewed as a dynamic, changing enterprise. Thus, prospective elementary teachers arrive in a methods course having acquired a distinct distaste for science, and an idea that it does not belong in elementary school. If they happen to get a traditional science education course as well, they will have little reason to change this view. Thus, new teachers will not exhibit the knowledge and skills necessary to teach the new courses.

2b. Bridging a Barrier. The recruitment phase of the solution was reasoned in the following way: recruit at least one person from each side of the barrier, i.e., recruit a scientist and a science educator from the same institution. Then design the program of training in such a way as to insure that they will talk and listen to each other and that they will get practice at problem solving and collaboration on tasks of mutual interest.

2c. Why Teams? The content of NSF programs has consequences beyond the individual. Attempts at producing durable innovations back home must scuttle the individual as the target and medium of change in favor of creating teams with multiple resources.

The task of changing others' expectations and ways of doing things is discouragingly difficult. This is especially so when the approach to implementation of new science programs at either the college or pre-college level conceives of the task as being merely that of changing the individual. The irresistible tendency to conceive of the change problem as a simple matter of changing the content sophistication of the individual probably produces frustration, demoralization and disillusionment in as large a measure as it accomplishes some positive results. A workshop, institute, or special training course often develops keen interest among the participants, high enthusiasm, and a firm resolve to apply all the wonderful new insights back home. It seems to be the case, however, that after an initial burst of activity participants "settle back." ((5)

What happens to the trainee when he goes back home? According to Cartwright, he discovers two or more of the following situations:

1. His colleagues do not share his enthusiasm and he quickly gets the message that his new insights are not welcome. (Especially when he has to cross department or school lines!)

2. He needs logistical or other support from some other point in the hierarchy and cannot get it.

3. He tries some part of a new program, perceives a negative outcome and has no other person to whom to turn to talk over alternative procedures. In short, he has no other people who share his enthusiasms and insights and with whom he could gain emotional and motivational support while he gets the new program operational.

New programs (AAAS and SCIS) produce organizational stress. They require that people re-think many of their own views of science and science teaching. The potential resource leaders will find themselves questioning the content of their own courses at the college level; they will also find out that they have to reappraise their own ideas of what science is appropriate in the elementary school. Much in the training could prove stressful for them.

When the potential leader is a college person (i.e., member of one system) and is supposed to function in some capacity in another system (i.e., school system) he has certain assets (e.g., expertise, enthusiasm) and liabilities (e.g., a fancy language system, ignorance of characteristics of the real world in which the innovation is supposed to operate) which help or hinder his efforts to produce change.

2d. <u>The University Professor - Elementary Teacher Problem, Otherwise Known as the University - Public School Barrier</u>. Each profession has its own problems. In this case, the university professors must eventually interact in some fruitful way with the people actually carrying out implementation, i.e., elementary school teachers and principals. The LTP participants need to understand something of what is involved in performing the role of the elementary teacher. They also need to learn how their own teaching helps or hinders teachers from performing their roles more competently.

2e. <u>Bridging a Barrier</u>. To provide immediate training and feedback to the college participants, ten teams made up of 4-5 teachers and an administrator took part in the LTP for a week. These teams came from schools planning to implement either SAPA or SCIS the following fall. These teams came to learn about the programs from LTP participants and to provide some helpful feedback to them. (The letter of instruction to teachers appears as Appendix I.)

There is an implicit, if not explicit, hierarchy of relations between a college team and a school team. In such cases information tends to flow predominantly in one direction--down. In this case, the barrier bridging would be accomplished through recruitment of school teams specifically instructed to help the college teams learn to do their work more effectively.

2f. The Problem of Professors and Children. While it might be easy for college participants to brush off the teaching difficulties faced by elementary teachers so long as the professors had no direct experience of these problems, it would help to bridge the professor-teacher barrier as well as to convey an idea of how the implementation (SCIS or SAPA) might look through the eyes of children, if some 150 inner city elementary children were recruited to do battle with the professors. (And battle does describe what happened in some cases!) The design implications of these last two recruitment decisions will be discussed later. (The organizational plan of the Columbia LTP appears in Figure I.)

2g. Geographic Factors in Recruitment. Since the development of a strong network of people who could collaborate on problems was a part of the LTP conceptualization, participants were recruited in regional clusters. College teams came from three institutions in the West, two in the South and five in the Northeast. The implications of this facet of recruitment will be discussed under follow-up.

2h. Description of the Population. The ten teams which finally made up the LTP population can be described as follows:

One team of 2 science educators, one from the regular department and one who directed university extension activities.

Two teams where both members came from science departments but the original training of one member of each team was in science education.

One team of 2 scientists, one from physics and one from chemistry.

Six teams consisting of one science educator and one scientist.

Ten universities were represented:

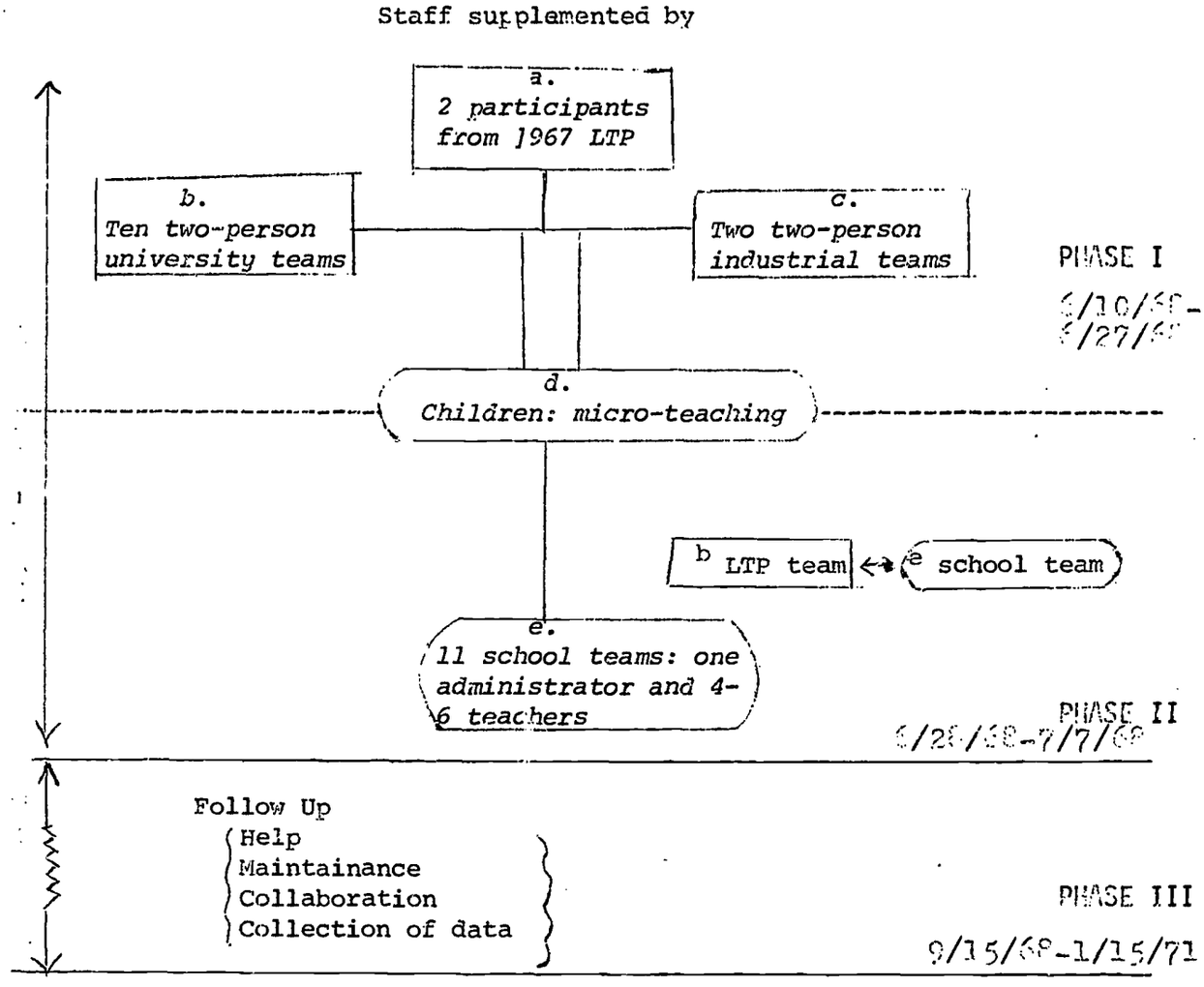
University of California
University of Southern Utah
Utah State University

Tuskegee Institute
Grambling College

State University of New York at Stony Brook
State University of New York at Oswego
St. John's University
Brooklyn College
The University of Connecticut.

21. Description of Staff. The staff consisted of two participants from an earlier LTP, a classroom teacher experienced in SCIS, a chemist who had been a writer on the SAPA-AAAS program and conducted inservice for that program, three science educators, and one social scientist.

I
ORGANIZATION OF
COLUMBIA LTP



b University team description
1 Consisting of 2 science educators
3 Consisting of 2 scientists
7 Consisting of 1 scientist and 1 science educator

III. OBJECTIVES OF THE LEADERSHIP TRAINING PROGRAM

Objectives for the Columbia LTP fell into two categories, those having to do with implementation and change (numbered 2-8 below), and one (number 1) having to do with the philosophical, psychological, content and logistical characteristics of the two courses, SCIS and AAAS.

3a. Objectives of the Staff. As a result of participation in the Leadership Training Laboratory, the members of the teams should be able to do the following:

1. Describe and explain the organization and rationale of the AAAS and SCIS programs.

2. Plan, initiate and carry out teacher education activities based on teacher education materials made available by the two programs, both in school systems and in the college.

3. Plan and implement teacher education programs that would prepare people to teach the two programs.

4. Specify content and characteristics of science content courses that would be compatible with the two programs.

5. Diagnose sources of resistance to change at all levels of operation and plan appropriate change strategies in school systems (and possibly in the college community).

6. Recognize whether a program in action (e.g., in a classroom) represents an appropriate transmission model and know what to do when it does not.

7. Exhibit a range of initiation and intervention skills and reception behaviors (e.g., skill in giving and receiving feedback, finding out who can make decisions in a system, etc.) Adjust explanations to different kinds of target groups.

8. Do joint planning for concerted action back home, both at the school and college levels.

3b. Objectives of Participants. While a group of planners (staff in this case) may state some objectives which they have for the learners, it is by no means obvious that the learners attach the same importance to the objectives. As a part of the data collected from LTP participants before they came to Columbia, they were asked to rate each objective on a 1-10 scale, according to the priority which that objective seemed to have for the participant at that time.

The question of interest was whether scientists and science educators attached the same priorities to the objectives. That information would be helpful in planning instruction. It might also be useful in predicting responses to various facets of the LTP. Participants again rated the objectives in terms of their own priorities shortly after the conclusion of training. It may be of interest to the reader to draw in on the attached handout a prediction of what might be expected in the way of responses from scientists as compared with science educators.

Results of Questionnaire I asking participants to rate the objectives prior to the LTP are shown for each of the ten teams in Table III A. They illustrate the necessity for planning some kind of learning conditions such that participants can work in accord with those priorities. But the questionnaire also suggests that in individual interviews with participants the staff could find what reasoning went with each rating.

Table III B shows how the teams rated the objectives at the end of the training. Based on an analysis of tape recordings, objective 6, which has to do with evaluation, was the most persistent and controversial issue throughout training. That fact is not reflected, however, in any major change in its mean priority rating. From the amount of time spent in discussion of behavioral objectives by participants and the heat the topic always generated, we might infer that a part of what was really being talked about had to do with self-justification by the LTP of the way in which they do their own teaching. They may well have started an appraisal of their own programs, few of which seemed to have behavioral objectives. (A part of the data collected prior to the LTP were course descriptions and/or syllabi.)

Hand-Out #1 Columbia Project

Directions: Try to predict responses made by scientists. Try to predict responses made by science educators.

I

Objectives: The objectives of the institute are stated in a paper you received with this questionnaire. They are restated briefly below. Please rate the objectives on the 5-point scale below in terms of their relative importance to you. You may have some objectives that we have not stated. Add them to the list and rate them in the same manner. *Circle one number per objective.*

OBJECTIVE	PRIORITY LOW				HIGH
1. Describe and explain the organization and rationale of the AAAS and SCIS programs; adjust these explanations to different kinds of target groups.	1	2	3	4	5
2. Plan, initiate, and carry out teacher education made available by the two programs, both in school systems and in the college.	1	2	3	4	5
3. Plan and implement teacher education programs that would prepare people to teach the two programs.	1	2	3	4	5
4. Specify content and characteristics of science content courses that would be compatible with the two programs.	1	2	3	4	5
5. Diagnose sources of resistance to change at all levels of operation and plan appropriate change strategies in school systems and possibly in the college community.	1	2	3	4	5
6. Recognize whether a program in action (e.g., in a classroom) represents an appropriate transmission model and know what to do when it does not.	1	2	3	4	5
7. Exhibit a range of initiation and intervention skills and reception behaviors (e.g., skill in giving and receiving feedback, finding out who can make decisions in a system, etc.).	1	2	3	4	5
8. Do joint planning for concerted action back home, both at the school and college levels.	1	2	3	4	5
9.	1	2	3	4	5
10.	1	2	3	4	5

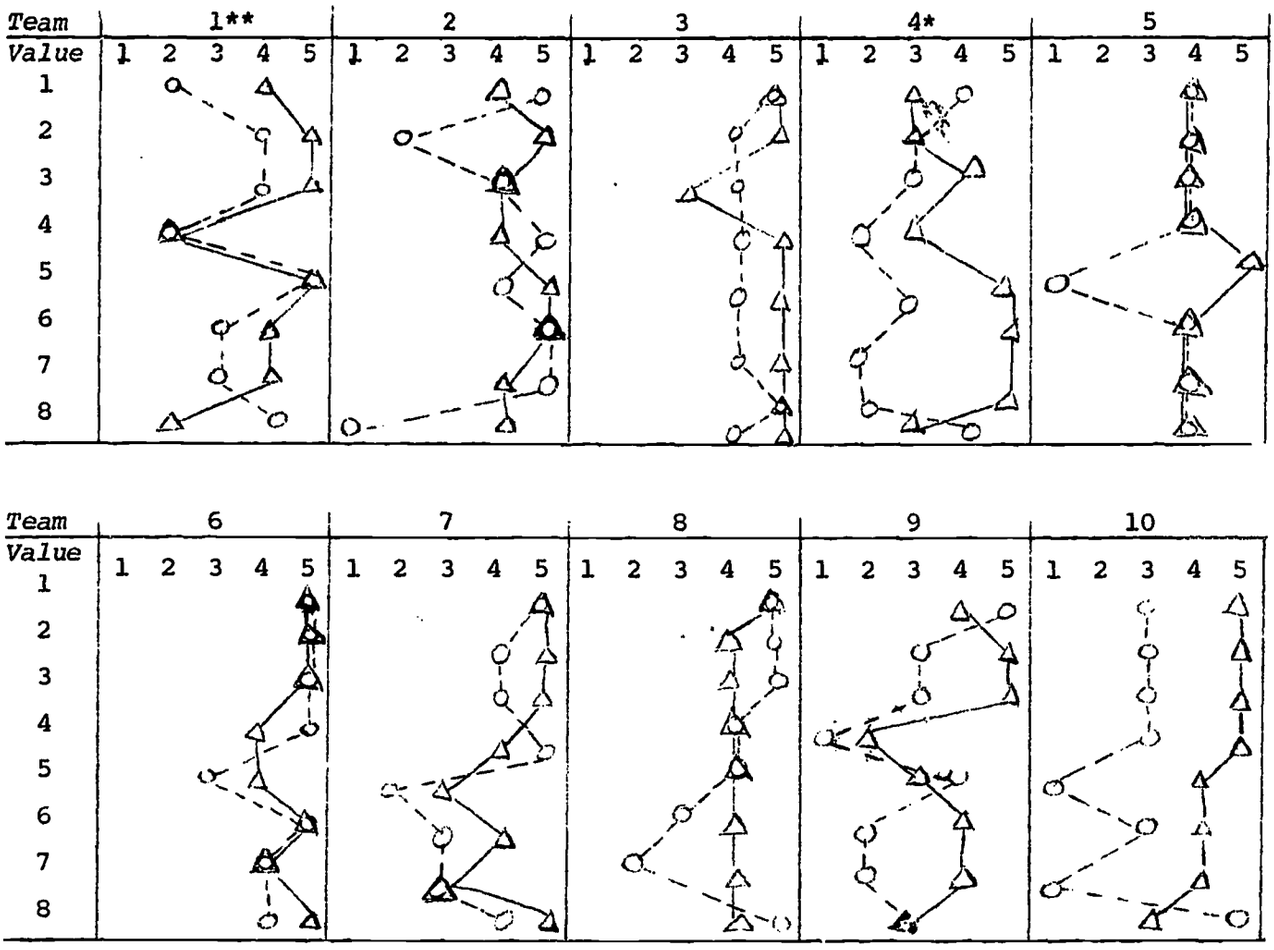
If there are any terms used in the statements above that you do not understand or have never heard of, do not worry about it — but circle them for us, please.

II

Working Relationship: Would you say the working relationships between departments of science and the department (or school or college) of education (specifically science education) could be described as:

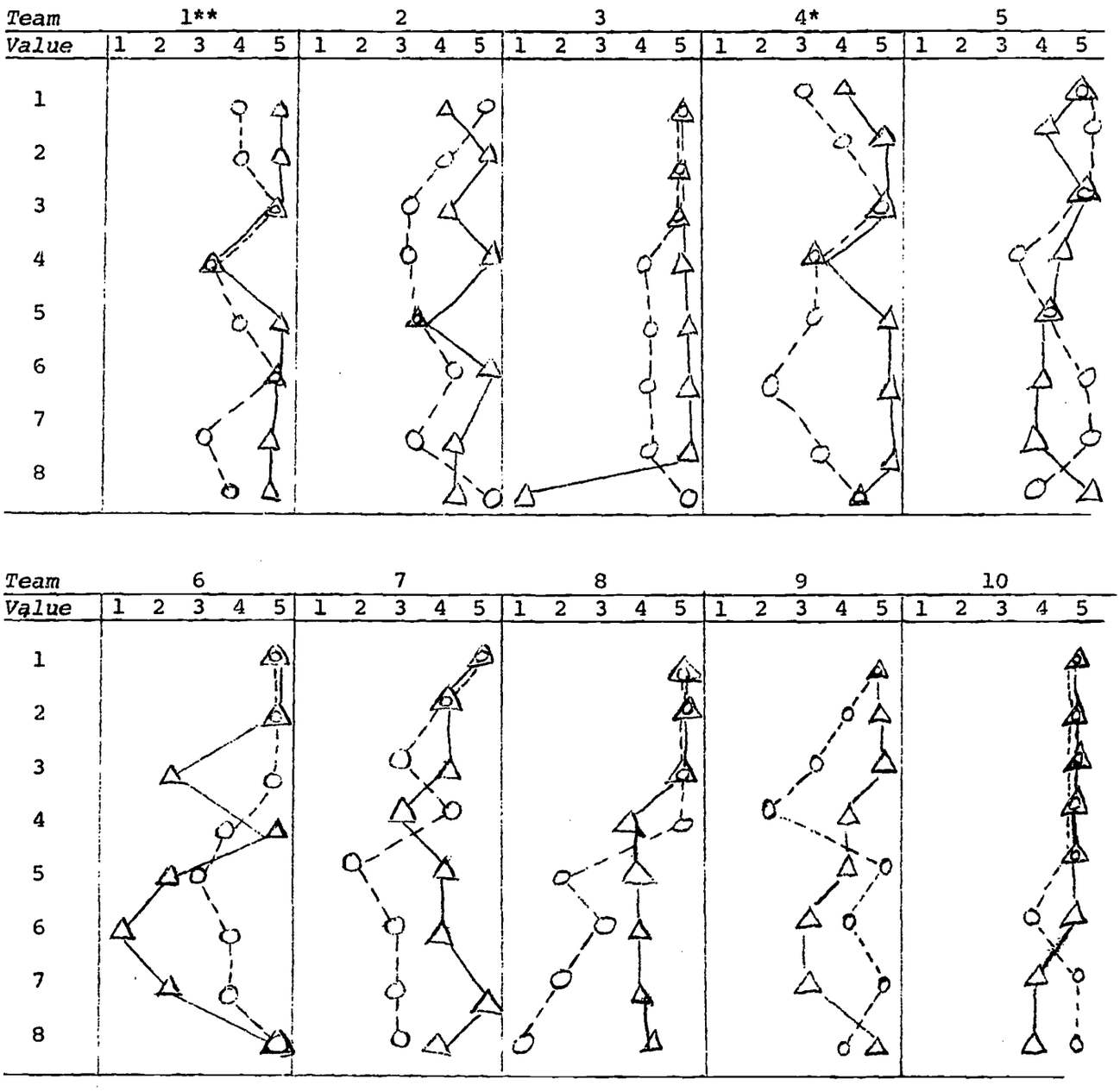
_____ non-existent
_____ poor (low cooperation)
_____ occasional
_____ about like with the mathematics department
_____ good, but could be better
_____ excellent

TABLE IIIA RATING OF OBJECTIVES OF THE INSTITUTE: PRIOR TO LTP
Questionnaire #1



Objectives were evaluated on a 1 to 5 scale (1 = low priority; 5 = high priority)
Code: o -- Scientist; ___ Science Educators; * both team members are scientists
** both team members are science educators

TABLE IIIB RATING OF OBJECTIVES OF THE INSTITUTE: FOLLOWING LTP
Questionnaire #2



Objectives were evaluated on a 1 to 5 scale(1 = low priority; 5 = high priority)
Code: o --- Scientist; Δ —— Science Educator; * Both team members are scientists;
** Both team members are science educators.

IV. DATA COLLECTED PRIOR TO TRAINING

4a. Course Descriptions. In addition to obtaining data on objectives, course descriptions were also collected to ascertain if and how much they contained of philosophy, content and activities supportive of SCIS and SAPA. We found that to be virtually absent except in two cases (science educators). Nothing in the science courses with the exception of one that contained some environmental science content which would be relevant to the SCIS life-science sequence seemed especially pertinent.

We also needed this data to form a base line against which to appraise the extent of the implementation activities in which participants might eventually engage.

4b. Perception of the Other Fellow's Department. We asked participants to choose one of six response categories which came closest to describing the quality of the relationship between science and education departments in their own institutions. As Table II A shows, both members of three teams described the relationship in the same way--"occasional" (number 3 on the scale). Seven teams showed some difference of opinion. Interestingly, five of the educators perceived the relationship as somewhat better than their scientist counterparts. However, no participant described the relationships as excellent (6 on the scale), but neither did any participant describe them as non-existent (1 on the scale). When the questionnaire was re-administered at the end of training, all ratings remained the same, thus verifying the stability of the perception. However, when participants were asked to predict what those relationships might be as a result of their LTP experience, six teams expected them to improve (Table II B). No group expected them to deteriorate! (And in fact we have through the follow-up some evidence that improvements are occurring in six of the institutions).

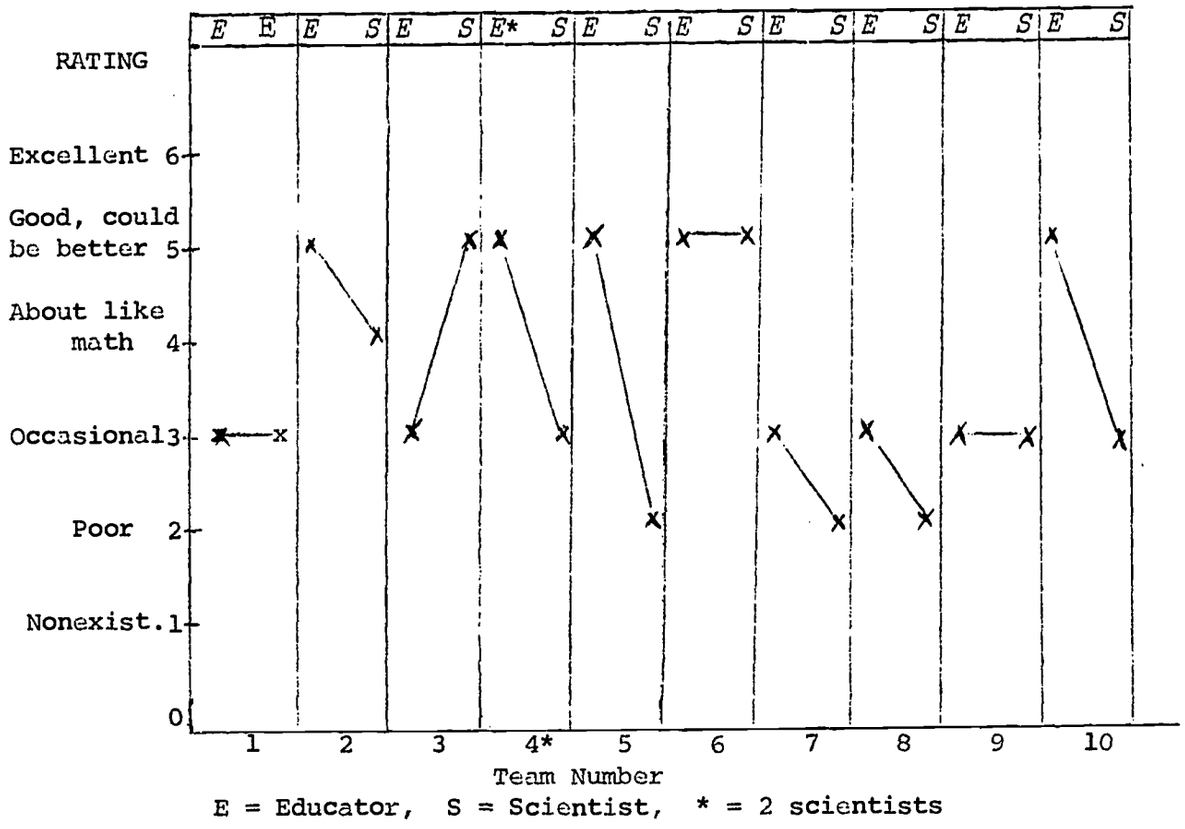
4c. Activities Connected with SCIS and/or AAAS Prior to LTP. Participants were asked to indicate whether they had engaged in certain categories of activity that would eventually be relevant to the dissemination of SCIS and AAAS. Table II shows the extent to which the group had experience in the categories of activities. Notice that most of the categories might more reasonably be expected of science educators than of scientists. Table II shows that only 4 out of the 20 participants had used video-taping for the improvement of instruction. Only one science educator had helped install one of the programs in a school district. No scientist had experience as an advisor or consultant to a school. Only 4 people reported ever having made any presentations to a Parent Teachers Association meeting or other parent groups. One scientist, a new Ph.D., reported he had never taught science to non-majors.

Asked at the end of the LTP to state which of the categories they expected to engage in, nine participants expected to deal with parent groups and 14 expected to make use of television (Table I B). Eleven expected to try to implement SCIS or AAAS in a school district.

It is of some interest to see how these expectations were borne out. Although detailed data on implementation will come later, the categories of activities in which participants actually did engage in the two years following the LTP are shown in Table I C. Notice that eleven individuals now give training relevant to SCIS and SAPA-AAAS, as well as in other new programs. Thirteen individuals engaged in micro-teaching (use of tape recordings and video-tape to study one's own teaching). Seventeen participants have made presentations to PTA's, NSTA (National Science Teachers Association), etc.

Table I D shows how much SCIS and SAPA-AAAS experience participants had engaged in prior to the LTP. (At this point the reader may wish to look ahead to Table V and Figure V to see how much SCIS and SAPA-AAAS activity participants did eventually undertake. These will be discussed later. Table I D also shows what participants would have been doing had they not been attending the LTP. The LTP was competing with teaching, writing and planning, and vacationing.

TABLE IIA PERCEPTION OF RELATIONSHIP BETWEEN SCIENCE AND EDUCATION DEPARTMENTS PRIOR TO LTP



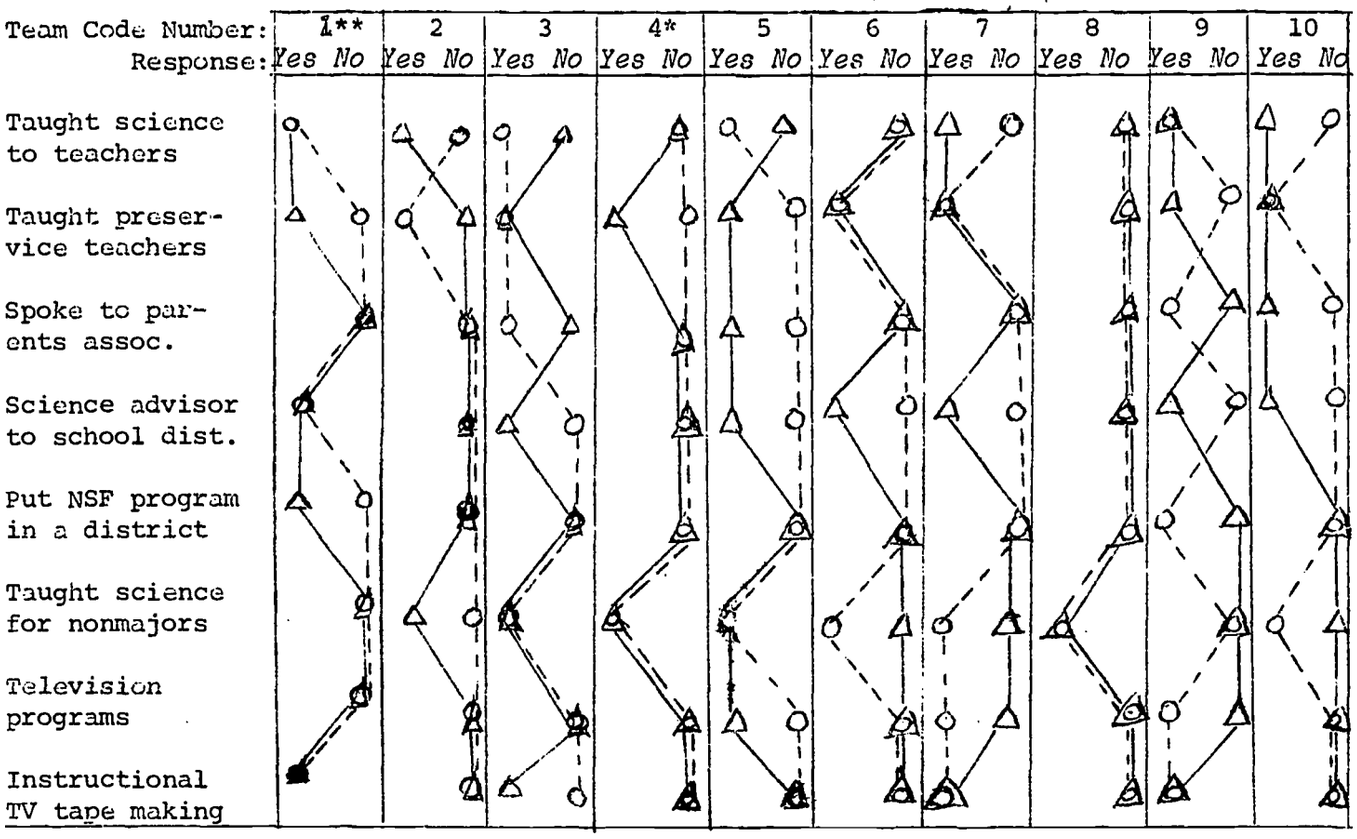
E = Educator, S = Scientist, * = 2 scientists

TABLE IIB PREDICTION OF WORKING RELATIONSHIPS BETWEEN DEPARTMENTS OF SCIENCE AND SCIENCE EDUCATION BASED ON EXPERIENCE WITH PARTNER AT JUNE 1968 INSTITUTE Questionnaire #2

		Present Perception	Improve	Remain about the Same	Deteriorate!
1	E	Occasional		X	
	E	Occasional			
2	E	Good			
	S	Like math			
3	E	Occasional	X		
	S	Good	X		
4	S	Good/excellent		X	
	S	Occasional	X		
5	E	Good	X		
	S	Poor	X		
6	S	Good	X		
	E	Good		X	
7	E	Occasional	X		
	S	Poor	X		
8	S	Poor	X		
	E	Like math	X		
9	S	Occasional	X		
	E	Occasional	X		
10	S	Occasional	X		
	E	Good	X		

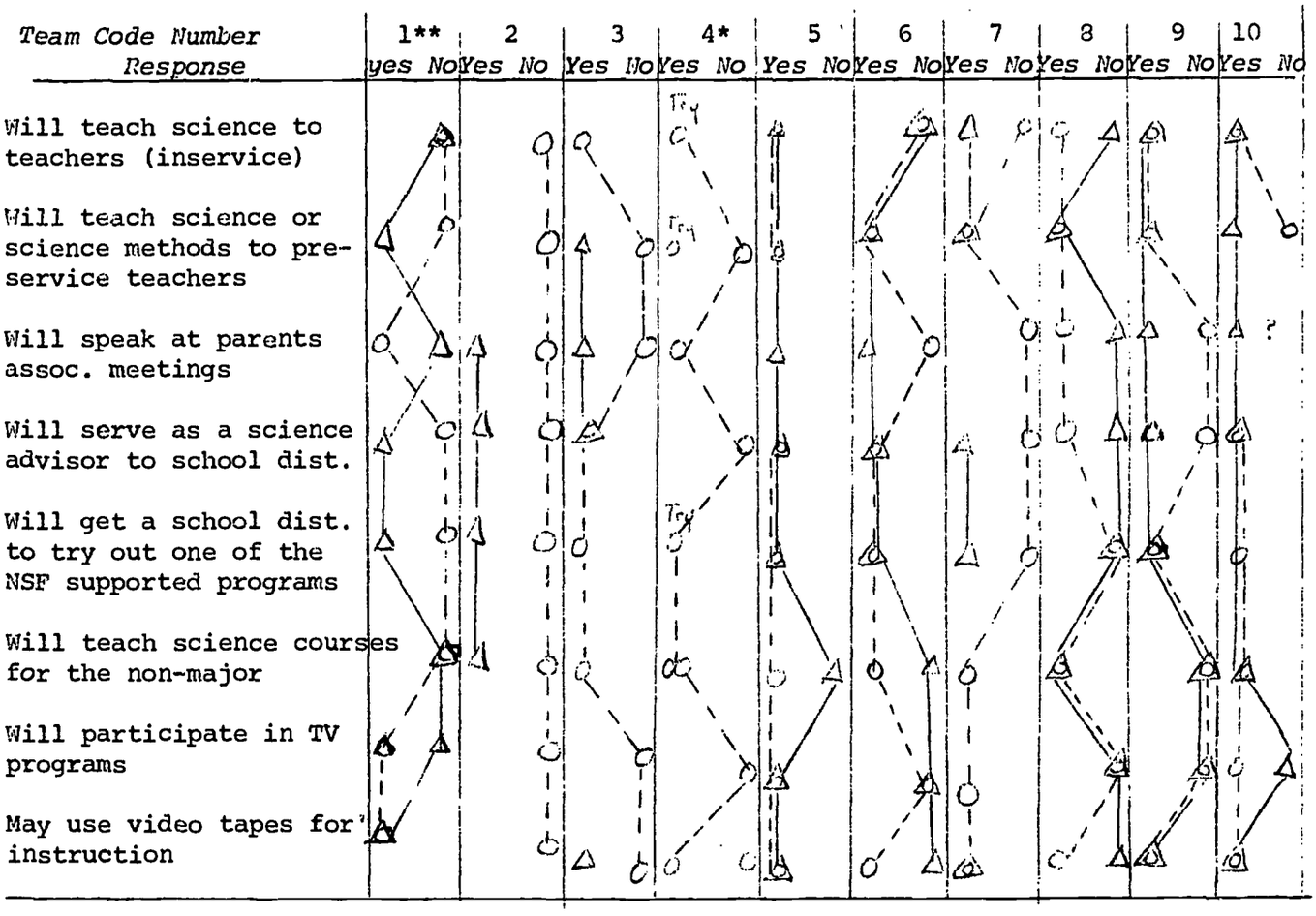
Scale for present perception: non-existent -- poor(low cooperation) -- occasional -- about like with the mathematics department -- good, but could be better -- excellent

TABLE IA SCIS, AAAS RELEVANT EXPERIENCES PRIOR TO ATTENDING LTP



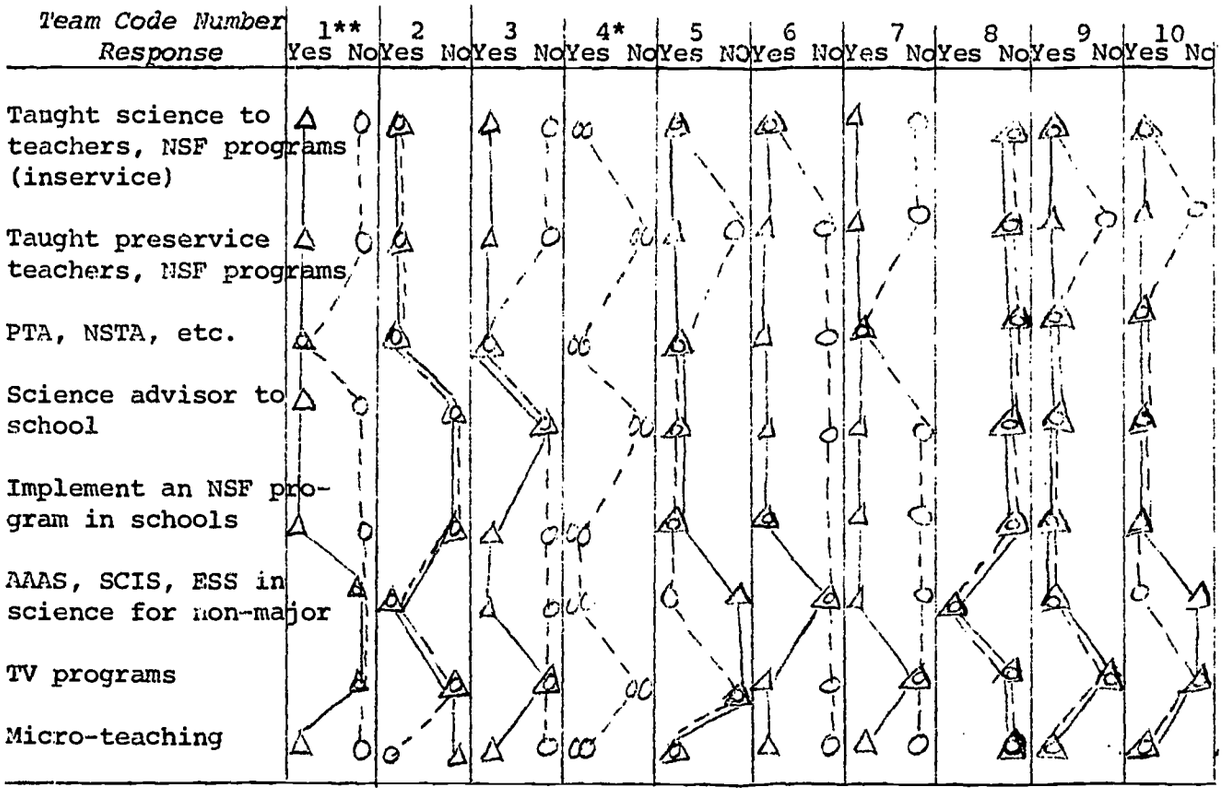
o --- Scientist; Δ ___ Science educator; * = 2 scientists; ** = 2 educators

TABLE IB DURING THE NEXT YEAR, WOULD YOU NOW EXPECT TO ENGAGE IN ANY KIND OF ACTIVITY AIMED AT UP-GRADING THE PUBLIC UNDERSTANDING OF SCIENCE?
June 1968, Institute evaluation; Questionnaire #2



Code: o -- Scientist; Δ — Science educator; * 2 scientists; ** 2 educators

TABLE IC SCIS, AAAS, ESS EXPERIENCES TWO YEARS AFTER LTP



Code: o--scientists; Δ — science educators; * 2 scientists; ** 2 educators

TABLE Id.
SUMMARY OF DATA FROM THREE QUESTIONS ANSWERED PRIOR TO LTP
(Responses Collected in May 1968)

TEAMS

		Experience with NSF science (elem) programs?	Worked with team partner?	What would you be doing during thid period? Teaching	Vacation	Working	Planning or writing
1	E	Yes Use printed materials in methods course, no kits	Cooperated Yes on an extension course				X
	E	Yes, superficial observation		X		X	
2	S	No	Yes, worked on courses together	X			
	S	No		X			
3	E	No	Yes, served on a committee	X			
	S	No			X		
4	S	No					
	S	No	No		X	X	
5	E	Yes Talk about units with preservice, no kits	Yes, worked on core course for teachers		X		X
	S	No			X		X
6	E	No	No		X		
	S	No		X			
7	E	Yes, Used in methods course but without kits, conducted AAAS workshops	No	X			X
	S	No		X			X
8	S	No	Yes, worked on proposals together	X			
	S	No		X			
9	E	Yes, wrote for SCIS 4 workshops in SCIS, AAAS, ESS	No				X
	S	Yes, 2 yrs with ESS-workshops and curric develop.				X	
10	E	Yes, observed classes	No		X		
	S	No			X		X

V. DESIGN FEATURES OF THE LTP

5.1 Conceptualization. (1) Participants were recruited as teams. (2) Very thoroughgoing attention was paid by staff and participants to the actual structure and processes of the institute itself as it proceeded. (3) Serious attention was given to the building of a "reference group" to support work after the institute. (4) Follow-up activities helped maintain the atmosphere of mutual learning and experiment.

Judging from the empirical study of temporary, time-limited systems (6, Miles, 1964), there seemed to be support for the following propositions:

a. "Personality" variables such as trustingness, imagination, perseverance, etc. are not fixed, but can be altered during and after even a short-run experience. Indeed, Cattel demonstrates that these characteristics change somewhat with age and experience.

b. Basic stances such as an orientation toward inquiry are not learned through exhortation, lecturing, etc., but primarily via the learner's direct experience with inquiry. In the case of teachers, that inquiry usually involves students.

c. The format, structure and process of a temporary system such as an institute provides the raw material for the learner's direct experience. If the system is oriented around knowledge transmission, then traditional "teaching" modes will perseverate, no matter how elegant the materials and "methods" advocated. In short, to a considerable degree, the medium is the message. How the institute is conceived, managed and experienced probably does more to change the learner than the particular content being worked on.

d. Much depends on the group support for learners which exists pre, during and post any time-limited experience.

A basic design principle says that you try to give the participants as much practice as possible in the actual kinds of activities in which it is hoped they will engage when they return home. The laboratory nature of the LTP permits plenty of trial and error learning as well as other modes of experimentation.

5.2 Four Laboratory Features of the Leadership Training Program:

1. Direct work with the materials of the two programs.

   Teaching Objectives:

   a. Teach content.

   b. Teach philosophy (through exemplar teaching).

   c. Teach psychological rationale of the two programs.

   d. Re-assess ideas of what science and science instruction should be.

2. Micro-teaching with children:

   Teaching Objectives:

   a. Reinforce and expand content learning.

   b. Recognize the kinds of learning and teaching problems that are particular to the program and kinds of lessons.

   c. Build a pool of anecdotal experience that will be useful later in giving illustrations to teachers and principals (i.e., start improving communication skills).

   d. Find out what part of the transmission of a reasonable version of the program depends on content per se and what part on how the instruction is carried on.

   e. Build confidence in ability to develop reasonable examples and analogs that children can understand. (That is, find out how to adjust ideas and language to the level of a group.)

3. Micro-teaching with principals and teachers.

   Teaching Objectives:

   a. To find out how to diagnose the state of knowledge of each of those types and adjust instruction accordingly.

   b. Learn what the innovation will "cost" these people in terms of how they are expected to function, what attitudes they are expected to change, what knowledge they are expected to have.

c. Find out how to communicate the content of the innovation more effectively.

4. Diagnosis of systems and practice of process skills.

Teaching Objectives:

a. Learn how to initiate change in school systems (e.g., who really makes decisions, what will it cost different people down the line in the system, what do different people have to know about the content and how should they learn it?)

b. Learn how to evaluate the quality of the innovation and what to do when the system is not functioning well relative to the innovation (e.g., a teacher does not do the job well; a principal will not let children have labs; parents and supervisors look at the activities as play instead of learning, etc.)

c. Learn what his strengths and liabilities are as a person from one system (the college) trying to act on another system (the school). Examine how amenable his own system is to demands from the school system (e.g., the common controversy of graduate units and "watered-down courses" for re-training.)

d. Provide buffering against the pressures from his own colleagues to stop trying to rock the boat (e.g., change content of courses, get more assessment from students as to what they want and how instruction seems to them).

e. Learn to adjust instruction to the state of knowledge of the learner.

f. Get feedback from staff, children, teachers and principals on how he is doing and what alternatives are open to him that he might not have thought about or tried, and to practice some of the alternatives to learn their consequences.

From various publications of the National Training Laboratory these attributes of feedback were abstracted:

"Feedback" is a way of helping another person to consider changing his behavior. It is a communication to a person (or a group) which gives that person information about how he affects others. As in a guided missile system feedback helps an individual keep his behavior "on target" and thus better achieve his goals.

Some criteria for useful feedback:

1. It is descriptive rather than evaluative. By describing one's own reaction, it leaves the individual free to use it or to use it as he sees fit. By avoiding evaluative language, it reduces the need for the individual to react defensively.

2. It is specific rather than general. To be told that one is "dominating" will probably not be as useful as to be told that "just now when we were deciding the issue you did not listen to what others said and I felt forced to accept your arguments or face attack from you."

3. It takes into account the needs of both the receiver and giver of feedback. Feedback can be destructive when it serves only our own needs and fails to consider the needs of the person on the receiving end.

4. It is directed toward behavior which the receiver can do something about. Frustration is only increased when a person is reminded of some shortcoming over which he has no control.

5. It is solicited, rather than imposed. Feedback is most useful when the receiver himself has formulated the kind of question which those observing him can answer.

6. It is well-timed. In general, feedback is most useful at the earliest opportunity after the given behavior (depending of course on the person's readiness to hear it, support available from others, etc.)

7. It is checked to insure clear communication. One way of doing this is to have the receiver try to rephrase the feedback he has received to see if it corresponds to what the sender had in mind.

8. When feedback is given in a training group, both giver and receiver have opportunity to check with others in the group the accuracy of the feedback. Is this one man's impression or an impression shared by others?

Feedback, then, is a way of giving help; it is a corrective mechanism for the individual who wants to learn how well his behavior matches his intentions; and it is a means for establishing one's identity --for answering, "Who am I?"

The laboratory experiences provide conditions for participants to gain insight and sensitivity to the behavior of groups and individuals. For the consultant, resource person, or change agent, diagnostic skills are especially important. He needs to learn to recognize when there is resistance and what forms it takes. He needs to know, for example, when interest and enthusiasm do not indicate an intention to modify teaching practices in science. He needs to identify resistance and conflict when it is masked by compliant behavior. He needs to broaden his repertoire of group skills--to recognize when conflict is healthy (i.e., promotes growth) and when it is unhealthy (prevents goal attainment). He needs to recognize instructional problems in the classroom and have an idea of what to tell teachers to do. He needs to learn how to initiate action in a system (e.g., how to identify who really makes decisions and how to talk to and hear people who occupy different roles in the system).

Mostly the participant needs to learn how to produce responsive learning environments, situations where would-be learners feel safe in trying out ideas; where they can learn by experimenting with new ideas and behaviors in a situation that is relatively safe and in which they can get helpful feedback.

5.3 Isolation. The circumstances of housing are important in the working out of a design. The maximum effect of the LTP can be achieved when participants are temporarily separated from their back-home situation and free to give all their attention to the work of the LTP. Thus, all participants were urged to move into the dormitory provided for them. The LTP at Columbia occurred just after the Columbia riots. Police barricades were still up and the graffiti in the dormitories spoke dramatically of the feeling that had recently run rampant there. Some students still remained in the lower halls and participants had a chance to talk with them.

Since one of the objectives is to teach participants about the properties of sub-cultures and social systems and to encourage as much exchange of ideas and opinions as possible, the live-in requirement helps keep attention focused on the temporary system which they form. It provides informal periods in which to corroborate or disconfirm one's feelings, to raise questions about what is happening, to develop sufficient knowledge of others to come to like and trust them.

Participants who for one reason or another cannot live in usually recognize that in some way the group has "gone past them". Often they eventually make arrangements to stay overnight every few days to "catch up" on the system.

If the group becomes close knit, then the probability that it will continue to find it useful to collaborate after the LTP ends is greater. But in addition, it will experience some separation phenomena that are common to almost all temporary systems in which people have worked hard and played hard together. These phenomena can be identified

when they occur and their effect on participant learning in the last days of a program can be examined. In its planning, the LTP staff needs to keep the separation phenomena in mind. It should be discussed with participants and indicators of its existence should be given. (People begin to ask about schedules, they begin to make phone calls about travel, to check with their offices, to press for an earlier departure time, etc.) The staff will perceive the level of attention and interest to be markedly less.

A program which requires the learners to engage in so many activities which are new to them and which also force a re-appraisal of dearly held stereotypes is going to produce conflict from time to time. A staff has to be prepared to receive some very hostile responses with the knowledge that people in the process of change do sometimes get angry at people perceived to be producing the pain. If they are allowed to express those feelings and are given plenty of support while they work on what "aches", the learners make great gains--and so does the staff. For example, at the end of the first day of the LTP, the college faculty were told that they would each have four second graders to teach for 30 minutes the next day. They could select any lessons they chose from SCIS or from SAPA-AAAS. That task should be relatively easy, since they had just completed seven hours of orientation to the SCIS and SAPA, since they all had strong science backgrounds and since they would work in teams, each taking 15 minutes of the instruction.

The transformation that the group experienced was nothing short of dramatic. During the day they had said in no uncertain terms that the problem with elementary science instruction was that teachers did not know any science. (When staff pointed out that the average teacher had 9-12 semester hours of science methods, the fact was ignored. Strongly held stereotypes are not likely to be upset by a fact, especially a fact which might force some re-examination of the way participants performed their role as teachers.)

Suddenly they were insisting that there was not enough time to get ready. (So we gave them extra time on the morning schedule); the classroom teacher on the staff became the most popular person in the place. The scientists suddenly wanted to talk to the science educators, who were themselves rather uneasy. The anxiety expressed in the dormitory that night was very high and quite general. The anger directed at staff was quite intense. Somehow they all got through the experience and managed to endure the sound and spectacle of their teaching played back on the video-tape and available as a tape recording which could be taken back to the dormitory.

Our first major bridging functions had been accomplished: The teams had had their first experience at collaboration and the professors were not quite so prone to give easy answers to the question of why elementary science instruction is so unsatisfactory. Other results of micro-teaching sessions will be discussed later.

VI. MANAGEMENT

Working under a temporary systems model (6) motivated by the ideas in Carl Rogers' book, Freedom to Learn, the following principles of management seemed indicated:

1. There needed to be a continuous flow of data to the planning group--commonly called feedback or evaluation of the state of the learners. This is the stuff out of which day-to-day program decisions flow.

2. There needed to be ways of making the resources within the participant group as within the staff visible: The diagnosis stage carried out prior to and just after the start of the LTP indicated areas of expertise that might be helpful to the LTP. Planning and conduct of those sections was done by the participants with the pertinent knowledge.

   This practice of identifying and making the areas of expertise visible and modeling its use would increase the probability that participants would call on these individuals again in post training activities. In short, it not only made the learning during the LTP richer, but it has potential for maintaining the collaborative network that we wished would survive and grow strong after the LTP. Analysis of the post-session data suggests that, in fact, such individuals were called on several times over the 2-1/2 year period.

3. The usual structure of the learning situation had to shift away from the traditional high authority mode toward a more open problem-centered operation where participants helped set the conditions for learning. A high authority mode functions well in highly stable systems. In any group, norms connected with the changes in progress develop. They might be described briefly as the following:

   a. Those connected with risk--trying out new behaviors or ideas is almost always accompanied by anxiety and uncertainty. Participants determine what the risk level will be. They decide whether to stick inside what they know how to do well. (The present system has a way of looking permanent and safe; why try anything new? Balanced against that argument was the presence of police barricades and the fact they were being paid to try something new.) Risk taking will be greater when the authority structure in the system is less rigid. (7.)

   b. The trust level which gets established in the group determines how likely participants are to risk. Trust furthers collaboration.

c. When participants can participate in restructuring portions of the program and in reformulating the goals, their work level tends to go up.

To help get those norms established at a sufficiently high level, the staff needs to keep in constant touch with the participants and it needs to think of co-planning with participants. Both have power within the temporary system, but the participants have more power because it is they who in the final analysis determine whether any change takes place.

4. The major technological skills needed on the staff seemed to be associated with the following:

   a. Mobilizing resources.

   b. Figuring out patterns of people and material flow.

   c. Scheduling and re-scheduling. This gets more complex and more frequent as the LTP progresses and participants take over more and more of the operation. Coordination of people and resources gets more complex.

   d. Knowledge of research relevant to the activities in which participants are to engage.

   e. Some evaluation skills--especially listening.

   f. An ability to tolerate conflict and the knowledge that he can choose to escalate it, or not to de-escalate it. (8)

The process training which we finally elected to use could be described as conveyed through structured games. For an example of one such game, see the exercise on one-way-two-way communication in Appendix B. The kinds of discussion such an activity provokes are indicated by the following quote which was taken from a tape recording made during the discussion. The man speaking was the "communicator" for the exercise.

> "Damn! Did you ever give a lecture and get the feeling nobody knew what the hell you were talking about and the more you say the worse it gets? It felt like that--like no one can hear you and you're all alone."

Other people in the group described how frustrated they got trying to make sense out of what the communicator said. The confusion got worse the more he kept talking.

The activity serves one important function for the college group. It forces re-examination of the lecture mode which is a one-way system. (For a list of such training techniques see (9)

While it would have been nice in the view of this investigator to do some process training in the context of the tasks being engaged in as part of the training on SCIS and SAPA-AAAS, it turned out that the social scientist was unable to be especially helpful either in planning or in process training. He had to learn how to work in an applied setting. (That some social scientists could function well in such settings had been particularly well demonstrated by three other social scientists with whom I had previously worked.) It turned out, then, that certain objectives were not especially well worked on during the LTP. These tasks had to be made up, where possible, through the follow-up program.

We based our instruction in this area on a book edited by Goodwin Watson, Concepts for Social Change. (10)

VII. FOLLOW-UP AND RESULTS

Since the collection of data and the follow-up were so intimately intertwined, it seemed useful to discuss them together. A similar comment concerning the close relationship between evaluation and the activities of the LTP also holds as the micro-teaching data described below clearly shows.

7.1 Micro-Teaching. For approximately three years prior to the LTP, Rowe had been studying the verbal discourse of teachers trying to do SCIS, SAPA-AAAS, or ESS (1). Now an opportunity was provided to observe how content sophistication changed the teaching. LTP participants certainly could not be accused of not knowing any science! There were no major differences in the interaction pattern when a much simplified version of Bellack's category system was employed. In addition, the wait-time which a teacher gives for a student to begin an answer and which Rowe had found to average one second was slightly less for the college people prior to receiving training on this variable. Their language was slightly more sophisticated, i.e., included technical terminology, and their bursts of uninterrupted (lecturing) speaking were slightly longer on the average.

Thus, we can infer that while content is certainly an important ingredient, techniques for producing a two-way exchange instead of a one-way interrogation needed to be taught. The remaining micro-teaching sessions were devoted to that end.

During phase II of the LTP, when participant teams worked with teacher groups, we could appraise the extent to which participants valued the micro-teaching experience by observing whether they chose to use it in their training of the teachers.

We could appraise the extent to which they had learned to distinguish observations from inferences when they made statements about teaching which they observed.

7.2 Institute Evaluation. Table IV shows how participants rated the various activities that made up the program of the LPW. If the program had been unresponsive to the needs of one group or the other then we might expect to see different profiles generated by the scientists and the science educators. Such is not the case.

Another thing we found is that when the level of trust in a group is sufficiently high and the group has had practice in giving feedback which is helpful, then activities tend to be appraised more realistically. The feedback can really be used for planning. We also learned that activities which produced much controversy or forced some kind of self-appraisal to occur were initially rated low. Interestingly enough, however, these are frequently the activities most chosen when participants conduct the training of others.

What was perceived not to have gone well or improvements that could have been made in the LTP were often reflected in the design and conduct of the CCSS programs which some participants eventually ran.

7.3 Back-Home Activities. I delayed presentation of this section because the results of the 2-1/2 year study are just too good to be believable. Yet they represent conservative estimates based on what participants reported. They are conservative because at the time of compiling, four participants had not yet reported their activities of the preceding eight months. They are conservative because when they described how many students were in courses they were teaching that now contained SCIS-SAPA relevant content they usually stated a range, e.g., 20-30 per semester; the lower number was used.

The figures which describe how many teachers were trained and actually teaching SCIS or SAPA as a direct result of training given by the participants (Column a of Table V) are accurate.

Briefly, Table V tells us the following:

a. 1537 classrooms containing approximately 37,575 children are presently engaging in SCIS or SAPA as a result of the activities of the participants.

b. Six institutions have adjusted their science for the non-major to include some SCIS and SAPA relevant content and processes.

c. Seven institutions now have one or more courses in the education department which reflect SCIS and SAPA content and philosophy, a gain of five.

d. The number of classroom visits made by LTP participants was 247, again a conservative estimate. It represents a gain of more than 200 hours over the two year period preceding the LTP and suggests that bridging functions are going on.

e. The number of PTA regional and national programs which participated for the purpose of giving information about SCIS and/or SAPA was 62, a gain in excess of 500%.

f. Participants won eleven NSF, CCSS (College Cooperatives) grants for the training of teachers as against a benchmark of zero prior to the LTP. Five attempts to get CCSS grants failed.

7.4 Description of Follow-Up and Data Collection. We might well inquire whether all this activity occurred in a single burst immediately following the LITP and whether most of it was contributed by one of the role types. Figure V shows some fascinating results. The mean rate of implementation is still rising as of this date (2/4/71). The shape of the growth curves are quite different and in a way reflects what we might expect. The scientists had a longer way to go. If we had terminated the follow-up and evaluation at the end of one year as originally planned, we would be forced to the conclusion that training the scientists had to be regarded as a poor investment. It turns out, however, that for them to bring about course changes requires time-consuming negotiation with other faculty members who teach sections of the course. There are many rebuffs.

The curve shows an up in implementation activities for both groups in periods after a follow-up session. Follow-up sessions usually had certain attributes:

a. Participants shared their experiences and gave help to each other (e.g., successful proposal writers helped those who wanted to prepare proposals).

b. New plans were made or budding plans got aired for such ideas as members could contribute.

c. The problems they were encountering were discussed.

d. Data were collected through individual tape recordings as well as through conversation.

These sessions usually took shape in response to what participants had on their minds. At one follow-up meeting, for example, several institutions had just suffered from student disruptions similar to those which had happened at Columbia. No one wanted to do anything except talk about that. It turned out to be hopeless to try to do much else. In response to that need, we ran out and bought up all the available copies of Schwab's book The College Curriculum and Student Protest. (4) People sat around reading that and talking about it. Far more insightful discussion of "How I am running my shop" came up by virtue of that experience than probably ever would have arisen otherwise. Thus contingency responding to the requirements of participants illustrates the thesis in Rogers' book, Freedom to Learn (11).

Two teams were broken up when one member moved to another institution. The member who stayed behind continued his implementation activities. The member who moved showed no such activity in the year following the move. One member is just beginning to become active.

The curve does not reflect the extent to which there was an increment in implementation activity following some kind of post-session activity because these post LTP events happened at different times for different segments of the group. The arrows show only approximately when some round of follow-up was in process.

7.5 A Stable Network for Collaboration. Over the 2-1/2 year period following the LTP, attempts were made to build up a stable network of mutually satisfying relationships among the participants and staff. In doing this the staff sought for and got help from participants. Eight participants engaged in the programs of other participants. Twelve participants took part with the staff at one time or another in the conduct of programs for teachers. The advantages of such a network when it flourishes are twofold:

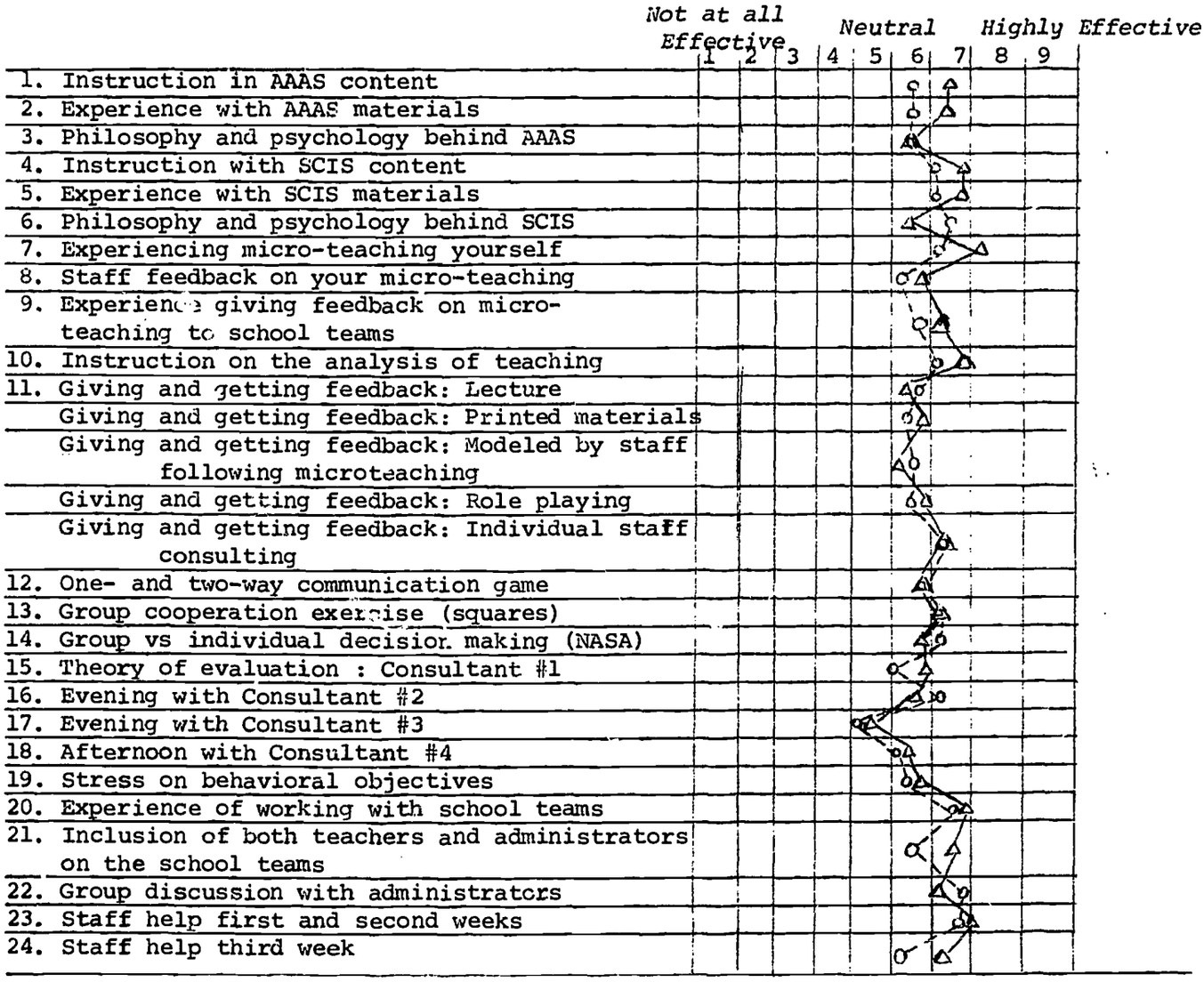
a. It provides each individual with a wider pool of resources.

b. It lends emotional as well as real support to change efforts.

Wherever the network was not active, the amount of implementation was correspondingly lower.

We are now considering whether it might be possible for the members of this network who are actively engaged in implementing new programs to work together on a joint venture in program evaluation of SCIS, SAPA-AAAS-ESS. That seems to be the next obvious and most exciting step. There have been no good comprehensive evaluations done of new programs and here sits a social structure with the competency and interest to move into a new area of investigation!

TABLE IV JUNE 1968, INSTITUTE EVALUATION -- Questionnaire #2



Code: o -- Scientists; Δ — Science Educators

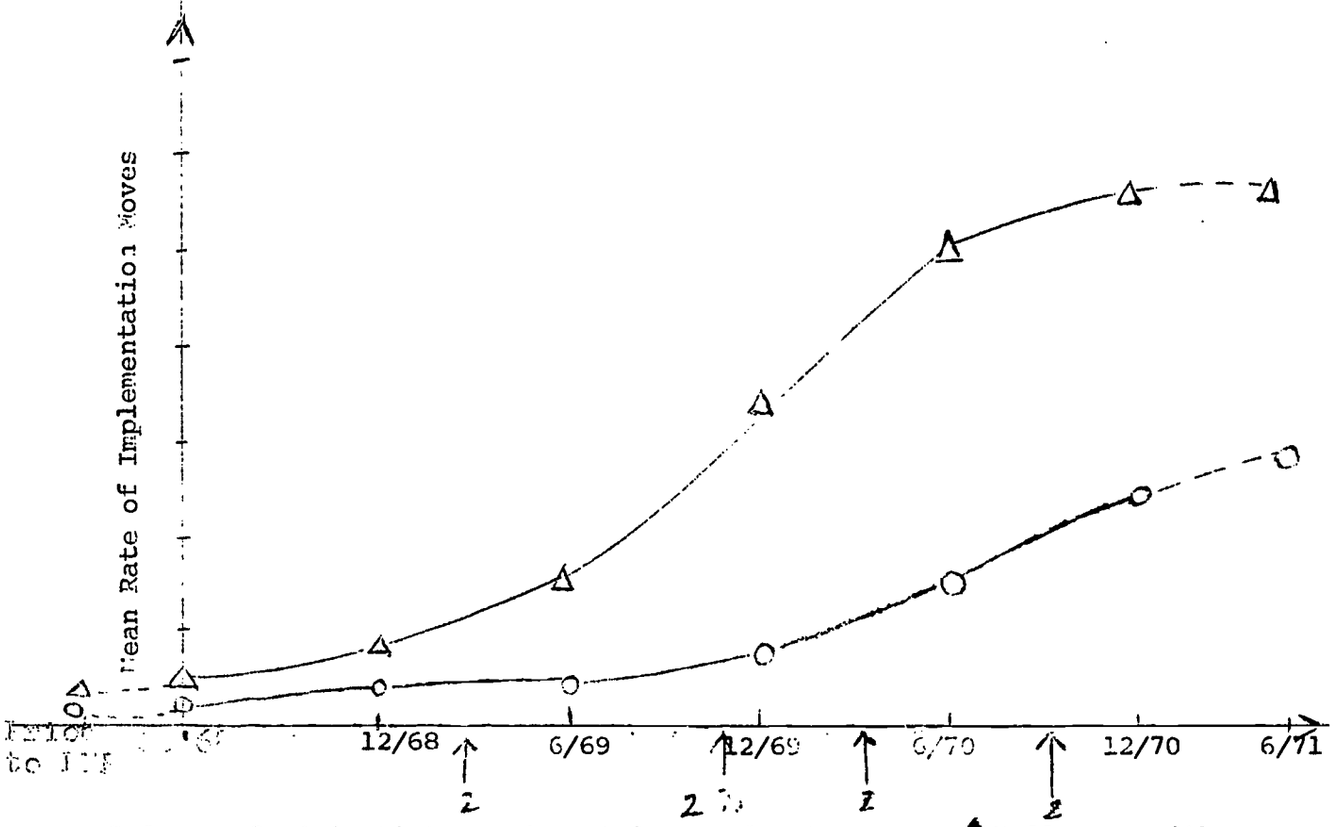
TABLE V CUMULATIVE DATA ON DIFFUSION FOR PERIOD 10/68 - 1/15/71
(All Estimates Are Conservative)

Institution Code No.	a Grants	No. of Teachers b Direct	c Diffusion	d Estim.No. of Children25/class	e Classroom Visits	f No.* of people given 2 hrs or more training	g PTAs-State, Mat'l.	h Misc.-Publications, TV Univ.Curric.	i Grad courses No. of students	j Undergrad. No. of students
1	1-	20	0	400	24	45	4	1	35	95
2	0	2	2	100	0	54	8	0	0	300
3	1-	0	0	0	12	0	4	1	0	90
4	1-2	70	80	4625	12	11	4	0	0	120
5	1	72	5	1925	14	90	7	1	120	2000
6	1-1+	28	35	775	30	140	6	3	100	250
7	1	120	280	10,000	60	500	11	3	75	350
8	1	35	0	0	6	36	0	0	0	40
9	3	385	300	17,125	35	120	5	0	110	800
10	1-2	58	45	2625	54	60	13	2	70	350
Total	5-11+	790	747	37,575	247	1056	62	11	505	4595

Columns b + c = 1537

* Teachers, administrators, supervisors *excluding* those in columns b and c, i and j.
i and j are conservative estimates.

FIGURE V Mean Rate of Implementation Moves by Roles: Showing Importance of Follow-up Activities and Long-term Evaluation Schedules



Code: O—Scientists, segment of LTP Δ — Science educators ↑ Follow-up with some

APPENDIXX I

Department of Science Education
Teachers College, Columbia University
New York, New York 10027

June 3, 1968

To Members of School Teams attending the June 24-28 Sessions of the Leadership Training Laboratory in Elementary Science.

We are looking forward to working with you at Teachers College, Columbia University, during the last week of June. The new science program you will be learning is exciting to both children and adults. You do not have to worry if science has never been for you. You will do well and will enjoy the training. There will be four other school teams also studying the same science program. Five teams will be learning the SCIS (Science Curriculum Improvement Study) and five will be learning the AAAS (Science--A Process Approach). Most of the sessions will be conducted in small groups, usually by teams.

Since we want to take advantage of your experience as a teacher to help us do a better job of training, teams will ordinarily lunch with their instructors. The object of lunch conversations is to help the college faculty learn what they should know about the following:

1. How they are doing in their training of you; what you wish would change; what you want more of; where you need help.

2. Knowledge you feel they should have about the realities of the elementary school that would help them to work more effectively with teachers and principals.

3. What you feel ideal undergraduate courses in science (for the non-major) should be like. (Try to tell the instructors honestly how the science courses you took made you feel.)

Instructors for teams come from faculties of colleges and universities around the country. We are asking you to help them find out what kind of training would be most effective in building your confidence and ability to "do" science.

On the attached sheets you will find directions for getting to Columbia and to your first meetings. We look forward to your coming and to the contribution you will make to the Leadership Training Laboratory in Elementary Science.

Sincerely,

Mary Budd Rowe

Willard J. Jacobson
Co-Directors

APPENDIX II

ONE- AND TWO-WAY COMMUNICATION

Objectives:

1. To demonstrate the differences between a situation in which two-way communication exists and one in which communication goes one way.

2. To demonstrate the differences between group and individual information.

3. To stimulate participants to think about their relations with people who are subordinate to them in the hierarchy (e.g., students, members of the school systems they may encounter).

Discussion:

Communication can be studied. Numerous experiments have been made to understand the attributes and processes of effective and faulty communication.

1. Communication can be viewed in terms of CONTENT. (The content of today's communication will be easy so as to allow you to focus on directionality factors. The action verbs that apply to the content are OBSERVING and DESCRIBING. CONSTRUCTING and PREDICTING!!)

2. Communication can be viewed in terms of DIRECTION. It may be ONE-WAY in direction (e.g., lecture; adminiatrator who does a lot of telling and does not listen to his faculty; a consultant for a new NSF program talking to schools, but not one of you!)

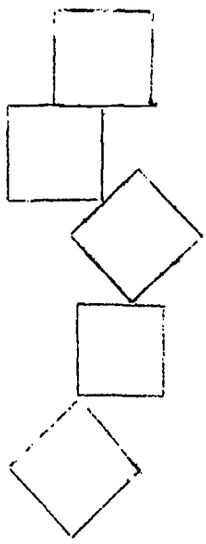
   It may be TWO-WAY in direction (e.g., when questions and suggestions are solicited and sometimes used; when a consultant for a new NSF program finds out what the wants, feelings, suggestions of a school system are and adjusts his assistance to accommodate them. This could be you.)

   Communication may be viewed in terms of NETWORKS. (E.G., a second grader tells his mother about his science, she then tells a neighbor who is on the school board, the school board member brings up the subject with the principal who speaks to the teacher, etc., etc., etc.)

3. Communication may be more or less noisy. All kinds of distortions and inaccuracies may get into the communication system. People interpret differently the "same communication." In classrooms where little clarification occurs errors can pile up and students "turn off." Repetition or redundancy may help get a message across when the system does not respond with fidelity.

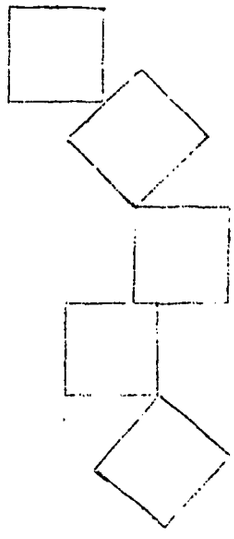
TODAY YOU WILL DO AN EXPERIMENT THAT WILL ALLOW YOU TO STUDY COMMUNICATION AS IT IS AFFECTED BY DIRECTIONALITY. IT WILL BE LOOKED AT IN TERMS OF TIME REQUIRED, ACCURACY, ATTITUDES.

I. ONE-WAY COMMUNICATION Sheet #1



Instructions: Study the figures above. With your back to the group, instruct the members of the group how to draw them. Begin with the top square and describe each in succession (no hands allowed!), taking particular note of the relationship of each to the preceding one. No questions are allowed!

II. TWO-WAY COMMUNICATION Sheet #2



Instructions: Study the figures above. Facing the group, you are to instruct the members how to draw them. Begin with the top square and describe each in succession, taking particular note of the relation of each to the preceding one. Answer all questions from participants. NO HANDS OR GESTURES ALLOWED.

Some of the Influences Which May Affect
the Giving and Receiving of Instructions

GIVER	RECEIVER
Language is not clear.	Does not understand words.
Instructions are not definite.	Ability is too limited to perform the tas.
Instructions involve too many unpredictable variables.	Is careless in listening habits.
Does not provide opportunity for receiver to ask questions or give own opinion.	Does not ask questions when he fails to understand.
Does not understand situation about which instructions are being given.	Is not interested in the work.
Feels unsure of his own authority.	Is in revolt against all authority as a reaction against earlier experiences. Unable to listen to anyone.
Does not understand and/or respect feelings of person to whom he is giving instruction.	Is consciously or unconsciously afraid of the person giving the instructions and therefore puts the energy into trying to cover the fear rather than listening.

FOOTNOTES

(1) Rowe, Mary Budd. "Science, Silence and Sanctions." In Science and Children, Vol. 6, No. 6, March 1969.

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