of innovations in education, that is the central concern of this paper. The theoretical contributions of the teacher education research will therefore not be treated in detail in this report.

The diffusion model of the Human Sciences Implementation Project is intended to test means of counterbalancing various sorts of resistance to curriculum innovation in the past. Each D & I Team consists of persons from all of the groups affected by curriculum change (parents, school board members, and other interested lay persons; teachers; curriculum specialists; principals; administrators; and teacher educators) who have been sources of resistance to change in other curriculum situations. Students also play a role in the model through participation in pilot-trials of the materials at the D & I Center Demonstration Schools.

The D & I Teams were conceived of, in Havelock's (1969) terms, as "linkers" between the Human Sciences developers, the "researchers," and teachers, the "educational practitioners" (p. 10-62), as shown in the diagram below:

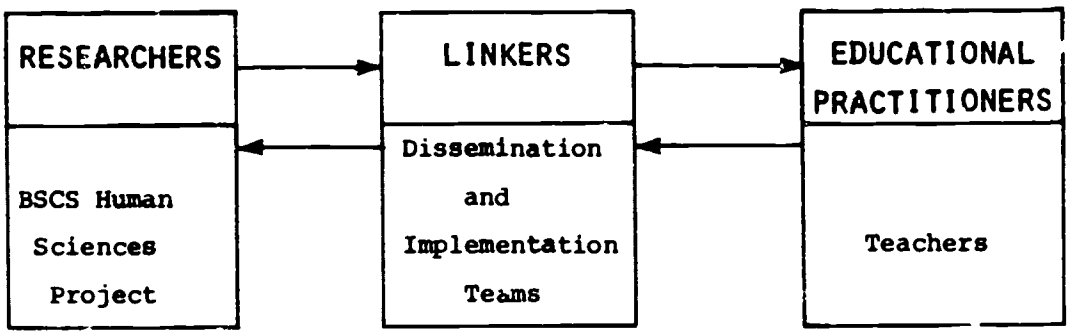

Diagram 1. Basic Components of Human Sciences Implementation Model.

In this diagram the linkage between the curriculum developers and potential users supplied by the D & I Teams implies a very simple system. However, the model for the project was based upon more complex

REPORT ON THE MODEL OF CURRICULUM DIFFUSION FOR THE BSCS HUMAN SCIENCES PROGRAM

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REPORT ON THE MODEL OF CURRICULUM DIFFUSION
FOR THE BSCS HUMAN SCIENCES PROGRAM

This paper reports on the progress through February 1975 of the Human Sciences Implementation Project of the Biological Sciences Curriculum Study (BSCS). The project was funded in January of 1974 by the National Science Foundation (NSF) to disseminate information about the curriculum and to train staff personnel of four regional Curriculum Dissemination and Implementation (D & I) Centers in the philosophy, rationale, and teaching of the BSCS Human Sciences Program (HSP). The implementation project also provides support services, materials, and field consultation to the D & I Centers located at Queens College of the City University of New York, Louisiana State University, the University of Texas at San Antonio, and Western Washington State College.

Basically, the implementation project involves the developers of a national curriculum project in the application of dissemination theory to stimulate the implementation of the curriculum program through a network of D & I Centers to the education community. The project may also shed some light on the "near-invisibility" to local school districts of the "national government, . . . universities, state agencies, and . . . private sector groups" in the "infrastructure of the educational change network," a situation described by Havelock (1974) as a "mystery" to diffusion researchers. (p. 94) The purpose of the BSCS project is to stimulate the dissemination of the HSP. The criterion for achievement is that of the NSF:

> The success of implementation projects must ultimately be judged in terms of the effectiveness with which the materials and practices in question are utilized in the classrooms. (National Science Foundation, 1974, p.2)

Theoretical Framework

The BSCS Human Sciences Program is a radical departure from conventional science curriculum programs for emerging adolescents, students generally grouped in grades six through nine. Since the program is so different from those currently in use in middle and junior high schools, the research of the project has focused in large part on (1) what is known about the "diffusibility" of innovative products, recognizing the characteristics of the HSP that may cause resistance to implementation, and (2) on identifying the behavioral adaptation that is required of teachers to implement the Human Sciences Program in classrooms.

The Human Sciences Implementation Project has drawn upon several areas of research. Planning began with an extensive search of the literature by Hurd (1972); he stated the case as follows:

> In the decade between 1960-1970 the government of the United States contributed nearly one billion dollars to develop new curricula in the sciences and to train teachers to use them properly. The diffusion and implementation of these programs in schools has not met expectations. (p. 1)

The project design has incorporated research in the diffusion of innovations by Havelock (1969, 1974), Schindler-Rainman and Lippitt (1972), Baldridge (1974), and Miles (1974). The teacher education aspects of the project have drawn upon the literature in cognitive development, notably by Piaget (1971, 1972, 1973), Elkind (1970, 1972a & b), Kohlberg (1969), Kohlberg and Gilligan (1972), and Kohlberg and Mayer (1972). More recently the project has begun to utilize the work on teacher education for "open" classrooms of Barth (1971), Wickens (1973), Kamii (1973), and Schwebel and Raph (1973). However, it is the first of these research areas, diffusion

of innovations in education, that is the central concern of this paper. The theoretical contributions of the teacher education research will therefore not be treated in detail in this report.

The diffusion model of the Human Sciences Implementation Project is intended to test means of counterbalancing various sorts of resistance to curriculum innovation in the past. Each D & I Team consists of persons from all of the groups affected by curriculum change (parents, school board members, and other interested lay persons; teachers; curriculum specialists; principals; administrators; and teacher educators) who have been sources of resistance to change in other curriculum situations. Students also play a role in the model through participation in pilot-trials of the materials at the D & I Center Demonstration Schools.

The D & I Teams were conceived of, in Havelock's (1969) terms, as "linkers" between the Human Sciences developers, the "researchers," and teachers, the "educational practitioners" (p. 10-62), as shown in the diagram below:

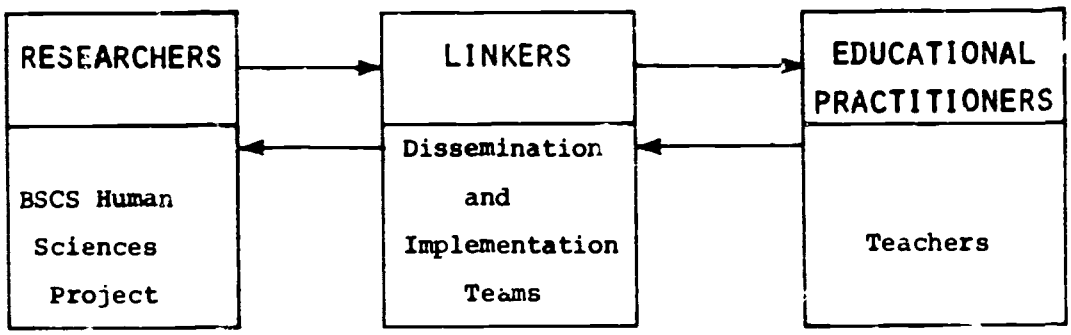


Diagram 1. Basic Components of Human Sciences Implementation Model.

In this diagram the linkage between the curriculum developers and potential users supplied by the D & I Teams implies a very simple system. However, the model for the project was based upon more complex

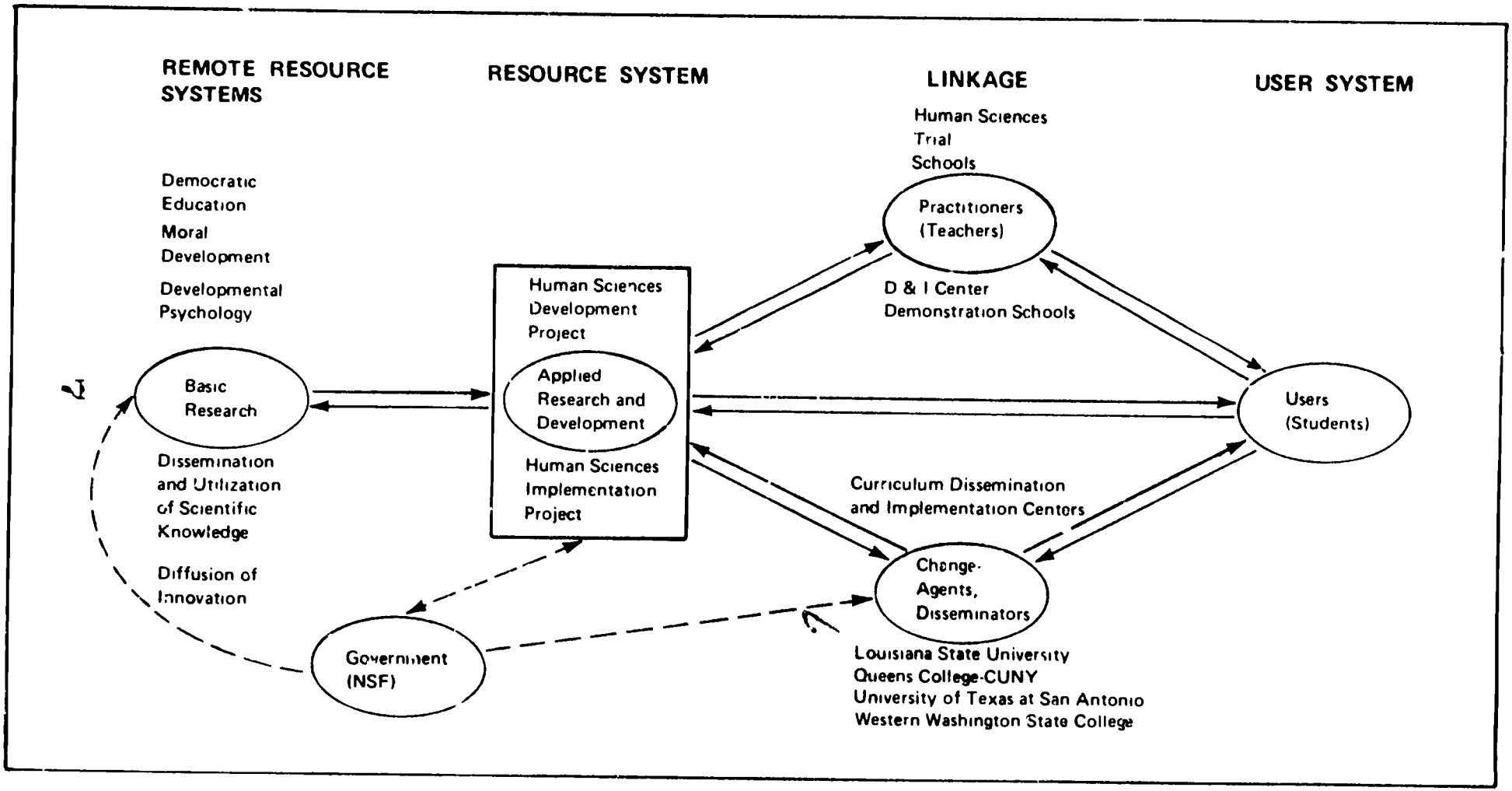
notions of the interaction between system components.

> The concept of linkage starts with a focus on the user as a *problem-solver*. We must first consider the internal problem-solving cycle within the user . . . there is an initial "felt need" which leads into a "diagnosis" and "problem statement" and works through "search" and "retrieval" phases to a "solution," and the "application" of that solution. But . . . the linkage model stresses that the user must be *meaningfully related to outside resources*. The user must make contact with the outside resource system and interact with it so that he will get back something relevant to help him with the solution process. The user must enter into a *reciprocal relationship* with the resource system; this means that something must be going on inside the resource system that corresponds to what is happening in the user. (Havelock, 1969, p. 11-15)

Diagram 2 illustrates the more complex design of the emerging Human Sciences Implementation Project. The initial supposition was that middle and junior high school educators would have a "felt need" to adopt curriculum materials that were more appropriate for the interests and developmental characteristics of their students. (Havelock (1974) indicates in a recent report that educators will seek to solve their curriculum problems at the local level whether or not they have access to the research and development facilities of agencies like the BSCS.) The D & I Centers provide the system with a mechanism to establish a "meaningful relationship" between curriculum developers and prospective users of the curriculum.

In Diagram 2, the HSP materials development and program implementation projects are arrayed in the central position of "resource system." Contact is maintained with the government funding agency (NSF), with "remote resource systems" engaged in basic research into the psychological (as well as philosophical) characteristics of emerging adolescents, and

DIAGRAM 2. HUMAN SCIENCES IMPLEMENTATION PROJECT SYSTEM



with researchers in the diffusion of innovations. In this perspective the BSCS projects serve as linking agents between the government, basic research agencies, and field practitioners (including the D & I Centers as their personnel develop the competency to assume a more central role in the system).

Diagram 3 provides a view of the system as it is expected to evolve over the next three years. The BSCS is to become a remote resource system along with basic research agencies, the government sponsor, and the commercial publisher of the Human Sciences Program. These agencies will be linked to practitioners and users (students) by the D & I Centers.

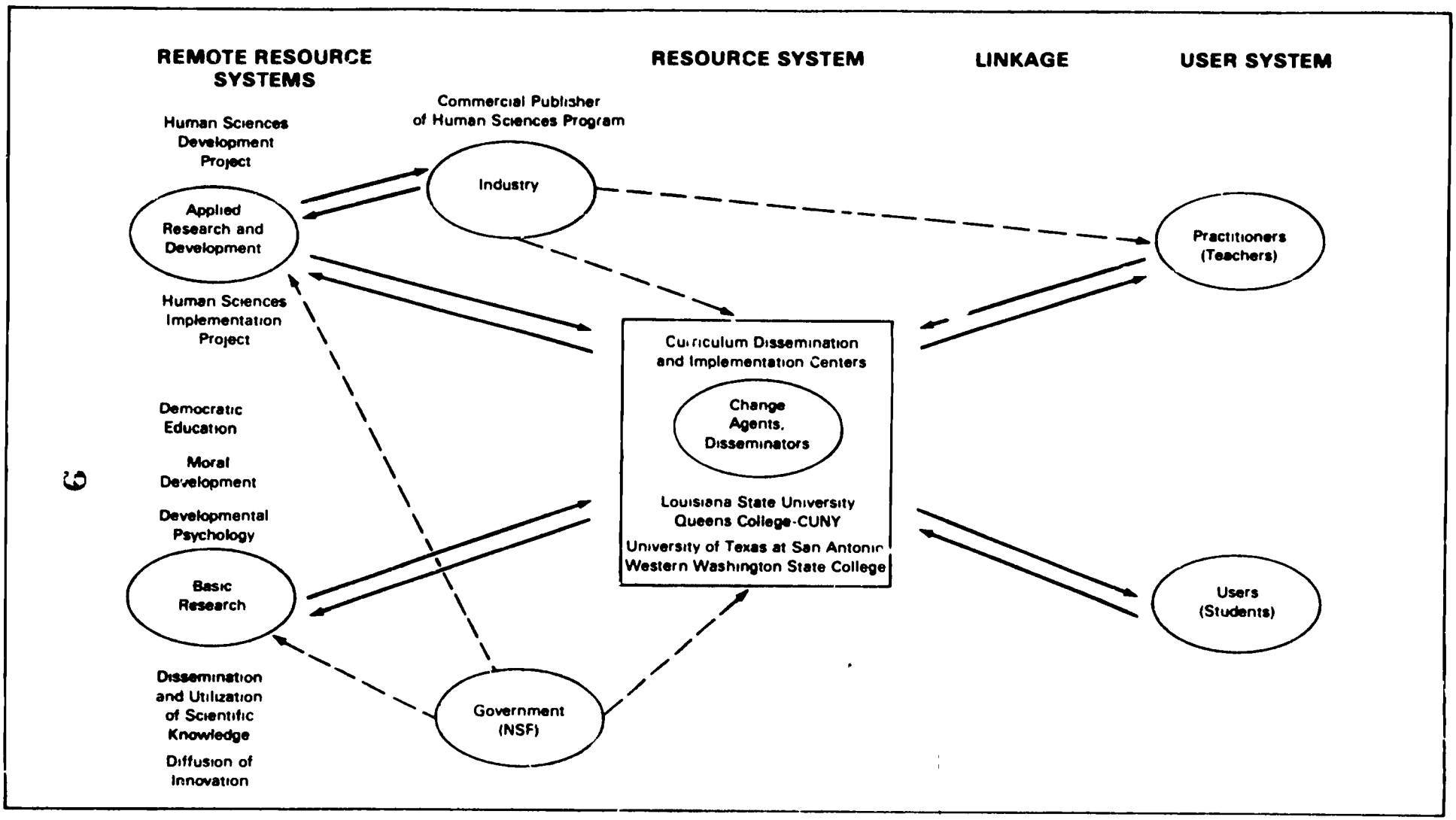
There is another well established system of linkage in the dissemination of educational materials that cannot be overlooked in the BSCS project design. This is the existing commercial system of textbook publishing and distribution. Ruff and Orlich (1974) have documented the influence of textbook sales representatives on the adoption of curriculum materials and that form of linkage cannot be neglected in the design of any dissemination model. The HSP diffusion model envisions several means for influencing the nature of this linkage:

(1) The National Science Foundation may be expected to sponsor an intensive program of training by the BSCS of university-based teacher educators, that is, establish additional D & I Centers.

(2) The publisher will probably want to channel implementation activities through the network of D & I Centers.

(3) The publisher will be requested to put a part of the royalty income from HSP sales into developing effective programs of teacher education to supplement (and in the long range take over) the government-supported implementation effort.

DIAGRAM 3. CURRICULUM DISSEMINATION AND IMPLEMENTATION CENTER SYSTEM



(4) The publisher's sales force will develop competence in helping schools achieve an effective implementation of the Human Sciences Program. This may include the conduct of inservice training by HSP experienced educators.

The "Chain of Knowledge Utilization"

The remainder of this paper will focus on the effort to establish effective means of linking the Human Sciences project to the D & I Centers and to the experience of the centers in establishing effective linkage with schools in their regions. Again, it was Havelock (1969) who provided the theoretical basis for the design.

> The development of reciprocating relationships goes beyond the point of improving individual *problem-solving* processes toward the creation of a stable and long lasting *social influence* network. This collaboration will not only make a solution more effective, but, equally important, it will build a more effective relationship--a relationship of trust and a perception by the user that the resource is truly concerned, that the resource will listen, and will have a quantity of useful information to pass on. The reciprocal and collaborative nature of this relationship further serves to legitimize the roles of consumer and resource person and it builds a *channel* from resource to user. (p. 11-17)

Concerned about their ability to build relationships of trust and mutual concern, the staff members of the Human Sciences Implementation Project underwent training with a specialist in interpersonal relations, Dr. Ronald Lippitt of the University of Michigan. The training, in May of 1974, focused on planning a conference for the D & I Center Teams and the development of group-process skills by project staff personnel. Extensive use was made of resources developed by Lippitt and his associates for various change-agent training programs.

The training conference for the D & I Teams was held in Boulder in June of 1974. The initial plan called for team and cross-team interaction with quite a bit of the conference time to be:

> . . . spent dealing with real situations that the participants delineated in real geographic back-home groupings. These included decreasing blocks to communication, recruitment of volunteers, handling specific power struggles, building an inter-agency committee, involving parents in community work, developing collaborative networks and others. (Schindler-Rainman and Lippitt, 1972, p. 62)

However, during the conference several of the participants viewed the back-home planning as an academic exercise; they wanted practical experience with the curriculum materials. These participants, mainly the teachers in each team, felt a need to have first-hand interaction with the curriculum. The feedback mechanisms in the conference design made it possible for the staff to recognize this situation, alter the schedule, and provide more time for working with the HSP materials. This seemed to be effective in helping the teachers start to develop a sense of personal competency to deal with the materials in their own classes. It also seemed to make it possible for them to better attend to the team back-home planning tasks.

The post-conference evaluation resulted in generally positive judgments about the conference sessions that *actively involved* the D & I Team participants: a structure for shared-governance; systematic feedback collection and response; personal interaction with the HSP developers; "team-building" (group process) activities; and involvement with students and teachers who had prior experiences with the HSP. The negative feedback centered on what was perceived to be ineptitude of the

staff in conducting a few of the team-building sessions, perceived by some as "touchy-feely" exercises. Although the conference planning had centered on task-centered activities and processes, some of the staff interventions were regarded as manipulative. There was also some concern about staff overemphasis on the development of "back-home" plans before participants felt comfortable with the concrete components of the program. Several persons judged that too little time had been allowed for cross-team interaction, what Lippitt referred to as "community building" activities. One participant, a sociologist, found the conference "a refreshing departure from traditional educational authoritarianism."

In general the BSCS conference was successful in getting started a *social influence* network in which the members of the D & I Teams felt a degree of "ownership" in the task of disseminating information about the program. In the time since the Boulder conference, however, there have been some changes in the outlook of D & I Team members, at least as can be determined from the performance of individuals in the separate teams. The BSCS implementation project personnel had no illusions that they could create and coordinate a tightly disciplined corps of proselyters--the commitment to two-way communications and reciprocity mediates against such an outcome--but they do hope to exercise influence on the network in the direction of more effective implementation activity. This function is to provide what Havelock refers to as "synergy" to the dissemination effort (Havelock, 1969):

> "Synergic" is defined... [as] "exerting force together or in combination, or upon the same point." For our purposes the "same point" is the act of adoption of an innovation. Several forces, several inputs of knowledge working together over time, produce the

> behavior which we identify as "knowledge utilization." On the one hand, therefore, "synergy" represents *redundancy*, the requirement that a message be repeated over and over again before it gets attended to and absorbed. There is no question that a high degree of redundancy has to permeate our communication systems for them to be effective knowledge transmitters. But "synergy" goes beyond redundancy in suggesting that there should be *purposeful* redundancy; a variety of messages must be generated pertaining to the same piece of information and these messages must be directed at the potential user on a number of different channels in a number of different formats, and all more-or-less coordinated to the one goal: adoption of innovation. (p. 11-29)

To the degree that the D & I Teams join the BSCS project in the task of repeating the HSP message over and over again to educators taking part in the regional programs we can expect positive achievement in the implementation of the curriculum. But where the HSP message is not sent with sufficient redundancy or where communication about the message is perceived not to be on a two-way basis, we can expect lower levels of implementation results.

The Organization of the D & I Network

As stated earlier, the Human Sciences Program is a radical departure from conventional science programs. Experience has shown us that the HSP "message" requires careful formulation, transmission, reception, and internalization before effective classroom implementation can begin. But, because several categories of people other than teachers are involved in curriculum adoption, it was decided that the D & I Teams should have personnel able to communicate with members of each of the categories of curriculum "gate keepers." This required the formulation of project objectives built around plans for interaction with the variety of

educators and lay people who influence curriculum decisions. Each of the centers submitted the following objectives in its proposal to the National Science Foundation:

1. To establish and test the effectiveness of a Regional Curriculum Dissemination and Implementation Center utilizing the BSCS Human Sciences Program.

Disseminating information about new curricula and establishing innovations in education has achieved only limited success in the United States in the past decade. Established mechanisms for continuing the examination, testing, and utilization of new curricula are nonexistent. The rapidity of social change suggests that new curricula would be sought and examined by school and college. Yet, efforts to secure new materials are not apparent in classrooms. Many educators are unaware of new curricula as they are developed. The idea of a Dissemination and Implementation Center is to establish mechanisms with potential for a sustained effort for securing information about new curricula; to select, analyze, and test these curricula; and to adopt and implement new curriculum products.

Key personnel in school districts, target schools, colleges and universities, and lay groups affect the acceptance and implementation of new ideas and materials. In order to secure the active participation of members of these groups a Dissemination and Implementation Team (D & I Team) is proposed as a key element in Center activities. . . .

2. To develop Dissemination and Implementation Team competencies to teach, demonstrate, prepare teachers, and interpret new curricula to a variety of audiences.

The seven-person D & I Team will serve as a nucleus to plan and conduct the activities of the Regional D & I Center. The Team will utilize additional specialists and representatives as needed to perform its functions in its region. For example, the assistance of cognitive psychologists will be essential to understanding the rationale and the pedagogy of the Human Sciences Program. The Team will also be assisted in developing competencies by the BSCS staff.

The Team will utilize the BSCS Human Sciences sixth-grade materials as an example of an innovative curriculum to determine the most effective means and to identify local problems in utilization and dissemination activities. The Human Sciences Program is very different from other curricula in organization, in the relationship of content to student activities, in teacher roles, and in methods of evaluation and grading. As such, it provides an excellent curriculum program to utilize as an exemplar of new curricula.

3. To utilize and demonstrate the use of the sixth-grade Human Sciences materials, philosophy, content, and pedagogy in a school setting.

The two sixth-grade teachers will serve as demonstration teachers of the Human Sciences Program during the school year. Their classes will be open to visiting educators, academicians, and lay persons throughout the school year 1974-75. Their classes will serve both inservice training and preservice training activities of the D & I Center.

4. To provide an inservice program for sixth-grade teachers in the region during the 1974-75 academic year in accordance with local needs and interests.

The co-directors, with the assistance of other members of the D & I Team, will conduct an inservice program for 10 teams of two sixth-grade teachers and one administrator from school systems in the region. This program is designed to provide each team with an understanding of emerging adolescents, their needs, interests, and development (cognitive, moral, personal, and social); and of the rationale and philosophy of the Human Sciences Program. It will also provide the teachers with direct experience in teaching the Human Sciences Demonstration Module in their own classrooms and the school administrator with working with faculty and community representatives in pilot-trials and evaluation of a new curriculum program.

5. To provide preservice teachers experiences with the philosophy and rationale, and the content and pedagogy for teaching emerging adolescents, utilizing the Human Sciences Program as an example of a curriculum designed specifically for this population.

The co-directors will incorporate the Human Sciences curriculum into their regular preservice professional program of teacher education. The demonstration classrooms will be utilized for observation and analysis and, when feasible, for practice teaching or other types of direct experience by prospective teachers in the classroom.

6. To provide dissemination of information about the Human Sciences Program for potential users and decision-makers in schools, colleges, and communities in the region.

This phase of the Center functions will be initiated in the [name of community] with educators and lay persons concerned with [name of demonstration school]. Parents' night at schools will be utilized to enlist the cooperation of sixth-grade parents in providing their evaluation of the Human Sciences Program for their own child.

Center Team members will seek to make presentations to local education groups such as parent-teacher association, Phi Delta Kappa, school boards, and administrator groups. They will utilize and evaluate literature prepared for these specific groups by the BSCS.

The Center Team will also assist participating inservice teachers in developing and implementing dissemination plans in their communities.

Structure of the D & I Network

Experience with the *political* aspects of curriculum adoption decisions led the BSCS implementation project planners to the decision to include as members of each D & I Team persons with influence in curriculum decision making: principals, curriculum supervisors, and so forth. This structure draws upon the kind of reasoning about *organizational* approaches to innovation diffusion expressed in the sociopolitical mode of analysis by Baldridge (1974). He argues that educational institutions should build "flexible and creative organizations responsive to their environments . . . with built-in reserves of expertise and resources to sustain long-range problem-solving." (p. 40) While the D & I Teams were primarily designed in accordance with the "linkage" model of diffusion, consideration was also given to the political structure of educational institutions. The workings of political forces in universities and school systems also became evident as the D & I Teams were formed. The network proposed to the National Science Foundation was to consist of the BSCS Human Sciences Implementation Project and six college-university based Curriculum Dissemination and Implementation Centers. Each center was to be staffed be a team composed of seven people. That design is illustrated in Table 1 and the results of NSF funding and of the recruiting effort are shown in Table 2. Each of the D & I Teams found it necessary to add one person to the team to fulfill some sort of local expectation. The director of one team chose to limit his participation to an adminstrative role and an additional university-level person was added to the team. Another team, responding to the political climate in their participating school district and to the exigencies of staffing in the demonstration school, added an additional teacher. Two teams found it expeditious to

Table 1. Proposed Design of the HSP Implementation Network. Number of Persons by Category of Curriculum Decision Input for Each Team and Totals.

Category of Team Member	Colleges and Universities						Total
	A	B	C	D	E	F	
University Scientist or Science Educator	1	1	1	1	1	1	6
University Social Scientist or Social Science Educator	1	1	1	1		1	6
School District Science Curriculum Supervisor	1	1	1	1	1	1	6
Demonstration School Principal	1	1	1	1	1	1	6
Grade Level Teachers	2	2	2	2	2	2	12
Parent, School Board Member, Other Lay Person	1	1	1	1	1	1	6
Totals	7	7	7	7	7	7	42

Table 2. Composition of Four Human Sciences D & I Teams Funded by the National Science Foundation for 1974-75 School Year Dissemination Programs.

Category of Team Member	Univ. of Texas at San Antonio	Louisiana State Univ.	Queens College CUNY	Western Washington State College	Total
Project Director	1	0	0	0	1
University Scientist or Science Educator	1	1	1	1	4
University Social Scientist or Social Science Educator	1	1	1	1	4
School District Science Curriculum Supervisor	1	1	0	1	3
Demonstration School Principal	1	1	1	1	4
Demonstration School Assistant Principal	0	0	1	0	1
Grade Level Teachers	2	2	3	2	9
Parent, School Board Member, Other Lay Person	1	1	1	1	4
University Graduate Assistants	0	1	0	1	2
Totals	8	8	8	8	32

add graduate students to help plan and conduct the summer workshops. (While this served a team function, it also helped with the problem of finding support for university or college graduate students.)

If it is possible to ascribe any variation in the performance of the D & I Teams to differences in their organizational structures, then the supporting data will likely be of considerable interest to organizational researchers like Baldridge. It seems more likely, though, at this stage in the operation of the network, that we will be able to explain more variation in terms of differences in the linkage role performance of individual members of the teams--commitment to the program, personal ability to establish social influence, and so forth. Such characteristics of linkage seem to be the major factors for generating hypotheses about the performance of the four centers.

The Collection of D & I Center Performance Data

The collection of data at the D & I Centers is aimed primarily at the evaluation of the entire HSP implementation effort. However, in order to identify causal factors of variation in participant evaluation of the different programs some comparative data are being collected.

The participants in the workshops have completed one BSCS evaluative questionnaire, giving their ratings on a five-point scale about the "helpfulness" of the summer workshop and inservice components of the center programs to their teaching the Human Sciences materials. Since our hypotheses about the performance of the centers, whether stemming from organizational differences or personnel performance, are so tentative, the identity of the centers is not given.

Table 3. Average of Participant Ratings of the Helpfulness to Teaching the Human Sciences Materials of the Summer and Inservice Components of the D & I Center Workshop Programs (1.00 = No Help At All, 5.00 = Very Much Help)

Component	D & I Centers A	B	C	D	Average
Summer Workshop	4.62	3.88	4.55	4.41	4.40
Inservice Sessions	4.36	3.17	3.50	2.91	3.52
Difference	0.26	0.71	1.05	1.50	0.88

The uniformly higher ratings given to the summer workshops over the inservice phase of the D & I Center programs is probably due to the general preference of participants for the more leisurely pace of the summer situation compared with that of attending a class during the academic year. From the standpoint of organizational theory, it is interesting to note that the two D & I Centers with the largest variation between ratings of the summer and inservice components, "C" and "D," both conduct their academic year sessions as all-day Saturday meetings. Both centers draw their participants from geographic areas somewhat more widespread than those served by "A" and "B" with week-night meetings. Additional study of the effect of travel distance, time of meeting, etc., on participant evaluation of the workshop experience will be undertaken before the academic year programs are completed to see if this variation holds.

Hypotheses about the effect of differences in "linkage" characteristics on participant evaluation of the D & I Center programs are similarly tentative and are in need of additional study. The team judged by BSCS personnel to be operating most in accord with the principles of team-shared change-centered operations, Team "C," received generally high scores on both of the participant ratings. But there was more than a full rating point difference between the summer (4.55) and inservice (3.50) phases.

Although the ratings of summer and inservice programs were both relatively high, second for both phases, we cannot explain the large difference between the two except for the fact that Team "C's" inservice meetings are conducted on Saturdays. The team that is judged by the BSCS staff to be operating least in accord with team-directed, change-agent principles received an even larger difference in the participant ratings of the summer and inservice phases of the program. Team "D" had a 1.5 point difference between the two ratings and the lowest average score of the four centers (2.91 out of a possible 5.00) for the inservice component. However, other indices of participant satisfaction with the D & I Center programs will need to be sought before any substantive conclusions can be made about the relative effectiveness of the four centers.

The Search for Antecedent Data

We are interested also in finding data on antecedent conditions that can be related to the adoption and implementation of the HSP by schools participating in the D & I Center workshops. One approach toward this end was the administration to participants of a questionnaire to assess participants' attitudes toward "open" classroom education. A questionnaire by Barth (1971) measured agreement with 29 statements of belief about children's learning (motivation, conditions for learning, social learning, intellectual development, evaluation) and assumptions about knowledge. The average scores, based on a scale where 1 equals strongly disagree and 5 equals strongly agree, for each D & I Center are shown in Table 4. The first row of data gives the average of agreement with the 29 statements by the participants in each workshop. The second row shows

participant responses to the statement, "In looking back over the 29 items above, how willing are you to work with a curriculum program that was based upon strong agreement with each of the statements?" Scoring for this item was scaled between 1 for "not at all" and 5 for "very much."

Table 4. Average Scores for Questionnaire about Open Classroom Education and for Willingness to Teach a Curriculum Program Based on Such Principles.

	D & I Centers				
Scores	A	B	C	D	Average
Score on Agreement with Open Education Statements	4.01	3.82	4.06	4.00	3.99
Score on Willingness to Teach Open Curriculum Program	4.44	3.28	4.04	3.95	4.01

(A tendency toward lower scoring by the participants in Team "B's" workshop may be a reflection of the general population in that region and probably explains the generally lower scores given to Team "B" on the program evaluation questionnaire. An interesting contrast is supplied by the generally higher scoring behavior of the participants in Team "A's" workshop.)

The scores on the questionnaire may have some relevance to ultimate adoption and implementation of the Human Sciences Program but we will not be able to measure any connection until the academic year is finished and we are able to compare questionnaire scores with implementation practices.

As described in the D & I Center objectives, school personnel participating in the D & I Center workshops were to be recruited to the extent possible in teams of three; a building principal or supervisor and two grade level teachers. This design was based on premises of both

organizational and linkage theory. Principals tend to be the key figures in decisions of curriculum adoption whether or not they have supportive social influence with teachers. The teams had varying success in recruiting the "ideal" three-person teams: Team "A" has 7 out of 11 participant school teams meeting the criterion; Team "B" has 5 of 8; Team "C" has 8 of 10; and Team "D" has 4 of 10. We will compare the adoption patterns of both kinds of school teams. The hypothesis to be tested is that teams with a principal participating will have a higher incidence of Human Sciences adoption and implementation than teams without a principal.

Data to be Collected

The BSCS Human Sciences Implementation Project is trying to find answers to the following general questions [from the project proposal to NSF]:

1. Is the diffusion model established by the BSCS Human Sciences Implementation Project Regional Dissemination and Implementation Center system more effective in stimulating utilization of the Human Sciences Program than the models developed by other implementation projects? This involves comparison of data on pilot-testing and adoption in different areas of the United States. Data will be obtained by correspondence in the next few years with the directors of other NSF-sponsored implementation projects that provide training in the BSCS Human Sciences Program.

2. Are the regional D & I Centers effective in stimulating the utilization of the BSCS Human Sciences materials? The Implementation Project staff will seek data for this question by consolidating information from the centers on:

   a. The number of adoptions and considered decisions not to adopt the Human Sciences sixth-grade program in the 1975-76 school year and/or the seventh-grade program in 1976-77.

   b. The number of individuals and school systems reached by dissemination activities of the Center.

c. The decision of each cooperating agency to submit a proposal to continue support of the Center to utilize the experimental Human Sciences seventh-grade and eighth-grade materials in 1975-76 and 1976-77.

d. The incorporation of additional dissemination activities involving curricula other than the Human Sciences Program as the center teams develop the competencies and commitment to continuous dissemination and implementation activities.

More specific evaluation data will be sought from schools participating in the workshops and inservice programs at each of the regional D & I Centers. A survey instrument developed by the Human Sciences project staff (see Appendix) may be adapted for use in the D & I Center evaluations. The questionnaire is based upon the analysis of the research literature about the "diffusibility" of innovative products of Havelock (1969, pp. 8-46/8-51).

The objective of the Human Sciences Questionnaire will be to measure the attitudes of school personnel toward implementation of the Human Sciences Program, asking questions in two broad categories: (1) How much change is required to incorporate the Human Sciences Program into the curriculum? and (2) What kind of change is required to implement the program?

It is hoped that these sorts of data will provide the BSCS and the NSF with knowledge about the effectiveness of the HSP project in the processes of educational change and give some insight into ways to increase the impact of "remote resource systems" upon the implementation of educational innovations in schools.

Conclusion

It is too early to predict with any certainty the outcome of the BSCS Human Sciences Implementation Project and, as Miles (1974) has indicated, it

all depends on one's vantage point. We can be pessimistic about the prospects for substantial impact if we take a long-range view of past experience in education as did Havelock (1969) in summarizing the 1930's research of Paul R. Mort:

> On the basis of 150 studies on the adaptability of public school systems, Mort . . concluded that between insight into a need and diffusion of a change to meet this need, 100 years elapse. Of this period, the first fifty years were generally required for developing a way of meeting the need, and the actual diffusion process covered a period of another 50 years.(p. 10-20)

More optimism is possible when we shift viewpoints toward the contemporary scene, a time of more rapid change in educational practices about which Havelock (1969) observed:

> Although the rate of change in education may be slower than in more technical fields, Miles nevertheless found that there has been an acceleration in the rate of change in education since the 1930's. . . . Miles suggests a number of reasons for this upswing, and he proposes that "the sheer size and growth of the educational establishment itself is exerting perhaps the most profoundly innovative effect of all." (p. 10-77)

If we proceed on the assumption that a project funded by the National Science Foundation and operated by a nationally recognized curriculum development center such as the Biological Sciences Curriculum Study is a part of the "educational establishment," then we might predict a substantial impact on the school science curriculum for emerging adolescents in the United States as a result of the HSP implementation project.

Another perspective tells us that a complex diffusion program incorporating sound principles of organizational theory as suggested by

Baldridge (1974), will have more impact on education than an individualistic or human relations approach. The Human Sciences Implementation Project certainly fits these broad criteria and therefore should be very effective.

And yet the author is convinced that caution seems to be the more prudent course for making predictions about the magnitude of the outcome of the HSP implementation effort. Reporting on the perceived sources of involvement in the adoption of innovations Havelock (1974) reported that "teachers and staff head the list of key participants," and stated:

> What is especially noteworthy . . . is the almost total absence of mentions of outside resource groups. Universities are spontaneously mentioned in only 29 out of 346 cases in which showcase innovations were reported, and they are seen as a key factor in only six cases. State agencies fare even worse, while Regional Educational Laboratories and private companies are out of sight. (p. 82)

Miles (1974) commented on the use of organizational theory in research into educational innovation by noting that:

> Baldridge's [1974] paper asserts the primary issue to be that organizations, not individuals, are adopters, and claims that organizational complexity is the main predictor of innovativeness. But a recent . . . [study] reviews a good deal of empirical evidence showing that complexity is positively associated with higher adoption rates, but negatively associated with implementation rates. . . . (pp. 199-200)

If the HSP Implementation Project can increase the visibility of the NSF and the HSP to schools in the U.S., and *if* the D & I Centers can improve on the rate of effective implementation (as compared with

adoption) then the project will have had a larger impact on educational change than other government supported programs. The final outcomes of the BSCS effort should be of interest to researchers in the field of educational innovation.

APPENDIX

"A. How Much Change in Receiver"

(from Havelock)

1. "Change in Size and Scope of Operations...outlays of capital, labor, land, materials, and equipment...[that] may...have ...impact on the receiver's life style..."

2. "Aquiring New Skills.

...what new skills are required and how much skill development is needed before utilization is possible?...utilization may be especially difficult in that it calls for the development of new skills by the practitioner."

(Human Sciences Questionnaire)

1. In comparison with the regular science program in the school, how has the Human Sciences program (HSP) affected each of the following factors that are involved in school operations?

   A. Cost of maintaining the curriculum program

   B. Personnel required to operate the curriculum program

   C. Space required to contain the program

   D. Consumable materials required to keep the program going

   E. School equipment (audiovisual, etc.) need for program

2. In comparison with the regular science curriculum program in the school, how has the Human Sciences program affected each of the following aspects of teaching? In other words, how much change in teacher behavior has been necessary?

   A. Maintaining classroom discipline and order

   B. Helping individual students with their problems

   C. Being a co-learner with students

   D. Assessing student achievement in comparison with other students

   E. Providing for the range of student interests and abilities

F. Assessing student attitude change toward science

G. Being able to help all students take active roles in their own learning

H. Preparation of materials and planning for instruction

I. Assessing student growth in ability to think in more complex ways

J. Reporting to parents about student progress

K. Helping each student to feel competent about learning

3. "Changing Goals. When the adoption of new ideas...suggests to the teacher that she is a helper in the learning process rather than a conveyor of facts, ...the new knowledge is changing not only [the receiver's] self-image but also his [or her] goals."

3. In comparison with the regular science curriculum program in the school, how much change in the goals for education has resulted from the introduction of the Human Sciences Program? In other words, does the Human Sciences Program require shifts in any of the following objectives for science education?

A. Students learn facts and principles of science disciplines

B. Students develop self-confidence, spontaneity, curiosity, and self-discipline

C. Students develop personal standards of competency to judge their own thinking

D. Students receive regular measures of achievement relative to other students

E. Students develop the ability to reflect on controversial social issues

F. Students develop moral character in accordance with acceptable standards

G. Students receive information about their potential for success in college studies

H. Students develop progressively more complex logical thinking and moral reasoning

I. Students develop acceptable standards of honesty, service, and self-control

4. "Changing Values and Orientation...related to changes in goals are changes in the more generalized and more deep-seated aspects of the receiver's life space... 'any innovation implying or requiring important value changes in acceptors...will encounter difficulty, since much more than the nature of the innovation itself is at stake.'"

4. In comparison with the regular science curriculum program in the school, how much change in your values about education has resulted from the introduction of the Human Sciences Program? In other words, would the adoption of the Human Sciences program conflict with or support your values?

A. Comparative standards for achievement

B. Individual standards for achievement

C. Teacher control of student activity

D. Student-directed inquiry activity

E. Good discipline and classroom order

F. Self-discipline and choice of activity

G. Indoctrination in cultural values

H. Reflective examination of social values

I. Cooperative social development

J. Individual personal development

K. Mastery of accepted inquiry skills

L. Competence in personal investigations

M. Transmission of academic science knowledge

N. Development of skills in pursuing personal interests

"B. What Kind of Change in Receiver."

(from Havelock)

5. "Substitution...the commonest and most easily adoptable innovation is one...seen as merely a replacement for another.... [However, substitution is also seen as] 'a mechanistic view of the instructional process, conceptualizing it as an assembly line, a conceptualization that overrides the human components and leaves basic problems (of utilization) unresolved.'"

6. "Alteration. Some innovations consist primarily of changes or alterations in existing structures rather than complete substitution of parts or elements...problems [arise] 'when the potential user regards [the innovation] as familiar--as only a slightly different version of an existing procedure or practice--and thus not worth the extra cost required to shift over to it.'"

(Human Sciences Questionnaire)

5. In your opinion, could the Human Sciences program replace all other science programs in grades 6 to 8 in the school?

Check one

YES

NO

DON'T KNOW

Indicate briefly why you answered the way you did.

6. In your opinion, could the Human Sciences program be altered in any ways that would permit it to be included as part of the regular science program in the school?

Check one

YES

NO

DON'T KNOW

Indicate briefly why you answered the way you did.

7. "Addition Without Changing Old Elements or Patterns. '...innovations which can be added to an existing program without seriously disturbing other parts of it are likely to be adopted.' [However] apparent cases of 'additions' might have to be reclassified as substitutions or alterations once we [delve]...more deeply into their history of development and diffusion."

7. In your opinion, could the Human Sciences Program be added to the regular science curriculum (without replacing or altering any of the regular science programs)?

Check one

YES

NO

DON'T KNOW

Indicate briefly why you answered the way you did.

8. "Restructuring...changing the structure of the receiver system in some significant way...changes in the curriculum may involve reemphasis and rearrangements which amount to restructuring."

8. Do you think that the introduction of the Human Sciences Program has changed the basic nature (the structure) of the science curriculum in the school?

Check one

NOT AT ALL

A LITTLE

SOMEWHAT

VERY MUCH

DON'T KNOW

If so, please list specific examples of such changes.

9. "Eliminating Old Behavior. ...the most troublesome knowledge of all...is that which tells us to 'stop.'...the would-be-diffuser is always in the position of accentuating the negative,...[and] this kind of behavioral [teachin~] change is very hard to bring about, and even when adopted, it is likely to be only a temporary suppression rather than a true elimination."

9. One of the objectives of the Human Sciences Program has been to make it possible for teachers and students to change certain behaviors. Do you think that the introduction of the Human Sciences in the school has enabled teachers or students to stop the following behaviors?

STUDENT BEHAVIOR

A. Depend on teacher for planning, direction, objectives

B. Depend on teacher for evaluation of all class activity

C. Contributions are limited to recitation of textbook material

D. Act as passive recipients of knowledge

E. Participation is limited to asking or answering teacher's questions

TEACHER BEHAVIOR

F. Follows a single preselected objective and applies it without variation to all of the students

G. Communicates with all students, (i.e., "out loud") even when talking to one pupil

H. Functions primarily as a transmitter of information and source of final answers

I. Plans and conducts class in terms of a single norm of student performance

J. Evaluates student performance against a predetermined standard of success

10. "Reinforcing old Behavior. ...the kind of knowledge which is probably the easiest to transmit and 'adopt,' knowledge which reinforces what we are already doing."

10. There are teacher and student behaviors that the Human Sciences Program seeks to reinforce and encourage. Do you think that the introduction of the Human Sciences in the school has supported the following behaviors by students and teachers?

STUDENT BEHAVIOR

A. Pursue objectives which they have established and planned

B. Evaluate own growth and development

C. Pursue self-selected activities with creativity and originality

D. Active participation in learning activities

E. Engage in small group activity with active group discussions considered important to learning

TEACHER BEHAVIOR

F. Pursues multiple objectives, each related to specific pupils or small groups

G. Communicates with individuals or small groups while others remain engaged in work

H. Functions primarily to observe evidence of learning (or lack of it) and guides pupils to independent learning activities

I. Plans and conducts class in terms of individual students

J. Evaluates students on the basis of individual growth and development

BIBLIOGRAPHY

Baldridge, J. Victor. Political and Structural Protection of Educational Innovations. In Sanford Temkin and Mary V. Brown (Eds.), *What Do Research Findings Say about Getting Innovations into Schools: A Symposium*. Philadelphia: Research for Better Schools, Inc. (Publication No. OP-305), 1974. Pp. 1-45.

Barth, Roland S. So You Want to Change to an Open Classroom. *Phi Delta Kappan*, 1971, *53*, 97-99.

Elkind, David. *Children and Adolescents: Interpretive Essays on Jean Piaget*. New York: Oxford University Press, 1970.

Elkind, David. Misunderstandings about How Children Learn. *Today's Education*, 1972a (March), 18-20.

Elkind, David. What Does Piaget Say to the Teacher? *Today's Education*, 1972b (November), 47-48.

Havelock, Ronald G. *Planning for Innovation through Dissemination and Utilization of Knowledge*. Ann Arbor, MI: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, The University of Michigan, 1969 (Fourth Printing, 1973).

Havelock, Ronald G. Locals Say Innovation Is Local: A National Survey of School Superintendents. In Sanford Temkin and Mary V. Brown (Eds.), *What Do Research Findings Say about Getting Innovations into Schools: A Symposium*. Philadelphia: Research for Better Schools, Inc. (Publication No. OP-305), 1974. Pp. 71-95.

Hurd, Paul DeHart. The Diffusion and Implementation of Science Curricula: A Planning and Developmental Proposal. Unpublished, Biological Sciences Curriculum Study, 1972.

Kamii, Constance. Pedagogical Principles Derived from Piaget's Theory: Relevance for Educational Practice. In Milton Schwebel and Jane Raph (Eds.), *Piaget in the Classroom*. New York: Basic Books, Inc., 1973. Pp. 199-215.

Kohlberg, Lawrence. Stage and Sequence: The Cognitive-Developmental Approach to Socialization. In David A. Goslin (Ed.), *Handbook of Socialization Theory*. Chicago: Rand McNally and Co., 1969. Pp. 347-480.

Kohlberg, Lawrence, and Gilligan, Carol. The Adolescent as a Philospher: The Discovery of the Self in a Postconventional World. In Jerome Kagan and Robert Coles (Eds.), *Twelve to Sixteen: Early Adolescence*. New York: W. W. Norton & Co., 1972. Pp. 144-79.

Kohlberg, Lawrence, and Mayer, Rochelle. Development as the Aim of Education. *Harvard Educational Review*, 1972, *42*, 449-96.

Miles, Matthew. A Matter of Linkage: How Can Innovation Research and Innovation Practice Influence Each Other? In Sanford Temkin and Mary V. Brown (Eds.), *What Do Research Findings Say about Getting Innovations into Schools: A Symposium*. Philadelphia: Research for Better Schools, Inc. (Publication No. OP-305), 1974. Pp. 197-216.

National Science Foundation. *Guide for Preparation of Proposals and Operation of Projects: Instructional Improvement Implementation*. Washington, D. C.: National Science Foundation, 1974.

Piaget, Jean. *Science of Education and the Psychology of the Child*. New York: The Viking Press, 1971.

Piaget, Jean. Intellectual Evolution from Adolescence to Adulthood. *Human Development*, 1972, *15*, 1-12.

Piaget, Jean. *To Understand Is to Invent*. New York: Grossman Publishers, 1973.

Ruff, Thomas P., and Orlich, Donald C. How Do Elementary-School Principals Learn about Curriculum Innovations? *The Elementary School Journal*, 1974, *74*, 389-92.

Schindler-Rainman, Eva, and Lippitt, Ronald. *Team Training for Community Change: Concepts, Goals, Strategies and Skills*. Riverside, CA: University of California Extension, 1972.

Schwebel, Milton, and Raph, Jane. The Developing Teacher. In Milton Schwebel and Jane Raph (Eds.), *Piaget in the Classroom*. New York: Basic Books, Inc., 1973. Pp. 278-92.

Wickens, David. Piagetian Theory as a Model for Open Systems of Education. In Milton Schwebel and Jane Raph (Eds.), *Piaget in the Classroom*. New York: Basic Books, Inc., 1973. Pp. 179-98.