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ABSTRACT

The nature and timing of decisions regarding the diffusion of new instructional materials and practices are critical to the ultimate utility achieved by a curriculum project. This publication is a collection of five conference papers which deal with various aspects of diffusion of innovative materials and ideas. Everett M. Rogers discusses two agricultural models, the wide scope and the narrow scope models of diffusion. His proposals emphasize use of change-agent teams. Authur Foshay discusses the problems of bringing about change within the present structure of the schools, the difficulty of moving in the direction of change. Practical proposals for improving the process of diffusion are suggested. A normative model is developed by Michael Scriven. Consideration focuses on how diffusion should occur and how the diffusion process should be changed. In a paper by Ernest Burkman a development-dissemination scheme used by the ISCS Project in Florida is described. Questions concerning diffusion and acceptance of new processes are answered by Edwin Mansfield in the final section of this publication. Related documents are SO 006 340 through SO 006 344. (SHM)

NATIONAL SEMINAR ON THE DIFFUSION OF NEW

INSTRUCTIONAL MATERIALS AND PRACTICES

Wingspread

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PERSPECTIVES ON DIFFUSION

Rogers

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and The Johnson Foundation

LESSONS FROM THE DIFFUSION OF AGRICULTURAL INNOVATIONS

BY

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Paper presented at the National Seminar on The Diffusion of New Instructional Materials and Practices, Racine, Wisconsin, June 1-3, 1973.

ATTRIBUTES OF INNOVATIONS

1.0 ARE THERE CHARACTERISTICS OF PARTICULAR SUBJECT MATTERS THAT MAKE PRODUCTS WHICH ARE BASED ON THEM MORE OR LESS LIKELY TO BE ADOPTED?

The rate of adoption of an innovation (at least an agricultural innovation, on which most of the research on this topic has been done) depends on:

1. The perceived attributes of the innovation, such as its degree of relative advantage, compatability, complexity, trialability, and communicability.
2. The extent of change agent efforts to promote the innovation.
3. The degree of felt need for the innovation in the target system.
4. The norms of the system, whether traditional or innovative.

Of these types of variables, the perceived attributes have generally been found to be most important. In other words, the way in which an innovation is perceived has a great deal to say about how rapidly it will be adopted. By no means are all innovations alike or equivalent in the eyes of the clients.

CHANGE AGENT CREDIBILITY

2.0 ARE THERE CHARACTERISTICS OF DEVELOPERS THAT TEND TO INHIBIT OR ENCOURAGE USE OF THEIR IDEAS AND PRODUCTS?

Change agents ("developers") who are most effective in introducing innovations to their clients must be perceived as credible. Research shows there are two dimensions or types of credibility: Competence and safety. Competence credibility is the degree to which a source is perceived by a receiver to be expert in the subject-matter of the innovation. An agricultural scientist at a state agricultural experiment station has this competence credibility in the eyes of farmers. So does the county agricultural extension agent (although he has less now for well-educated farmers in his county than 60 years ago, when most farmers had an elementary school education or less).

Safety credibility is the degree to which a source is perceived to be trustworthy and reliable. While competence credibility comes from superior education and professionalization, safety credibility comes from homophily, from the change agent being similar to his clients in various ways. The Extension Service since 1969 employs para-professional aides as change agents to contact poverty clients. This experience has shown that the aides sometimes become inauthentically professionalized, and lose their safety credibility with their clients.

Safety credibility is an especially important aspect of change agents because an innovation necessarily represents a certain degree of risk for the client at his time of adoption.

The Sam Stieber study of educational extension agents shows that their safety credibility was essential in their success. The agents were former teachers and administrators who were given a very brief training as change agents, prior to beginning work. The homophy with their clients (mostly teachers) aided their effectiveness.

When the adopting units are organizations (like schools), change agent teams may be an especially valuable approach. The professional change agent, from outside the client system, forms a temporary system with two or more "internal" change agents. They colaborate to implement the innovation, and then disband. Thus the change agent team includes both external and internal change agents, representing both competence and safety credibility for the clients.

PRODUCT CHARACTERISTICS

3.0 PRODUCT CHARACTERISTICS: WHAT ARE THE CHARACTERISTICS OF EDUCATIONAL PRODUCTS THAT MAKE THEM MORE OR LESS LIKELY TO BE DIFFUSED?

Unlike many agricultural innovations, most educational innovations have a small degree of relative advantage and so they must be adopted largely on faith, rather than demonstrated, measurable superior performance. In contract, hybrid corn offered 20 per cent profitability, miracle rice and wheat provides 300 per cent.

The cost dimensions of an innovation incluse: (1) initial cost, continuing cost, profitability. It is, of course, how each of these cost attributes is perceived by the client that matters.

Another dimension of "cost" (or relative advantage) is the social profitability or prestige pay-off.

The recommendation of an agricultural extension service for an innovation is important in promoting its adoption. Sometimes there are incentives or subsidies, aimed to encourage, but their effect is now questioned in agriculture (as a means of promoting diffusion). Incentives lead to a faster rate of adoption, but a lower "quality" innovation-decision (for example, discontinuance is more likely once the incentive stops).

CHARACTERISTICS OF THE SYSTEM

4. CHARACTERISTICS OF THE SCHOOL (FARMER)

4.1 One of the best predictors of whether a farmer will adopt an innovation is his past innovativeness; in general; we are another example of the general point that an individual's recent behavior predicts his future actions.

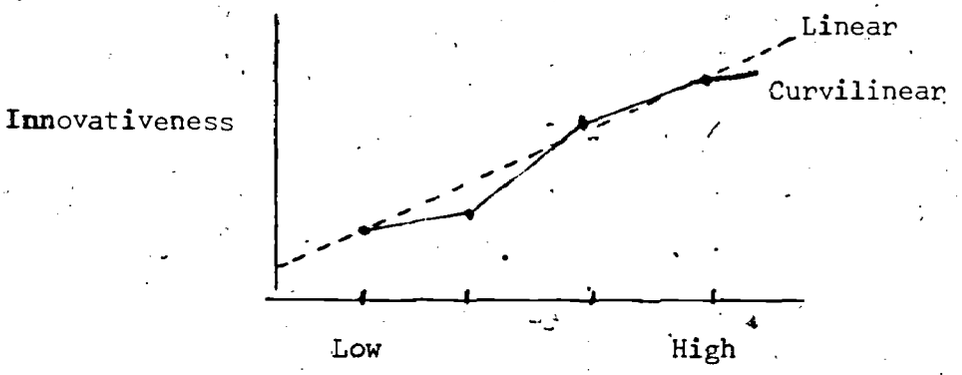
4.2 Researches by van den Ban and Flinn show the importance of "system's effects" on innovativeness, suggesting the role of group or community support in adoption-rejection decisions. Farmer's decisions are considerably influenced by the innovativeness of their peers in the same community. These community norms are determined in part by the actions of opinion leaders; past investigations show that opinion leaders are highly conformist to norms, and play an important role in determining what the norms are.

4.3 (Omitted)

4.4 The level of formal education of farmers is important in predicting their innovativeness, but teachers and administrators are relatively homogeneous regarding formal education, and it does not seem to be so highly related to innovativeness. More important is cosmopoliteness, indicated by a teacher's travel to out-of-town professional conferences, to visit other schools, etc.

4.5 Age is negatively related to innovativeness among farmers, but the relationship is relatively weak.

4.6 Richard F. Carlson presents data about the school funding → innovativeness is positively and highly related to farm income, farm size, farm efficiency, and other indicators of socio-economic status. Frank Cancian recently posited that this relationship may be curvi-linear, due to the conservatism of the upper class:



Quantities on a
Socio-Economic Variable

4.7 In agriculture, incentives have not been found to be a sound approach to speeding up diffusion, in the long range. At best, they may provide a "cue-to-action" to farmers, an event in time that crystallizes their favorable attitudes toward an innovation into action.

COMMUNICATION CHANNELS

5.0 Communication Networks

Mass media channels of communication (film, newspaper, magazines, TV, and radio) are most important in creating awareness-knowledge of innovations, while interpersonal channels are most important in persuading individuals to form favorable attitudes toward an innovation. For farmers, the most important mass media channel is farm magazines. Peer communication from homophilous friends and neighbors is the most important interpersonal channel for farmers.

OVERVIEW

6.0 General Observations

6.1 Needs are crucial in the diffusion and adoption of innovations. Campaigns to promote an innovation that does not fulfill a need, will generally be unsuccessful. So it is essential for developers to know the felt needs of their clients through: (1) needs-sensing surveys (perhaps a national needs assessment panel for education should regularly be surveyed), (2) advisory councils to identify needs, and (3) social indicators.

Most research in education cannot be utilized because it is not based on needs, and so when innovations result from this research, they are not widely adopted.

To some extent, a very advantageous innovation (like hybrid corn) creates its own needs.

6.2 Information systems like ERIC organize their contents around research reports, but users organize their needs around specific problems. So information systems must transform completed research into synthetic publications, which can be read and understood by clients. This difference is illustrated in agricultural diffusion by the agricultural experiment station research bulletin, and the extension service bulletin.

6.5 Overadoption of innovations sometimes occurs: the client adopts an innovation that experts feel he should not. Farmers frequently overadopt expensive machinery, as schools yen for language labs, and hospitals for cardiac arrest units, which then have a low rate of use.

6.6 The important problem in educational diffusion is implementation of the new idea, once the innovation-decision has been made. Implementation has been little studied to date.

Change in Schools:
an Insider's Look

A paper prepared for the National Seminar on the Diffusion of New Instructional Materials and Practices, under the auspices of the Social Science Education Consortium, the Diffusion Project, Indiana University, the American Political Science Association, and the National Council for the Social Studies.

June 1-3, 1973

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This paper is set in motion by a number of oft-repeated questions, put to me by the Directors of the present seminar: What can be done (to bring about change) within the present structure of the schools? Why is the school so difficult to move in the direction of change? At what point is it necessary to create an alternative system of education? Is it really necessary to "deschool" the school?

These questions, as is immediately recognizable, are put on a rising crescendo: can we do anything with the school as it is, or should we ultimately seek to destroy it?

Let me respond at once that the creation of an alternative school system, and the "deschooling" of society, on a massive basis, do not appear to be available options at present. It is likely that alternative schools will continue to be organized and to live their relatively short half-lives, and that a very small number of children will participate in

them. It is even possible that a "deschooled" society will be set up, here or there--indeed, we have in certain Amish communities just such societies now--but it scarcely seems likely that the country as a whole, or even large portions of it, will undertake the trauma that "deschooling" implies.

I shall, therefore, confine what I have to say to the questions that pertain to the present school situation, with an eye to its likely evolution.

As Seymour Sarason points out (in The Culture of the School and the Problem of Change), any attempt to understand the folkways of the school must begin with an acknowledgement of the enormously complicated institution we seek to deal with. As he says, the criticisms levelled at the school from outside the institution are also made within it, and have always been. The role requirements within the school, he belives, are full of conflict and complexity, and are only slightly understood, even by those who inhabit them.

If Sarason is right (and his remarks ring true to me), then responses to the questions from the Directors that might make a difference cannot be based on a comprehensive theory of social change, applied to the schools. What is required is that we apply such informed common sense as is available to us. I shall try to respond to the questions from that stance. I have (as has Sarason) been in a helping relationship to schools and school systems for a long time; earlier, for a long time, I participated in two school systems as an employee. It is out of this experience that I wish to extract four generalizations about change in the schools.

1. If an innovation is not comprehensible to the leadership of the schools, it will be trivialized or aborted.

This notion might be put differently: the quality of the offering in a school cannot rise above the level of educational sophistication of the principal and superintendent. Or, more bluntly: the quality of instruction cannot rise above the quality of the administrators' minds.

In one of the large cities some years ago, the Curriculum Department finally succeeded in persuading the Purchasing Department to furnish easels for instruction in elementary Art. The innovation had been established elsewhere in the country for a good many years; this city's Art people were embarrassed at the backwardness of their system in this respect; feelings ran high, and at last two easels, accommodating four children at a time, were provided for each elementary classroom. The Curriculum Department, following its usual ritual, prepared a guide for their use, to be sent to the schools as the easels were delivered. The guide was pretty good, as guides go: the advantages of easels were pointed out; the writers took advantage of the occasion to reteach some elementary matters concerning children and Art; it was suggested that, ideally, children should have two or three opportunities per week to use the easel.

Two or three opportunities per week, divided into classes of thirty-five children, with four easels, presented a management problem. It was solved, of course: a new subject, "easel," appeared in the curriculum. Whatever Johnny was doing, at 11:20, his turn at the easel came along, and he was told, "Stop the Math, Johnny, it's time for Easel." Never underestimate the ability of the system to trivialize the curriculum.

Similarly, the Open Classroom is viewed in many a school as an arrangement of space. Deep disagreements are explored over whether it is better to have an open classroom, an open corridor, operable walls, a Relaxing Corner, and so on.

How does such nonsense happen? Typically, because there is no one in the immediate school situation who either really believes in the innovation, or who understands it in any important way. The key person is always the principal. Some of us worked hard to de-regiment the teaching in a set of six first grade classes in a school near Teachers College. The principal visited the classrooms a few times, and once announced her approval of what was being done: "I would have thought these classes were too noisy, except that I see the children working. The noise is incdient to the work." Quite an insight for an old-liner. But at the end of the year, at a meeting, having congratulated the teachers on the improved climate in their classrooms, she aborted the whole effort by saying that it had not improved the reading scores, and was therefore of no importance. Thus ended the project.

I have watched teachers using the SCIS curriculum to teach vocabulary; scratch a primary teacher, and you have a reading teacher; the properties of objects are also (and to some teachers more importantly) adjectives: smooth, hard, flexible, heavy, and so on.

Such slippage is, perhaps, inevitable. But it tends to continue, if the supervising officers in our hierarchical school systems don't understand the new practice, approve of it, and give it leadership and encouragement. The basic motivation of the middle management school official is to keep the top management at bay; the basic motivation of the top management is to keep the Board of Education off its neck, and to gain a good press. None of them is

primarily interested in the quality of the offering. The offering, for the officials, is an instrument for achieving upper-level approval.

What follows from this school-of-hard-knocks wisdom is this: in introducing a curricular innovation, include the administrators in the training. Refuse to offer the training unless the administrators will undertake it. Never, never, assume that orientation of the teachers is sufficient, for the teachers are not the key persons in the school system.

A second principle may be derived from the first, as follows:

2. To be successful, an innovation must appear both to come from the top down (thus being legitimated) and from the bottom up (thus being honest).

If the key person is always the principal, the principal may not know it. From the principal's office, the key person appears to be the teacher. Indeed, generally, as one looks down from the top of the hierarchy, responsibility appears to grow as one descends. But from the bottom up, as has been pointed out, legitimation appears to grow as one ascends. If one asks the superintendent who should be oriented to an innovation, he will name the teachers. If one asks the teachers, they will tend to name the administrators. It follows that an innovation must come from both directions, for the teachers keep it honest (or don't) and the administrator, in his role as keeper of the reward system, makes it legitimate.

There is nothing simple about this arrangement. Despite Sloan Wayland's assertion of several years ago, that the teacher is best understood as a bureaucratic functionary, teachers don't view themselves that way. Since the administrator, from the teacher's point of view, is usually ignorant about instruction, the teacher tends to see himself as making basic

professional decisions that are evaluated capriciously by the higher-ups. The teacher's basic attitude toward the administrator, when it comes to instructional matters, is apprehensive. If anything really good is to be done, from the teacher's point of view, the teacher will have to do it. His explanations of what he has done tend to be obscure and vague, for the teacher has found that the more explicit he is, the more likely he is to collide with some trivial prejudice of the administrator.

Administrators have often been good teachers in their time. However, as their experience grows, they find themselves compelled to deal with an ignorant, capricious public; it is not surprising that in time they begin to sound more and more like this public to the teachers who report to them. Acting as "front man" for the teaching staff, the principal and the superintendent are, in the final analysis, in an impossible position: if they fend off parent complaints, they seem unresponsive to the public. If they carry such complaints to the teachers, they seem to take the side of the parents against the teacher. Too often, the function of the principal is to keep parents at bay; if that front is peaceful, the interior of the school can be left to take care of itself.

A double bind, indeed. What happens if an innovation is proposed? It has to be made legitimate, chiefly by the administrators. The administrator, acting out of hard experience, will see it as necessary that the public be convinced that the innovation is an improvement, but he has to present it in a form the public can understand, and make promises that the public will approve of. That's why team teaching was presented as a curriculum innovation, which it is, of course not.

This apparatus of administrators-who-face-the-public functions as a

protective device for teachers, who by and large do the best they know how in a system outwardly devoted to public relations. If there is honesty in the teaching, it is because the teachers know how to do an honest job. But they can't, if what they do is not made legitimate by the administrators.

That's why innovations have to come from the top down and the bottom up at the same time. How can this be done?

First, through orientation to the innovation that includes the administrators and the teachers, as fellow teachers. Then, by orientation of the administrators that addresses their public relations problems directly. Third (and this is very often overlooked) by providing both administrators and teachers with evidence-gathering devices and approaches that make formative evaluation possible.

It is this last--formative evaluation--that is crucial if the respective role demands of the teachers and administrators are to complement each other. If they dont complement each other, as has been pointed out, the innovation will be ignored, trivialized, or aborted. What is required is this: that the teacher appear to himself as one who knows about teaching, including the adjustment of subject matter to fit his students; that the principal see himself as a participant in instruction with the special task of interpreting the school to the public. A set of formulated teaching strategies, no matter how thoroughly field tested, cannot do this of itself. In the effort to conduct in-service training for new instructional plans quickly--in a matter of weeks--too many curriculum plans have come off prescriptive, and the teacher is treated like Wayland's "bureaucratic functionary."

The alternative was suggested, nearly a generation ago, by the late lamented Action Research movement. This movement, quickly brushed aside by

the formal educationl researchers because it didn't fit their rubrics, sought to provide teachers with the means for constantly monitoring the consequences of their teaching efforts; to conduct what is now called formative evaluation. Teachers will believe their own eyes before they will believe what you and I say to them. The main missing ingredient in curriculum reform efforts is provision for the teachers (and thus the administrators) to base modifications of the received plan on evidence. As things stand, teachers typically evaluate such plans on their unexamined sense of how they go in class--does the plan "fly"?

All the models for innovation I have seen provide for frequent, step-by-step evaluation. What they tend to leave out is the possibility that this evaluation might be designed by the actors in the drama--the teachers. I mean to suggest here that this missing part of the innovation strategy be supplied: that not only evaluation instruments, but plans for the development of home-made evaluation instruments, be built into curricular plans. If that is done, then (as happened in a prominent New York high school) PSSC will not be tried for a few terms, then abandoned because the teachers subjectively opined that the new plan was not as good as the one it sought to replace, especially since they knew the properties of the old plan in depth and the new plan was simply a set of prescriptions.

3. Credit for the success of an innovation goes to its originator; blame for a failure is lodged with the classroom teacher. It is not rewarding for a teacher to adopt someone else's innovation.

It should not be necessary to stress the power of the reward system when we consider the fate of innovations in school systems. Apparently, however,

there is something about it that leads to its being overlooked.

One of the school systems I have worked with at some length is well known for the adoption and generation of innovations in education. The reason I was asked to work with these people was that, over a number of years, the system had flown apart. The effect of a large amount of foundation money had been to encourage inventiveness by members of the staff, and a succession of superintendents had been publicized nationally, and had left (chiefly to join the foundation); but morale in the staff was uneven, the curriculum leadership group was uncertain of its role, and (most important) innovations were lasting only as long as their originators stayed in place, and were not spreading through the system.

Several problems had produced this situation: the temper of the times, a stereotypic view of the community, happenings in the state and in the neighboring large city. However, the most important part of the problem locally was the reward system. The superintendents were rewarded with national publicity in the Saturday Review and the New York Times and through the efforts of the supporting foundation. This publicity had the effect of defining these leaders locally, so that they were viewed with awe from inside the system. But there was a crucial omission in the reward system inside the system, which was greatly exacerbated by external publicity: the reward for invention within the system was very considerable--perhaps national publicity--but there was no reward for adopting an innovation from within the system. Other systems adopted some of the innovations developed in this system, but the system itself did not. As one of the leaders in the system told me, "the Brownie points went to the innovators, not their imitators."

To recognize this possibility is to recognize ways to deal with it. For the innovator who wishes to institutionalize his innovation, it would be desirable to form inter-school teams of teachers and administrators to develop and redevelop his innovations, thus spreading the credit around and increasing the likelihood that the new approach will spread.

Of equal importance is the sharing of blame. When a nationally recognized curriculum program is adopted locally, and doesn't work, the blame is assigned locally. After all, the national program has proved itself in many places; it has been carefully developed and field tested; obviously, if in Podunk it doesn't work, the fault is in Podunk. Since innovations, as Henry Brickell pointed out, tend to spread from one school system to its near neighbors, one must ask what effect Podunk's failure has on its neighbors. Within a school building, a teacher picks up an idea, or invents one, and tries it out. It doesn't work. The teacher is pitied, or blamed by parents, or is perhaps attacked by the local press. Is it rewarding?

What is required is a far more elaborate follow-up by national curriculum developers than has usually been undertaken. When a national program is undertaken in a local school system, someone from the national staff should monitor it for at least two years, and preferably three or even four, to see it through its early debugging and institutionalization. The national program representative can function importantly to influence the local reward system, precisely because he will be viewed from inside as a disinterested outsider, whose praise arises from not improper motives. When a failure occurs, this outsider can share the blame, or even take it. When a success occurs, he can see to it that the credit goes to the teacher and

the administrator. What is needed is a reward system that recognizes the attempt as well as the success, and gives credit locally for both.

The failure to recognize the nature of the internal reward system isn't the only reason why schools don't change, but it is an important one. It accounts in large measure not only for the apparent "resistance to change," but also for the growth of teacher militancy. When attempts are made to make curriculum plans teacher-proof, and when these attempts are accompanied by a failure to attend to the reward system, the teachers, of course, band together against their tormentors. They do not fail to recognize the implied contempt in such approaches, and they react accordingly.

4. Ergo: innovations must be locally verifiable and locally modifiable, at the classroom level.

It must be remembered that local teachers and administrators are personally responsible for what they do. While the national press and general educational opinion have influence on what local people believe, the influence is far from overwhelming; the trial of innovations is always local. The story of innovation in education is, by and large, a story of failure, ever since the days of the early laboratory schools. The current rage is the open classroom, and the publicity has been deafening, but the local people have heard claims before, and are cautious because they are accountable locally for what they do.

If, however, local people are given the means for making the new idea fit their circumstances and encouraged by the innovators to do so, and if they are given the means for verifying the effectiveness of innovations,

they at least will have the possibility of being responsible local innovators.

This last point has been recognized by some students of educational change, and by some designers of curriculum innovations. But some designers have not recognized it; their proposals are too prescriptive, their plans unverifiable, and institutionalization has been slow.

I vividly remember the time the co-director of a well known Science project appeared at a national convention to convey the Good News that a group of outstanding scientists had redesigned the secondary offering in his field. To my question, "Yes, but suppose you are wrong?", his response was outraged: he said the originator of the project had received a gold medal from his professional association; he strongly implied that I had no right to ask such a question. Well, the enrollment in his field has dropped 10% since the introduction of his program; competing programs have appeared since; the promises trumpeted to the nation in the press have not been kept; indeed, the whole educational research enterprise is under severe attack from national governmental officials.

This sad state of affairs might not have been so general in its impact if the necessities for institutionalization of educational innovations had been observed at the local level. As things stand now, the teachers, who ought to be the principal supporters of educational research and development are apathetic about it.

I suggest that this has happened because the needs internal to public school systems have been overlooked. Let me state them, as they arise from what has already been said:

1. The strategy for introducing an innovation has to be consistent with the local reward system.

2. Innovations must be introduced to the administration of a school system, as well as to the teachers.

3. The role needs of the administrator and the teacher must be met as part of an innovation strategy.

I began these remarks by laying aside two of the questions raised by the directors of the present conference: what about alternative schools? Should we "deschool" society?

While, in their present form, the answers to these questions show little likelihood of becoming the dominant mode for education in the United States (or, indeed, anywhere else in the developed part of the world), they merit attention on a different basis.

Alternative schools have sometimes led the way for the institutional school. Some elements of Summerhill, for example, have found their way into a few alternative schools; some elements of the campus laboratory schools found their way into the Progressive movement, and thus into the public schools. Like the agricultural extension agent, we might do well to foster the development of "experimental plots"; the present appearance of alternative schools can be so considered. The difficulty with these schools at present is that they are defined by what they reject, not by what they seek to do. Where the establishment school has a prestructured curriculum, they seek an emergent curriculum. Where the establishment school uses standardized tests as criteria, they seek to have no criteria; where the establishment

school seeks regularity in attendance and schedule, they seek to abolish such regularities. Where the established school is primarily concerned with intellectual development, they reject intellectuality. They have not, so far, affirmed anything on their own except "participatory democracy," which in the days of the Progressives was called "cooperative planning."

If the alternative schools can be kept alive, however, it is to be hoped that some orderly experimentation may be undertaken within them. Curriculum leaders for a long time have hoped that school districts would form experimental educational centers within their organizations. A few were formed, but they perished from lack of intellectual nourishment and budget squeezes. The alternative schools seem a more authentic form of the same thing. They, therefore, should be nurtured, for in the alternative schools, unlike the scattered experimental schools of two decades ago, people are free to make mistakes. There is an élan to an alternative school, at least while it is young. Perhaps such schools ought to have short lives, like a demonstration in any laboratory. Novelty is part of their meaning. Perhaps, in the alternative school, there is being worked out a means for continual renewal of schooling--a quality devoutly to be sought.

As for "deschooling": the proper office of the present school is to offer systematic knowledge, as distinguished from the diffuse knowledge one picks up in the course of unstructured daily life. A "deschooled" society would still have need of systematic knowledge. Where would it be obtained?

Here, as in the case of the alternative schools, we might take advantage of some existing techniques and institutions. Much has been said and attempted

in the way of teacher-proof materials. It is precisely teacher-proof materials that make a formal school unnecessary. If we can develop them, let us by all means do so. Let us not put them in schools, however. Let us make use of that other universal institution, the super-market. To deschool society, put teacher-proof materials in the local A & P. Make mandatory school attendance a little less rigid, so that students may work at home. Provide criterion-referenced evaluation materials, perhaps in the form of the old Dalton contracts. Voila!

There is, of course, a certain irony in these suggestions. Both the alternative schools proposals and the deschooling proposals grow out of revolutionary motives. What I have suggested--and perhaps it should be emphasized that these suggestions are meant seriously--is that both of them be incorporated in a somewhat redefined public school enterprise.

When Andrew Cordier took over as President of Columbia University during the Troubles in 1968, the radical students were faced with a new kind of antagonist. Cordier had, after all, dealt with the Russians at their most negative. In comparison, the students were naive. He quickly defused the movement, and it subsided. Not without diagnosis by the students, however. The editor of the Columbia Spectator saw it clearly. "That _____," he said, "he decapitated our issues!"

So it is, I think, with the public schools. They can be changed, but only if one works with the dynamics that they respond to. If one does, they are likely to adapt in the future, as they have, somewhat, in the past. They are much too entrenched to be taken by storm, but they can be changed from the inside.

NOTES ON MICHAEL SCRIVEN'S PAPER

During the early planning of this Seminar, it was determined by the Directors that it would be imperative to have an evaluation consultant participate. Michael Scriven, well known for his interest in evaluation and for his contributions in the form of new conceptualizations dealing with various aspects of evaluation, has agreed to work with this Seminar.

In order to focus on Scriven's thinking about the problems of evaluation and diffusion, a set of questions was prepared for him. These questions follow.

These questions fall into three broad categories--evaluation of diffusion activities, needed research in diffusion, and the moral responsibilities of persons in different roles in the diffusion process.

Evaluation

1) What are the major criteria that any diffusion activity should be evaluated against?
2) As the focus of the diffusion activity varies--from classroom to school to school district to state to nation--should the criteria for evaluation vary?
3) When a number of diffusion-type activities are under way in a school or school district, how can the effects of individual activities be separated out?
4) What are the various forms of instrumentation that can be used to gather data for the purpose of evaluating diffusion programs?
5) To what extent are the answers to the foregoing questions modified by considerations of whether the evaluation is short-term or longitudinal?

Research

1) What specific kinds of research now being done in the field of evaluation have particular relevance to evaluation of diffusion efforts?
2) If the amount of resources available for evaluation of diffusion programs were increased, what are some critical questions that should be answered?

Responsibility

1) What responsibility does a developer or publisher have to find out how good his product is before it is marketed?
2) What responsibility does a funding agency have to find out how good an educational product is, which it supports?
3) What is the responsibility of the user of educational products to let others--developers, publishers, colleagues, etc.--know about the quality of the products?

Scriven chose not to answer the questions but rather to address himself to what the system of diffusion ought to be as compared to what it is now. The following paper, then, is a normative statement that will give us some guidence as to how we should shape our thinking in light of an "ideal" model.

A NORMATIVE MODEL FOR DIFFUSION

Michael Scriven

0. Introduction

The questions are chiefly concerned with the question how diffusion in fact occurs. I shall instead consider the questions (a) how it should occur, and (b) how we get from here to there, i.e., how it should be changed. The answers to these questions would indeed be irrelevant or impractical or impossible if we had no idea of the present situation. But I think we have a fairly good idea of the present situation and the seminar will no doubt prove this somewhat. An expensive survey would improve it further, but is certainly not worth its cost. Social improvement should begin with careful formulation of an ideal (founded on a general knowledge of the situation), followed by checks with reality to see if it's unworkable in any detail; if should then proceed to an implementation plan and finally to further checks with reality to see if that is unworkable. Both ideal and plan can be improved after the check; and the check should involve a pilot run if possible.

It is a waste of time to study the present situation--except as "pure" sociological research--unless you have some idea what you're going to do with the results, i.e., you have a plan or set of possible plans that you will improve in the light of the data, providing such a plan is the aim of this note.

It is interesting to compare the diffusion problem with the moral education problem. The Piagetian work of Kohlberg tells us about the sequence of moral levels through which children pass. But that, per se, tells us nothing whatsoever about what we should do (if anything) in moral education. When Kohlberg began to get interested in the latter question, he began to look at very different empirical research questions, e.g., can a Stage II child learn from Stage V material? Notice that this is a question about the results from a possible procedure, a possible plan for moral education--namely, to use the same basic material at all levels. It was (one version of) that plan--the usual one--that Hartshorne and May showed to be unsuccessful. But a general study of what is done in moral education is of almost no policy interest whatsoever, since (a) it

doesn't work worth a damn, and (b) it's not clear that it should (since it's morally dubious). The only good reason for looking at what's done there is to provide a basis for the kind of horror that (sometimes) gets things changed (cf. studies of poverty, health delivery).

Similarly, my view of diffusion at the moment is that it works exceedingly badly--a view over which there may be less disagreement than over anything else I say here--and where it does work it's not clear that we benefitted (MACOS, New Math &c.)

Moreover, I do not think it probable that the group's answers to the questions given will tell us anything we didn't know coming in, anecdotes apart. That is, I doubt whether we'll come out with any generalizations we couldn't all have formulated before attending. (I hope this is wrong and I say it partly in the hope that it will prove to be a self-refuting pronouncement.) We will, I am sure, come out with more detailed data about some important cases than we had before, and I value this kind of knowledge highly. But only because it improves plans, not for its own sake.

1. Normative Models in General

The models presented in the prolegomena to the questions consist of two descriptive models and one normative one. That is, the first two models are descriptions of how diffusion is thought to happen in fact (in at least some cases) while the third--notice the term "good guys" in it--is normative. So the conference already has a concern for "how it spoze to be" implicit in its documents (note also items 6.1, 6.5, 6.6 which are normative questions). But this normative element needs to be made more explicit and treated more carefully and I hope we'll do this at Wingspread. Otherwise confusions will weaken our possible impact.

Notice that the names for the first two models are evaluative; the "manipulation model" and the "exploitation model." But these models are meant to be descriptive--whereas the third model is meant to describe an ideal state, not a real one.

Now the relation between descriptive and normative models is very close. The physical model of gases involved in the kinetic theory of gases leads to a

conception of an "ideal" gas, which obeys the gas laws supposed to apply to real gases. "Ideal types" in sociology &c. are meant to help explain real behavior. It would take too long here to expand on the general relationship of real and ideal models, except to say that we should be careful to notice that the answers to almost all the questions would relate to constructing a descriptive model, whereas at least the titles of all three models and the substance of one are normative and the obviously preferred one is entirely normative. But where is there any discussion of the relevance of these normative dimensions to the descriptive data we are asked to supply? We shall need to tread carefully if we try to put the data together with the models; yet if we do not try this, I fear we shall have done little that is useful.

It may be useful here if I put forward a model that is ideal in both the descriptive and the normative sense. I'll call it the Rational Consumer model.

2. The Rational Consumer Model for Diffusion

I hope I may assume that the preceding discussion will siphon off the usual nonsense about "consumers aren't rational, so this is an inappropriate model." One might as well say that gases aren't ideal so the kinetic theory isn't appropriate. The point is that (a) consumers are to some extent, in some circumstances, rational; and this model will be descriptive with respect to that behavior; it refers to an idealization of behavior, a descriptive ideal; (b) consumers benefit from being more rational (a function) and this model hence presents a normative account which can direct action--it presents an ideal in the normative sense.

The Rational Consumer Model is naturally a special case of the Good Guys model, since the latter is so general as to cover all defensible arrangements. Hopefully, we can specify the Rational Consumer Model in somewhat more detail. It will be helpful to begin with some discussion of the rational consumer in a non-educational context. The rational consumer is someone who is (a) prepared to make a considerable (but not excessive) effort to acquire the data and/or evaluations that will identify the optimal product for the special circumstances of the consumer, and (b) will then purchase this product and no other. Where there is inadequate data, or unreliable evaluations concerning a purchase

decision, the rational consumer will either undertake experimental investigations alone, or will initiate steps to form a group which can do these and communicate the results; the decision between these two will depend upon lead time, available and necessary resources. (The formation of consumers' unions is a kind of paradigm example of the second strategy.) The formation of consumer groups that operate rationally is possible only to the extent that a critical mass of rational consumers exists. Non-rational consumer groups, e.g., some health food groups, may of course form in the absence of this condition; and they may be manipulated by their elected officers in a relatively rational way. This is one of the most important sources of power for rational consumers; we can call it a case of the quasi-rational consumer, i.e., one who is part of an organization or in other ways is led to act in a way that is coincident with the actions of a rational consumer, although the individual does not meet that standard personally.

Another critical spin-off from the formation of rational consumers' groups or the existence of unorganized rational consumers in substantial numbers is the emergence of rational producers. A rational producer will not generally exist unless there is substantial evidence for the existence of a market of rational or quasi-rational consumers; there will be rational potential producers, but since they're rational they won't be producers unless they think they can sell their product. And again we have the phenomenon of quasi-rational producers, i.e., producers that do what a rational producer selling to rational consumers would do, but for incidental reasons, e.g., philanthropy, federal pressure, or a mistaken assumption about the rationality of consumers.

This is not the place to review the whole history of Consumers Union, but nobody interested in normative models for the future can afford to overlook it; a brief review will be found in the journal International Consumer (the issue for Summer, 1972). Suffice it to say that it clearly demonstrates both the very limited proportion of rational consumers in the country which spends more on education than any other in the history of man; but also the existence of a very substantial absolute number of rational consumers who can exert a decisive effect on the market for some products in some circumstances. I do not make the mistake of supposing that everybody that subscribes to Consumer Reports

is a rational consumer. However, it can hardly be read for the romantic or pornographic content, and there is enough direct evidence about the correlation between orders for mail-order items and doing well in an issue of Consumer Reports to support the generalization above.

3. Improving Current Practice

One can only identify imporvement if one can identify the direction in which the ideal lies. Since it is a definitional truth that a system in which the consumers are all rational and the producers are all rational is optimal for consumers (not at all necessarily true for producers, which does a lot to explain the present situation), and since we are all consumers whereas very few of us are producers, it's a reasonable conclusion that the society as a whole will benefit substantially from moving towards the Rational Consumer Model. The question now is how to move in that direction.

The role of the federal government in accelerating movement can be crucial. It can in effect provide an artificial market for would-be rational producers; and it can substantially reduce the costs to a rational consumer of making the rational choice, thereby providing an incentive. Moreover, it can set up model production facilities to lead the way, and it can gather data in the way that it is doing in this conference, hoping thereby to facilitate rational diffusion. It can also actively disseminate products itself, and it may even use other means of obtaining implementation. (Sales techniques, &c.)

If one looks at the meteoric growth of Consumers Union after its very slow start, one can speculate about the effect of two factors. One of these is the gradual improvement in the quality of consumer education courses, whether given under the heading of home economics or in extension. Another is the natural phenomenon of diffusion which, like cell growth, has an ideal form close to the exponential (that is, every convert becomes a new proselitizer).

There were no doubt also very important contributions to the growth of consumerism from political radicals, whose dislike of the big corporations all too often found excellent grounds in the evidence and thereby generated a general indignation and unwillingness to be hoodwinked that contributed towards raising the conciousness of consumers.

Transferring these considerations from the non-educational area to education itself, we immediately see certain very noticeable deficiencies in the way that system is geared to rational diffusion. Let me highlight these for you by describing some features of a hypothetical educational system which is aimed to move towards the Rational Consumer model (I do not suggest that this is the only possible plan to achieve that goal; it is just one possible means).

Half of the curriculum in every teacher training institution would be devoted to developing the critical skills, and the knowledge of the basic resources and evidence in the educational area, that would make the teacher a moderately competent rational consumer. No administrator could possibly obtain his or her post without outstanding performance in the rational consumer skills and knowledge areas. There is no suggestion that all decisions by an administrator would be made on the basis of product performance data; the rational consumer has to take account political considerations as well. But rational consumers must be extremely conscious of the costs of political intrusions into the decision-making process and make their decision whether to tolerate these on the basis of a good judgment of overall social benefit.

Consumer education would be a major item in the school curriculum, with criterion performance measured both in the affective and cognitive domains by studies of purchasing patterns, attitudes towards advertisements of various types, prioritising of legislative proposals &c.

Approximately half of federal support funds in education would be focussed on the improvement of products and of consumer capacity to select them rationally. The whole model of support for the R & D sector would be overhauled to provide for extremely severe entry requirements for large development contracts, and extremely loose entry requirements for very small ones, good performance on the small ones being the entry requirement for the large ones. Major parts of the federal money would be used to support one or more Consumer Reports' type testing and information operations (we have a start with EPIE; without the support and hence without adequate facilities, it does a most valuable job). Another major slice of funds would be used to support research on procedures and the development of instruments to improve the efficacy of evaluation. At every professional association meeting attended by teachers or producers

there would be (subsidized) presentations by the testing and evaluation groups, and there would be an attempt to set up more than one of these so that some competition between them could be observed. A network of field agents for in-service upgrading, on-the-spot evaluations and state liasion would be supported.

I'd sum up the present situation by saying that rationality of the consumer is scarcely the main deficiency, since most products are indistinguishable from each other in terms of demonstrated merit; but that where there is an opportunity to observe the rationality of the consumer, it is noticeably lacking. One therefore needs to move strongly forward on both fronts; improvement of products and the description of their established merits, on the one hand, and improvement of the consumer's skills and concern with merit on the other. Serious efforts to do this by NIE, and the private sector, and each of us as individuals could reasonably be expected to produce a complete revolution in the quality of educational products in use in about the same time as it took CU to generate Ralph Nader; that is, about thirty years from now. For we are at the moment in the neolithic stage as far as a defensible system of production, diffusion, and consumption is concerned in the educational field. We may be grateful that it is not the paleolithic stage, but it's time to do more than survey the scene. We need to inject considerations of quality very forcefully and frequently.

And we need not feel that thirty years is too long to wait. In a given sector of the educational field we can produce a revolution within three to six years, if we focus and direct our effort effectively. We have seen this happen with the Keller plan and programmed texts for basic skills and it is afoot with CAI and individualized instruction. The diffusion process lags even there, but revolutions often occur well before they get onto the front page. We have the beginnings of a move towards the Rational Consumer model, and I think the burden of success now lies on diffusion; evaluation has been or is being done, differences have shown up that will benefit consumers. The task is to disseminate the results and encourage their rational appraisal--in short, legitimate diffusion.

4. Conclusion

I should like to conclude with a mention of another dimension of the normative model. Suppose we discover that product X is much the best for a given educational task. It may be thought that the task for diffusers is to maximize use of X. Not so; that's how the task would be defined for a soap huckster. Legitimate diffusion may not go beyond rational persuasion, training in rational procedures and subsidy. To be specific, it may not involve subliminal appeals, prejudiced presentation of the relevant evidence, or appeals to prestige, status, self-esteem and snobbery. It may not even involve the low-key advertising we see and appreciate with Xerox sponsorship of TV programs of considerable public service or artistic merit; it can only involve product-related presentations.

These normative issues about legitimate types of diffusion deserve a place on our agenda, I believe; and they grow naturally out of the Rational Consumer model. Morality is the optimal game plan for a rational society; and morality is ill-served by those who see their task as using whatever means work best for achieving the ends they believe best. It is still worse served, however, by those who are not even prepared to find out what means work best. There is no other starting point for legitimate diffusion than scientific evaluation.

Dr. Ernest Burkman
Florida State University

DISSEMINATION OF MATERIALS

No factors are more critical to the ultimate utility achieved by a curriculum project than the nature and timing of its decisions regarding the diffusion of materials. Early in its planning, ISCS decided to attempt a development-dissemination scheme that was somewhat different from that used by many projects. This chapter broadly outlines both that scheme and the actions it led to; and it highlights some of the reasoning which influenced the ISCS dissemination activities.

As can be seen from the model diagrammed in Figure 4-1, instructional design projects are often completed in two separate phases. Many projects try to complete development of their materials before attempting dissemination. This affords them the opportunity of concentrating upon the development of an instructional package before becoming concerned with the problems associated with dissemination. It also allows field testing of the materials to be kept to the minimum necessary for revision purposes.

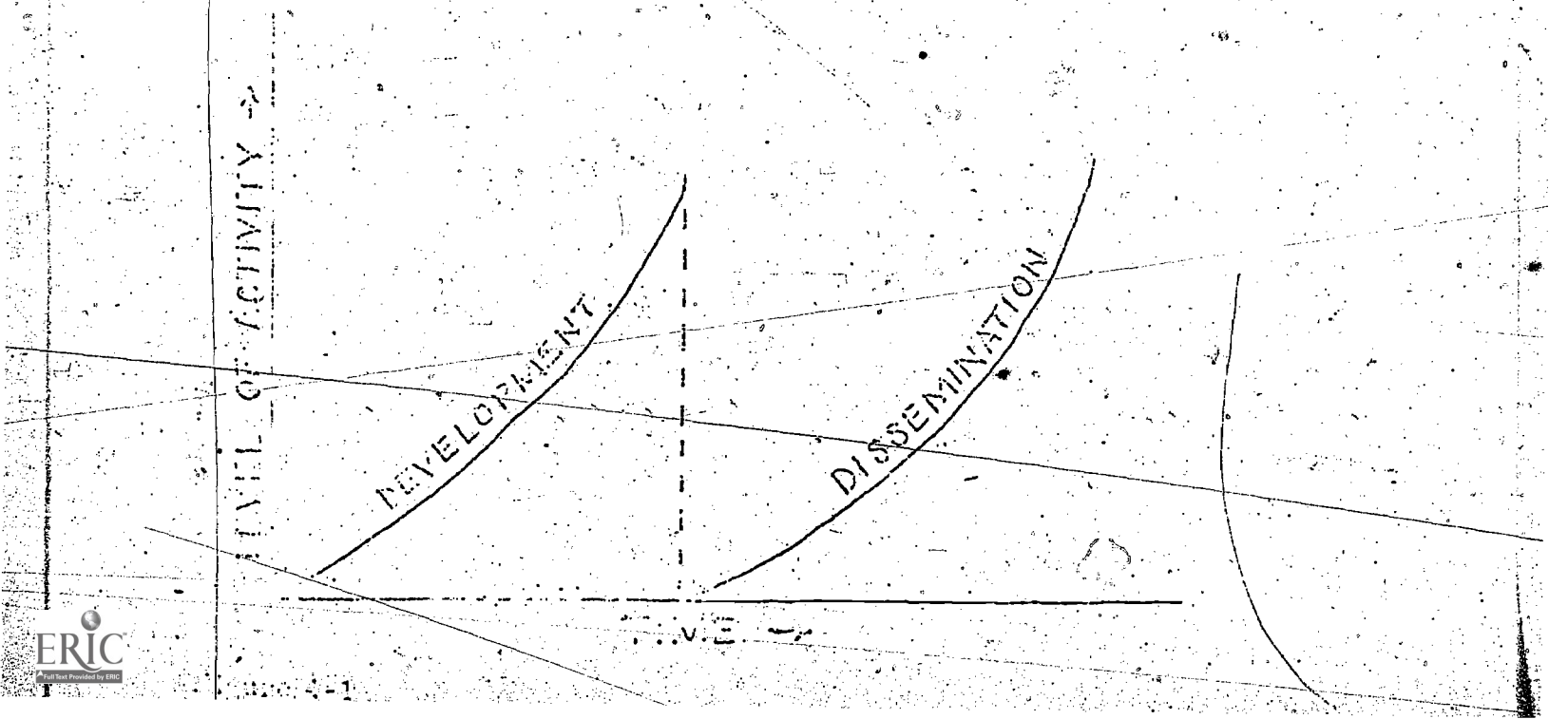

Fig. 4-1

Those projects that developed materials fully before thinking about dissemination sometimes found that there was little or no demand for their product when it became available. Because they had failed to keep others informed of what they were doing, or because the materials they produced tended to be idealistic with respect to the real world of schools, there was little market for their product. Furthermore, because such projects often operated like small, tightly closed corporations, they missed out on both the critical and the supportive input they could have received during the formative years from competent advisors.

A few curriculum development projects have made the opposite mistake -- they have broadcast their efforts too widely and too soon. Before development activity had gotten much beyond the idea stage, they had described their plans, often in idealistic ways. Such projects spoke before every available educational forum and garnered inches, columns, and pages of newspaper publicity. They often wound up spending so much time on diffusion activities and in answering inquiries about their program that their development activities were curtailed. Sometimes, as a result, their program never got fully underway, as shown in Figure 4-2.

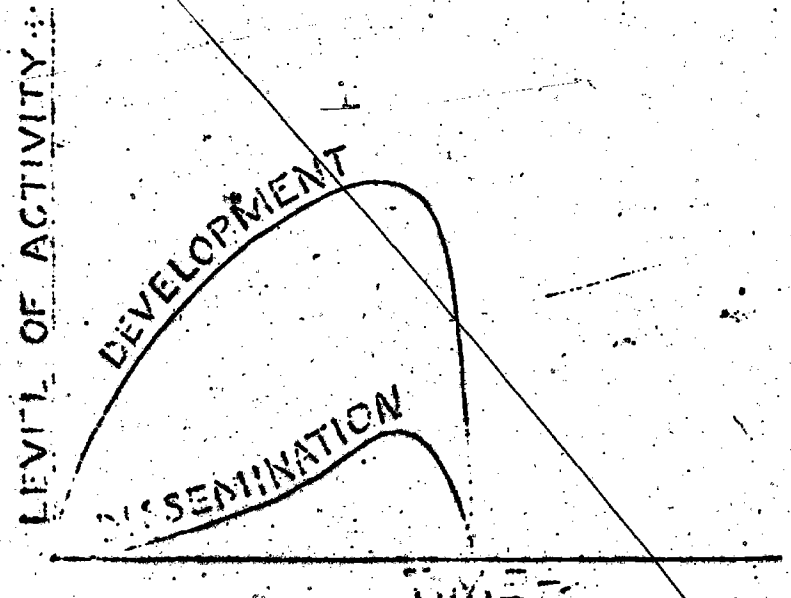

Figure 4-2

The ISCS approach has been simultaneously to plan its development and dissemination strategies and to work on both of these facets of its effort throughout the life of the Project. As indicated in Figure 4-3, development of materials was given primary emphasis during the early years of ISCS, and dissemination work became the Project's principal focus later. It is significant, however, that at no time in its history did the Project completely ignore dissemination activities.

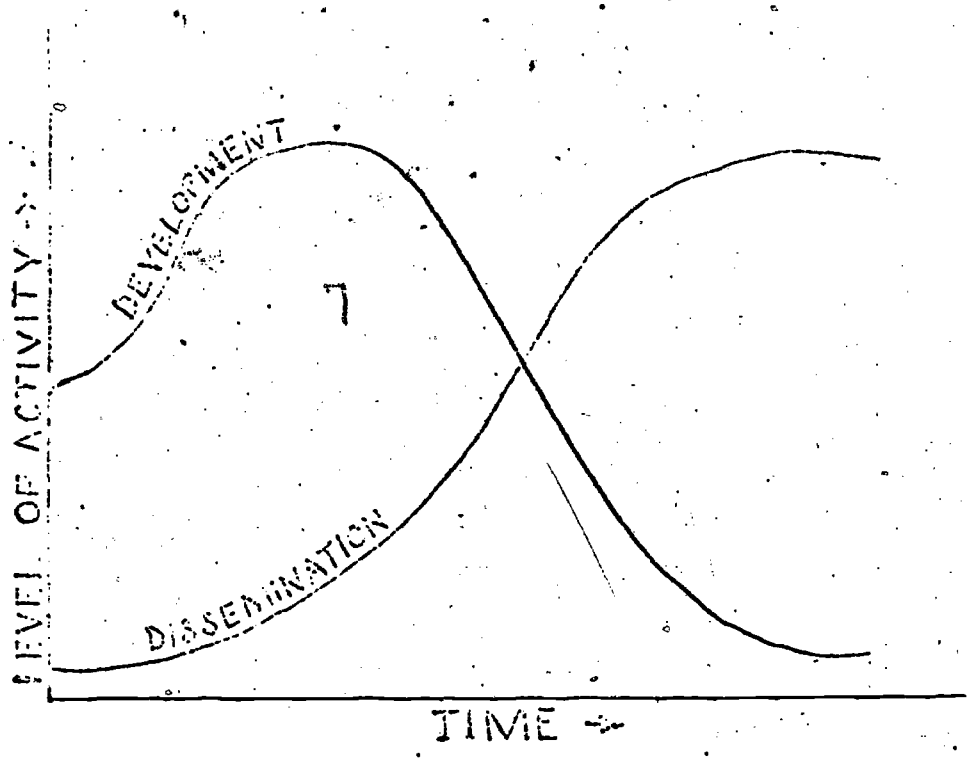

Figure 4-3

Details of the ISCS approach may prove helpful to future curriculum projects. Thus, the remainder of this chapter is devoted to the main features of the plan and some specifics regarding its implementation.

Outline of Dissemination Plan

The ISCS dissemination strategy consisted of six phases as shown in Figure 4-4.

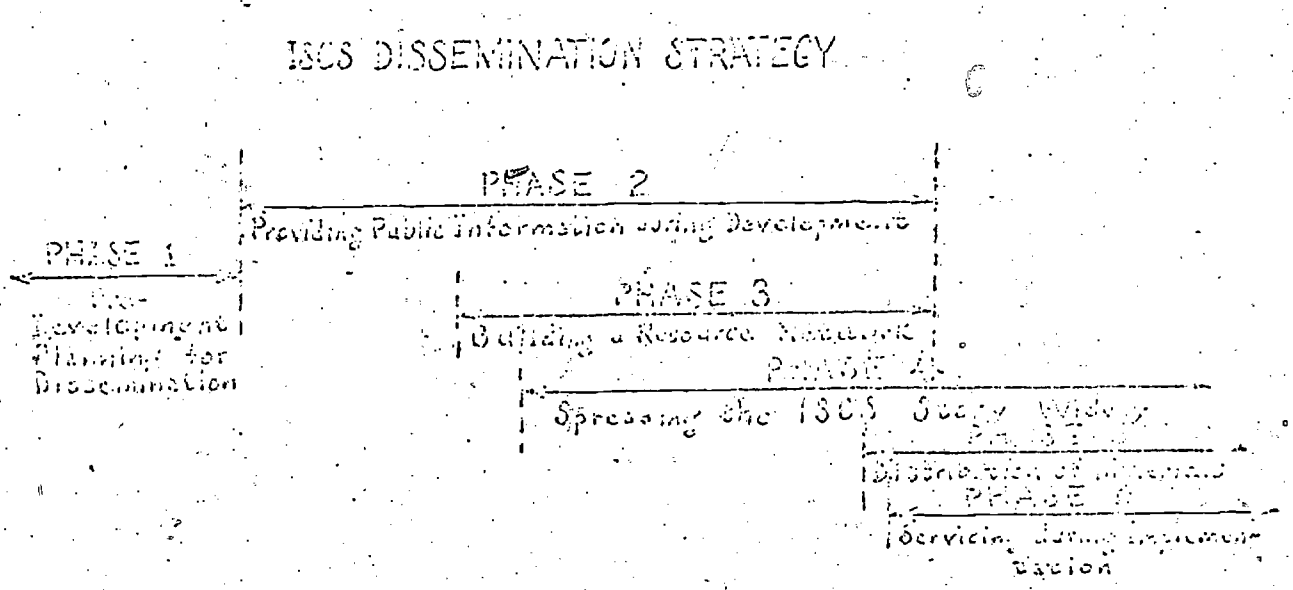

Figure 4-4

The six phases were not discrete; they overlapped in time and function as the diagram indicates. And some of the phases are continuing.

Phase 1. Pre-Development Planning for Dissemination

A number of decisions, made before the actual development of the ISCS instructional package began, went a long way in establishing the ultimate limits within which the materials in that package could be disseminated. Those who determined the rationale for the Project were committed to the notion that the ultimate package of materials must be realistic with respect to the training of the teachers who must implement it, the abilities of the students who would use the materials, the facilities in the schools in which the program would be used, and the status of school budgets for instructional materials. Great pains were taken to assess these matters and to build into the plan for developing the ISCS

instructional materials provisions that would allow the materials to be used under the conditions which that assessment revealed.

As those who conceived the plan for the ISCS Project had anticipated, the study of existing conditions in junior high schools revealed great inequities. It showed that junior high school teachers were not particularly well trained either in content or pedagogical methods, that junior high school science is often taught in ordinary classrooms with little or no laboratory equipment, and that the student entering the seventh grade has difficulty in dealing with abstract concepts. It was reasoned that the ultimate package of instructional materials to be developed would not have very great impact unless it could be implemented under these limiting conditions.

The results of the pre-development study and planning was the decision to build into the program for developing instructional materials a set of quite severe constraints. It was assumed that if the Project could live within the limitations listed below, its materials would tend to fit the conditions that exist in schools and therefore would be well received and thus more easily disseminated.

1. Complete equipment kits would have to be developed that contained everything necessary to do every activity in the instructional package. Furthermore, the kit of equipment, adequate for five classes of thirty students to use during the experimental period, was kept under seven hundred dollars. (This figure, it was assumed, was in line with what schools could and would spend on science equipment.)
2. The activities to be designed would have to be practical for use in a class of thirty students operating in a forty-five minute time period. (These two figures are close to the averages for the United States.)

3. The program must be practical for use in an ordinary classroom with one electrical outlet, one sink, and flat top tables for student use. (This is well below a desirable or recommended minimum for laboratory science instruction but is consistent with the situation in many American classrooms.)
4. The ultimate package of instructional materials must fit the provisions of most state textbook adoption criteria, must be competitive in cost with presently used instructional materials, and must be acceptable to most of the teachers that would use them.
5. The materials must be usable by a teacher whose training in science is minimal and who has no specialized training in implementing individualized instruction.
6. The instructional materials must be in such form that they would be practical from a commercial point of view. It was felt that unless a commercial publisher could envisage the probability of making a profit by selling the materials, the likelihood of wide dissemination was very slight indeed.

The limitations described above were designed to insure that the final version of the ISCS materials would have high potential for dissemination. But it was recognized at the outset that good and practical materials do not in themselves insure massive impact. In addition to developing good materials, the Project decided that it must bring those materials to the attention of school people and others who determine the instructional materials schools use. And it was clear at the outset that mechanisms must be established whereby materials were distributed effectively to schools who chose to use them and through which schools could be helped to make whatever transitions were required. Although the implementation of these efforts was postponed until later in the Project's history, planning for them was done before the actual development of materials began. Some of the decisions that came out of that planning are as follows:

1. The Project would periodically publish a newsletter which would be distributed widely to people who have the potential to influence educational decisions.
2. The Project would avoid the temptation to produce, in any extensive way, written or verbal descriptions of its plans. The approach was to wait until the Project had done something and to report on those accomplishments. This meant that the giving of speeches and the writing of articles tended to be postponed until the Project was well underway.
3. The Project would attempt to involve key people of many types and representing many organizations and disciplines in planning and executing its work. ISCS felt that this move would not only insure adequate input for the developmental process but would add credibility during dissemination of the ultimate instructional package as well.
4. The Project decided at the outset to use a "multiplier effect" in disseminating its product. It was assumed that it would ultimately be necessary to have a nationwide network of resource people in order to develop the program successfully, and the Project set out from the beginning to interest and train key people to become a part of that network.
5. It was decided to conduct a larger field trial than was absolutely necessary for formative evaluation purposes. It was assumed that there were dissemination advantages in having large numbers of tryout schools scattered geographically across the country. The Project attempted to place at least one school with an operating ISCS program within driving distance of every teacher in the country before the experimental stage was over.

The planning decisions previously described were taken long before the actual development of materials began. But this pre-development planning and decision making represented only Phase 1 of a six phase dissemination strategy. A discussion of the remaining phases follows.

Phase 2. Providing Public Information during Development

The group that the Project sought to reach during the developmental years was a mixture of decision-makers from all levels -- science educators, scientists, school administrators, supervisors, and department heads. By making such individuals progressively aware of the ISCS story as it developed, the Project hoped gradually to build interest in the program, interest that would peak about the time that the commercial editions of the materials became available. To this end, the Project began a series of low-key presentations at conventions, conferences, and educational meetings.

Beginning with the 1966 National Science Teachers Association (NSTA) Regional Conferences, formal and informal sessions were conducted by the Project staff to explain and demonstrate the operation of the program. Emphasis was given in these presentations to the unique features of the materials. Participants were frequently given the opportunity to experience the activity-centered approach in laboratory sessions in which the individualized nature of the course could be explained and actually experienced.

To help tell the story of the rationale, the mechanics, and the current state of the materials, visual aids were developed. Those used in the earliest presentations consisted mainly of a set of transparencies for the overhead projector. These next evolved into a series of 35 mm slides and a 16 mm silent film.

The slide set went through a series of modifications to keep it up-to-date and to reflect revisions in the materials. At the same time, a second movie film was developed, this time with a sound track. Duplicates of the slide set and the sound film were obtained so they could be used both by the staff in its presentations at conferences and by local school people as public information aids.

This pattern of participation in conferences and meetings continued to expand in the succeeding years. A list naming some of those sessions is included in Appendix D.

An important feature of all of these sessions was to show what the experimental versions of the student's and teacher's books and some of the ancillary equipment looked like. Fortunately, the very nature of the program dictated that the materials have considerable eye-appeal. Any individualized program depends to a large extent on whether it creates sufficient interest in participants. For ISCS that meant turning out the best looking experimental product in the limited time available each year. And to do this ISCS had to build up a skilled and efficient art staff, editorial competence, working relationships with equipment manufacturers, and eventually a close working relationship with the commercial publishers. Each year, as the staff became more experienced, the experimental editions became more appealing as well as more effective learning instruments.

Thus, the experimental books themselves became a key part of the diffusion effort. Copies of the printed student materials were made available at cost to conference participants who furthered the dissemination effort by allowing others to examine their copies when they returned to their home schools and universities.

An attempt was made to inform the public about the Project vicariously as well as directly. A brochure, distributed at meetings and by mail, gave an overview of the program in terms of rationale, materials, and methods. The semiannual newsletter reached an ever widening audience that by the fall of 1970 included some 12,000 key personnel in all fifty states and many foreign countries. Examples of ISCS informational publications appear in Appendix E.

Beginning in the fall of 1967, orientation sessions were provided for all teachers in the field trial schools receiving financial support. (The ISCS center leader concept and some of its problems are discussed in Appendix F. Appendix G contains samples of the programs used.) In addition to Project-originated programs, a number of local orientation

Evidence of ISCS visibility resulting from the field trials and other diffusion efforts soon became apparent. As early as 1967, schools from California to New York were asking to try the materials. They offered to pay their own way and indicated a willingness to agree to any reasonable conditions ISCS chose to impose. They simply wanted the opportunity to use the materials with their children although they knew the texts and laboratory equipment had further revisions to undergo and thus a life expectancy of only one year. Other schools not yet ready to try the program wanted to find out more about what it offered and to see it in actual use so they could evaluate whether or not they should adopt it later.

As a result of the expanding interest, two additional dissemination moves were made. First, to broaden the exposure of ISCS to influential school systems in different geographic areas, small numbers of qualified schools were selected in strategic areas and allowed to purchase books and materials from their own funds. Teachers from these independent schools were invited to attend centrally located ISCS teacher orientation sessions at their own expense.

As a second move, ISCS demonstration centers were established at both supported and independent schools. Staff visits materially helped in selecting the locations. Eight schools were chosen and equipped with brochures, a film slide set, and additional student materials. Visitors were encouraged to go to any of these demonstration centers and see ISCS for themselves. This was part of the plan to spread a network of ISCS knowledgeable people and demonstration schools throughout the continental United States such that any teacher, educator, or administrator would find one or the other in easy driving distance. This network is discussed in Phase 3. The original eight demonstration schools are listed in Appendix M.

Phase 3. Building a Resource Network

When the Project concluded that it had developed a demonstrably [illegible] product -- a good method for teaching junior high [illegible]

one for which there was already some demand, it was decided that ISCS should actively seek to build a nationwide network of resource people who could both give accurate information about the program and help schools to implement it. A nucleus of resource people existed as a result of the developmental activity. Approximately thirty university and public school personnel participated in the ISCS 1966 summer writing conference. During the summers of 1967 and 1968 similar conferences were held, with up to forty visiting writers taking part each summer. Some of the people participated in successive summers for the sake of continuity. All were potential resource people for ISCS. (See Appendix I.)

Within twenty-six months from the official start of the Project, over one hundred and fifty resource people around the nation were capable of setting up informational meetings about ISCS and could advise on implementation problems. These people came from the following sources:

1. Center leaders.
2. Teachers in test and independent schools.
3. Writing conference participants.
4. Former ISCS Project staff members.

It was apparent simply by looking at a map that there were many holes in the desired national network. Projections showed that a total of about four hundred and fifty resource people would be needed and, to obtain these, plans were made for ISCS resource training conferences that would train key individuals.

In the summer of 1968 a three-week intensive training conference was held at Florida State University. Twenty-two carefully selected participants performed all the major activities of the Level I materials. In addition, they were given background information in physical science and an overview of the status of Levels II and III materials. Those who attended proved to be excellent resource people. Thirteen became center leaders for new groups of tryout schools in the following two years. Ten later taught [illegible] courses for potential ISCS teachers, and two institutes undergraduate programs for training teachers in ISCS methods. All have continued to be active in the program since the conference.

The success of this first conference prompted three more conferences at Florida State University -- one in the summer of 1969 with twenty-two participants and two more in the summer of 1970 with fifty people attending. In addition, similar conferences were held by Purdue University and the University of Maryland in 1970. By the end of the summer of 1970, more than three hundred resource people had been trained.

During the summers of 1969 and 1970, sessions on ISCS were conducted at the various NSF institutes for science supervisors. As people who affect change in their school systems, these supervisors were important in the diffusion effort. On the basis of the introduction they received, several instituted the program in their local school systems in the following years.

The ISCS staff also made their own services and the services of appropriate resource personnel available to summer institutes for junior high science teachers. Consequently, in 1968, 1969, and 1970 sessions of one or two days were included in a number of widely-scattered teacher programs. A list of these institutes, and other training sessions of this type, is included in Appendix D.

Phase 4. Spreading the ISCS Story Widely

No sharp line of demarkation can be drawn between Phase 3 and Phase 4. Certainly the contacts with supervisors and teachers during summer institutes resulted in a considerable spread of information. Even more so did the administrators' conferences at which the ISCS program was represented in 1969 and 1970. In each of these conferences, as many as seventy administrators were introduced to the new curricula in science. Two- or three-day sessions on ISCS were held using laboratory activities and appropriate printed and audio visual materials. In addition to familiarizing the participants with the program, it was possible to explore with them means of implementing it in their individual systems.

Even with the large numbers of summer institutes and conferences at which the story of ISCS could be told, there still existed a need for some method of spreading the information even more widely. Consequently,

during the 1969-70 school year the first of a series of "drive-in conferences" were held. These were conducted by resource personnel at strategic locations across the United States. Generally about thirty participants from a small area were invited for the full-day meeting. A list of these conference locations is included in Appendix D.

The mechanics of the operation of drive-in conferences were as follows. On the basis of interest, inquiry, or personal recommendations, key personnel in school systems within a general area were identified by the local resource person. Invitations furnished by Project headquarters were sent out over the signature of the resource person, with a stamped card to be returned to him. General suggestions on securing a meeting room and arranging for luncheon facilities were furnished to the resource person as were printed material to be handed out and used in the conference, a kit of laboratory equipment, a print of the 16 mm sound film, and a set of 35 mm slides. Appendix J gives samples of some of the printed matter.

On the appointed day, the conference leader used the various materials to give an overview, conduct an activity session, and answer questions. A questionnaire was used with the participants to assess their reactions, and a report on attendance and matters relative to the conference was submitted to ISCS.

The enthusiasm for the program generated by this series of meetings stimulated interest among administrative and supervisory personnel in public schools and among science and education people in colleges. In response to this interest a series of three meetings, arbitrarily called "VIP Conferences," were held in San Francisco, Chicago, and Washington. The meetings were of two days duration each and were attended by up to seventy-five participants in each of the three locations. A laboratory session was provided for each of the three grade levels, and these were interspersed with presentations on the rationale, mechanics, and implementation of the program.

Interest in the program and utilization of it in schools was not limited to the United States. On invitation from scientists and educators, staff

members visited Japan, the Republic of the Philippines, Australia, India, and Germany. Institutes and training sessions were conducted for periods varying from two to six weeks for teachers in the Philippines, Germany, and Japan. In the latter two countries, work was carried on with personnel from the overseas Dependent Schools. In the Philippines, teachers from domestic public and private schools were trained.

Staff members also spent additional time in the Philippines working with educators to adapt the materials for use in their schools. Similar adaptation efforts were carried on for public schools in Australia. Further teacher training activities and material adaptation is contemplated for other foreign countries in the future.

Phase 5. Distribution of Materials

Once it became obvious that Phases 1 through 4 of the ISCS dissemination scheme had been successful, the Project was faced with finding a way to get its materials mass produced and delivered to the large number of schools that were choosing to use them. Those associated with the Project decided very quickly that this meant enlisting the aid of a commercial publisher and an equipment manufacturer. The Project saw no other way to get the marketing job done competently and efficiently.

In selecting a publisher for its commercial editions, ISCS was determined to avoid the problems that had beset other projects when they published commercial editions. To this end, the ISCS Project Director, during 1968 and 1969, contacted other curriculum development projects which had passed the publishing stage and talked at length with their directors. He sought specifics regarding difficulties they had experienced. Among the problems noted were the following.

1. Delivery, quality, illustration, and design problems had frequently ensued when the project contracted separately with an equipment manufacturer and a book publisher. When these agencies had a coequal status, coordination was often difficult to achieve, and decisions were sometimes the result of compromise rather than

of what was best for the project. Frequently, there was an absence of communication between the two agencies, causing publication and equipment delivery delays, incorrectly drawn art, and apparatus incompatible with text revisions.

2. Advertising and marketing copy was sometimes prepared without consultation with the projects. When this happened, the goals of the Project were sometimes misrepresented, emphasis was placed on improper features, and the copy was directed at the wrong audience.
3. Sufficient control over the final products was at times not retained by projects. This resulted in texts that lost the flavor and style of the experimental editions, in equipment inconsistent with course objectives, and in costs of both equipment and printed materials that were sometimes excessive.

Keeping these problem areas in mind, ISCS went through the following steps in selecting a commercial publisher and an equipment manufacturer.

1. About sixty-five members of the American Textbook Publishers Institute were invited to send one or more representatives to a special ISCS publisher's information session in Washington, D.C. on April 1, 1968. For convenience, the meeting was held during the week of the national convention of the National Science Teacher's Association, a time when many publishers as well as members of the Project staff would be in the same area. During the ISCS session, the Project staff described the rationale of the program, the present materials, the status and results of the field testing, and ISCS plans for the immediate future.
2. Those publishers who attended the initial meeting and expressed interest in ISCS were invited to visit the Project's Tallahassee headquarters and discuss objectives and requirements informally. These meetings enabled the ISCS staff to become better acquainted with the sales, editorial, production, and managing staff of various publishers and thus to some extent aware of their capabilities.

3. A bid form was sent to each of the interested publishers. In order to provide the publishers with the necessary background information for their bid and to insure that each publisher's proposal to ISCS contained essential data, three policy guides were enclosed. (See Appendix K.) Perusal of these policy guides will reveal some of the measures taken by ISCS to avoid the problems cited earlier.
4. On the basis of formal proposals from each publisher and several follow-up meetings with those whose proposals seemed to meet ISCS requirements, the final selection of a publisher was made.
5. At this point (January, 1969), the ISCS staff began to work informally with representatives of the Silver Burdett Company, the selected publisher, while efforts were underway to obtain a contract acceptable to ISCS, the Florida State University, the Florida State Board of Regents, the U. S. Office of Education, the National Science Foundation, and Silver Burdett.
6. A draft contract was prepared by the ISCS Director, and this was coordinated with the Florida State University Contracts and Grants Office and the Florida State University legal advisor. Steps were taken to insure that the wording of the contract met the requirements of the Florida Board of Regents and that the President of the University was satisfied with the main provisions.
7. In the fall of 1969, representatives of ISCS, OE, NSF, and Silver Burdett met in Washington to reach agreement on the wording of the contract which had been circulated in draft form earlier. Substantive agreement on all points was reached at the meeting, leading to signing of the contract a few weeks later in November, 1969.

Subsequent events proved the wisdom of giving so much attention to planning and negotiation phases of selecting a commercial publisher, detailing working arrangements in advance. Although minor disagreements

occasionally arose between the publishers and the Project, these did not create serious difficulties because it was easy to establish that the ISCS position had been clearly detailed in the beginning. A few specifics will show how ISCS anticipated future problems.

1. In negotiations with the publishers, ISCS made it clear that Silver Burdett would not only be responsible for the printed materials but that they must, by subcontracting if necessary, assume full responsibility for materials ancillary to the text. Thus, Silver Burdett subcontracted to Damon Engineering the task of providing the necessary laboratory apparatus, equipment, and supplies. ISCS retained the right to approve manufacturing prototypes but was not plagued by the delays, the disagreements, and the misunderstandings that often arise when the publisher and the supplier of ancillary materials are independent agencies.
2. The formal agreement with the publishers made all promotional materials for the commercial editions subject to ISCS approval. The wisdom of this arrangement was apparent when the early drafts of the publisher's advertising copy proved unsatisfactory. A set of guidelines was sent to Silver Burdett on August 11, 1969, to assist them in representing ISCS in printed materials, in responding to correspondence, and in presentations at meetings and the like. (See Appendix L.)
3. By making all printed text materials subject to ISCS final approval, the Project was able to insure that many of the innovations of the experimental versions were retained in the commercial books.

Phase 3. Servicing during Implementation

Phase 3 of the diffusion effort deals with the means of servicing the schools that continue with the program after the experimental period and

more importantly the new schools that adopt the program once the commercial versions are available.

In anticipation of the sixth diffusion phase, a first effort at teacher education, called *Preparing the ISCS Teacher*, was written in the spring of 1970. This book was used at a number of conferences, and valuable feedback was obtained. Several exploratory meetings involving teacher-educators, held during a period of more than a year, also gave some general direction for this final phase. At the same time, several summer institutes aimed at training junior high school teachers in the ISCS program were conducted. These institutes showed that the most profitable means of strengthening science background and giving a teacher familiarity with the special methods needed were through the use of ISCS student materials themselves. In other words, teachers working as students, using the text, laboratory material, self-tests, and other features could prepare for teaching the course by experiencing the same problems as their students would experience.

During the early development of the materials, teacher's guides had been prepared to accompany each student text. Specific hints and suggestions were included to help the teacher in areas that could cause the greatest difficulty in working with students. Among these areas of potential difficulty were the following:

1. Establishing the proper atmosphere in a classroom using individualized materials.
2. The care, handling, and retrieval of laboratory equipment and supplies.
3. Evaluation and grading of students in an individualized situation.
4. The rationale for specific content and process used in the program.
5. Specific areas of physical science content in which the junior high teachers might have less than adequate proficiency.

Although the teacher's guides proved helpful to participating teachers, it was evident that more specific help and help in greater depth would be necessary as the program was diffused on a wider scale. The decision was made to develop a series of modules aimed at the particular problems.

Two basic considerations underlay the decision to develop rather comprehensive modules. First was the need to insure fidelity in teacher education programs that would be conducted by many people. Second, the paucity of good science educators readily available to every school system meant that whatever was developed should be usable in local school systems by relatively untrained teacher educators. From past experience, ISCS believed that the modules should be individualized and should allow educators to assist other teachers in a classroom situation or permit teachers when necessary to work alone.

Specific audio and visual resources could be made a part of these modules. These resources would be newly-developed and aimed at helping the teacher in a particularly difficult situation. For example, a film segment with an accompanying audio track might be used to show examples of teacher-student interaction in the classroom.

As these modules are developed, they will be given a thorough field testing with practicing ISCS teachers. It is envisioned that this method of teacher education could have general applicability to other curriculum projects. Certainly it would have the potential to individualize the pre-training and in-service education of large numbers of teachers.

Other activities that will continue during Phase 6 include activities by the publisher to further maintain and stimulate interest in the ISCS program by means of advertising copy, attendance and displays at educational meetings, and visits to schools by their sales force. Additionally, ISCS will continue to encourage and support other universities that plan to submit proposals for ISCS institutes or include ISCS as part of other summer programs.

[illegible] of the size staff needed to accomplish the many functions described in the foregoing dissemination plan, a list of the

so-called "permanent staff" of ISCS through August 31, 1970, is included in Appendix M. And because of the relative importance of the Advisory Committee to the operation of the Project, its membership is detailed in the same appendix.

Unfinished Dissemination

The story of ISCS dissemination efforts and the plans for further diffusion are incomplete at this point. Several things remain to be done. The teacher education modules are considered essential to proper development of a good individualized program and should be brought to fruition. Arrangements should be made to hold more in-service teacher training institutes throughout the country. More pre-service teacher training programs should be developed. And more funds should be made available to selected school systems to assist them in purchasing materials required to participate in the ISCS program.

ANSWERS TO QUESTIONS

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1.0 ARE THERE CHARACTERISTICS OF PARTICULAR SUBJECT MATTERS THAT MAKE PRODUCTS WHICH ARE BASED ON THEM MORE OR LESS LIKELY TO BE ADOPTED?

The innovation's requirements with regard to knowledge and coordination can be important, the diffusion process being delayed if the innovation requires new kinds of knowledge on the part of the user, new types of behavior, and the coordinated efforts of a number of organizations. Also, if an innovation requires few changes in socio-cultural values and behavior patterns, it is more likely to spread rapidly. And the more apparent the profitability of an innovation and the easier it is to explain and demonstrate the advantages of the innovation, the more quickly it is likely to spread.

2.0 ARE THERE CHARACTERISTICS OF DEVELOPERS THAT TEND TO INHIBIT OR ENCOURAGE USE OF THEIR IDEAS AND PRODUCTS?

The personality and prestige of the developer, as well as the amount spent on promotion, will have an effect. But the most important factors seem to be the profitability of the innovation and other factors discussed below.

3.0 WHAT ARE THE CHARACTERISTICS OF PRODUCTS THAT MAKE THEM MORE OR LESS LIKELY TO BE DIFFUSED?

In 1961, I proposed a simple mathematical model to explain the rate of diffusion of new processes. This model explained the rate of diffusion of a dozen major innovations in the United States surprisingly well. Moreover, subsequent work has shown that it is useful in explaining the rates of diffusion of other innovations -- in other countries -- as well. This model has been used for technological forecasting. For example, as part of a study conducted for a

federal agency, this model was used to forecast the rate of diffusion of numerically controlled machine tools in the tool and die industry. So far at least, these forecasts have been quite accurate. In addition, this model has been used by a number of firms in a variety of industries. For example, a leading aircraft engine manufacturer has used this model in its internal planning.

Two important variables influencing the rate of diffusion are the profitability of the innovation and the size of investment required to adopt it. In addition, however, my coworkers and I have found that there are other variables that have a statistically significant and quantitatively important effect on an innovation's rate of diffusion. For one thing, the variance of the profitability of the innovation among the firms in the industry has an effect. Also, the length of time the innovation has been used in other industries can be important. Further, the structure of the industry -- the number of firms, their average size, and the inequality in their sizes -- has an effect. In addition, the R and D expenditures (as a percent of sales) of the firms, and the licensing policies of the developer of the innovation, can be important too. We have used these variables to explain the diffusion of about 20 chemical innovations and to explain the diffusion of numerical control in 10 industries.

4.0 WHAT ARE THE CHARACTERISTICS OF ORGANIZATIONS THAT DISCOURAGE OR ENCOURAGE THE INTRODUCTION AND USE OF NEW IDEAS?

We have looked in considerable detail at the decision-making process within particular organizations. Particularly for numerical control, we have carefully selected samples of users and non-users, and conducted intensive interviews with both types of firms to determine the factors that influenced their decision to use or not use it. Then we have employed econometric techniques to analyze the results. Our findings suggest that the structure of the organization has a significant effect on how rapidly a firm begins using a new

technique. For example, holding size of firm constant, organizations that require a relatively large number of decision-makers to approve a decision of this sort seem to be relatively slow to begin using an innovation. Also, we have obtained detailed data concerning the estimated and actual profitability of innovations, and we have tried to relate the errors and biases in these estimates to the characteristics of the organization. In addition, we have made a number of studies of the intrafirm rates of diffusion of major innovations, particularly for railroad and chemical firms.

We have also investigated the characteristics of the firms that are relatively quick, or relatively slow, to begin using various new techniques. The results, which pertain to a wide variety of industries (including bituminous coal, iron and steel, brewing, railroads, chemicals, machine tools, and many others) indicate that, holding other factors constant, big firms are quicker to begin using new techniques than small firms, and firms where the innovation is more profitable are quicker than those where it is less profitable. Moreover, in relatively small firms where the owner makes the relevant decisions, his age and education also seem to have an effect. The younger and better educated he is, the quicker the firm is to begin using the new technique. However, a number of other factors -- like the profitability of the firm, its profit trend, its liquidity, and its growth rate -- do not seem to be related to how rapidly it begins using an innovation.

5.0 WHAT ARE THE COMMUNICATION MECHANISMS WITHIN THE DIFFUSION SYSTEM THAT ENCOURAGE OR DISCOURAGE THE DIFFUSION OF INNOVATION?

It is difficult to answer this question because the communication system seems quite different within and among firms than in education.