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Traditionally it has been assumed that there is a fairly smooth sequence from research through a developmental phase to the utilization of research results. Evidence shows that this sequence is seldom followed in actual practice and that special efforts must be made to assure that the results of research are applied. In an attempt to remedy this problem in education, a traveling seminar and a conference were organized for the implementation of educational innovation. Schools across the U.S. where significant innovations had been introduced and in operation for at least one year were selected. Groups composed of local administrators, State education department officials, and college teachers toured the schools, after which they participated in a conference. One year later the innovative activity in districts participating in the tour was compared with that in a nonparticipating control group; it was found that the participants had introduced more innovations than the nonparticipants. Analysis of this experiment suggests that such programs can speed research into application more successfully than printed communication or demonstration schools. Factors leading to the successful application of research results and the importance of the regional laboratories in evaluating the effectiveness of innovations are also discussed. (TT)

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FROM RESEARCH TO DEVELOPMENT TO USE

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FROM RESEARCH TO DEVELOPMENT TO USE

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The title of this paper emphasizes the traditional assumption that there is a fairly smooth sequence from research through a developmental phase to the utilization of research results. More and more evidence is being accumulated to show that this sequence is very seldom followed in actual practice and that special efforts must be made to assure that the results of research or new developments are, indeed, carried through to application in a school setting or, for that matter, in most other applied situations. There is widespread recognition that a problem exists in making the translation process effective. This is recognized by many actions at the national level. For example, the last Congress passed the State Technical Services Act of 1965, which will provide federal assistance to the states in helping them acquire the necessary documentation and information to assist their local industry in applying the results of federally-sponsored research and development.

The problems associated with utilizing research findings have been receiving increasing investigation throughout the departments of the Federal Government, particularly in the Department of Defense. As is well known, each year the Department of Defense spends around 6 billion dollars on research, test, development, and evaluation. For several years now there has been concern that the new knowledge gained through many research and exploratory development projects is not being adequately translated into useful weapon systems. Because of this concern the Department of Defense has

been sponsoring a series of studies on the way in which new knowledge and reports are used by engineers and scientists in laboratories and industrial organizations. In addition to the Department of Defense, other federal departments supporting research and development have been looking at the problem of how change is introduced as a result of new knowledge and techniques.

In education this is not a new topic by any means, but it is one that is receiving increased emphasis. This emphasis is evidenced by symposia such as the one in which we are participating, as well as the publication of books and newsletters on the problem of education innovation. A good example of the latter is the recently-instituted newsletter of the Conference of Strategies for Educational Change being produced at Ohio State University (4). Professional educators in the universities and in the public schools are trying to solve this particularly difficult problem.

This paper will relate some of the studies and investigations that have been alluded to above. Three separate studies from quite different settings will be described to illustrate some of the findings and problems associated with the generation of new knowledge and its impact on the institutions which receive the knowledge. Finally, an attempt will be made to relate these studies to the mission of the regional laboratories.

A Study of Factors Affecting Military Research and Development

Although this symposium is largely concerned with problems in education, it seems desirable to examine some of the studies that have been done in other fields in an attempt both to understand the generality of the problem we are discussing and to gain specific insights which can be derived from other

studies. First, a review of an extensive study recently completed for the Department of Defense by Arthur D. Little (5) will be presented.

The Department of Defense procures very advanced new weapon systems, some of which turn out to be quite successful while others fail to meet their design goals. The question can be asked regarding the management and development factors that led to the development of successful weapon systems in some cases and unsuccessful ones in others. In order to obtain some answers to this question, it was decided to study six recently developed successful weapon systems. The systems studied varied considerably in complexity and function and included the development of a new 105 mm. howitzer, an acoustic homing torpedo, the Hound Dog air-to-ground missile system, the Sergeant missile, the Polaris missile system, and the Minuteman ballistic missile system. It was judged that the successful development of each of these systems required the application of new technology which had not previously been incorporated into weapon systems. The Arthur D. Little team studied the technical reports and descriptions of these six systems and tried to identify all of the significant research and development events or units of new knowledge or technology that were instrumental in the successful completion of these particular systems. The team also visited the laboratories and private contractors responsible for the design and manufacture of these systems. The individuals who were involved in the early design phases of each of the systems were asked to identify the significant new developments which led to a successful system. Some 11 research events and 52 exploratory development events were selected for more detailed study. The following list will provide some notion

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of the kinds of events selected: the development of castable double-based propellants, the conception of canted rotatable nozzles for thrust vector control, the prediction of the ablative behavior in flight of quartz heat shields, the development of the high-temperature shock tube, the development of a disc memory for the digital navigation computer, etc. Once these various events had been identified, the team interviewed the management of the organization in which the event occurred, and the people who were personally involved in the development under consideration. From these interviews and detailed studies of the development of the weapon systems the study team drew a large number of conclusions, many of which appear applicable to some of the problems facing educational research and development. Listed below and briefly discussed are several of the conclusions reached by the study team.

1. Transition from Research to Development to Use Is Not a Straight-forward Process.

Their observation of the development history of the various systems led to the conclusion that research and exploratory development are not phased in any orderly progression from basic research through exploratory development, advanced development, engineering development, system development, to production. Rather, the several phases go on somewhat simultaneously, and in many cases the logical order of some of the phases is reversed. Likewise, there is often a lack of understanding of what new knowledge and technology is needed. Even though such needs may have been stated in formal reports or requirement statements, the information did not seem to get communicated to the people who were actually working on the project. The report says, "In eight

of the research and 46 of the developmental events, knowledge of the need was communicated informally to those who responded with the idea to satisfy it, rather than by a formal document or briefing." Thus we see the research and development process as quite informal, often not well organized, in which personal interactions take on greater significance than formal lines of authority or communication.

2. The Time Lag between Initial Discovery and Application Is Large.

It was found that for many of the development events which were critical to the success of a particular weapon system, knowledge regarding the solution of the technical problem had existed for quite some time. For example, the study says, "For half of the events the technological base had existed five or more years prior to event initiation: that is, except for the particular innovative idea which formed the kernel of the event, all the other science and technology involved had existed and been available five or more years... This clearly suggests that more rapid technological events are possible if there could be a more rapid bringing together of needs, idea sources, and allocable resources in the right kind of environment."

3. Communication in Research and Development Tends to Be Informal and Largely on a Person-to-Person Basis.

For 33 of the various R&D events studied, papers, patents, and written reports, although available, had not been particularly important in bringing about the utilization of the particular knowledge; rather, informal communication among the personnel involved in the development seemed to be a matter of overriding importance. The report observes that "a great deal of significant

technical information and technical stimulation is transmitted by personal contact and word of mouth. Documents are not remembered as sources of information or of stimulation, but rather as back-ups and references to be used after an initial basis of understanding has been established by personal contact." This finding is entirely consistent with another study recently completed by the Auerbach Corporation (1) on the methods of information communication used by a very large sample of defense scientists and engineers. Here again, it was found that personal communication and personal files were much more important than formal documentation procedures.

4. Ideas Are Pushed through to Application at the Location at which the Ideas Originate.

In studying the various R&D events it was found over and over that the pushing through of an original idea from the research stage to the actual application involved the same people and the same management as were involved in the original idea or discovery. Very seldom were there instances where an idea or new finding had been developed in one laboratory and successfully transferred to application in another laboratory or manufacturer's establishment. It is particularly significant that in 55 of the 63 research and development events studies, the conceiver of the idea remained involved in the execution from the research and exploratory development phases up to the stage of manufacture.

5. Strong Leadership Is Essential.

In 58 of the 63 research and development events it was observed that strong personal enthusiasm and commitment to the achievement of the goal was essential and that this greatly contributed to the successful completion of

the particular development event. Strength of leadership is not meant is a disciplinary sense but rather in the sense of enthusiasm, real belief and dedication to the idea being worked on.

6. Funding Is Not Neatly Controlled.

It seems particularly significant that initial funding of many of the research and development events was outside of the normal funding channels and often the item worked on was different from the normal designation of the category for which the particular funds were to be used. In 43 of the 63 events the funds which launched the event were discretionary expenditures rather than expenditures which had been allocated for that particular development. Often it was found that the funding for the development had been borrowed from other activities.

7. An Adaptive Rather than an Authoritarian Organizational Environment Was Important.

One of the most interesting findings of the study deals with the problem of management environment. It is often said that in military organizations, and particularly in organizations which are managed by engineers, there is a tendency toward an authoritarian management environment. It is unusually significant that in 62 of the 63 successful events the local enivornment was adaptive rather than authoritarian. By an adaptive environment the study team meant that authority was not based on position in the hierarchy but on expertise with regard to the task at hand. Critical decisions were not confined to the top but were diffused throughout the organization according to the ability of each person to contribute his knowledge or talent to the job

toward which the organization was dedicated. Communication was not necessarily through established channels but rather was a function of who needed to know the information and how it would help achieve the desired goals which had been previously agreed upon. Likewise, in these organizations, values and motives were communicated throughout the organization, in addition to technical information.

Before leaving this interesting study we should note several reservations. One is that the team undertaking the study consisted entirely of engineers and physical scientists. It was not until late in their study that they recognized the need for the participation of behavioral scientists. One of their recommendations is that in future studies of this nature the team should be a mixed team with a strong behavioral science contribution. It seems possible that the study team overreacted to the adaptive environment findings, and they do not seem to be particularly familiar with the rather extensive psychological literature in this area. Another reservation is that all of the events studied were taken from the development of successful weapon systems. Initially, it had been hoped to also study unsuccessful weapon systems to ascertain what events had led to their poor outcomes. With regard to this the report says; "However, the very thought of gathering together such a body of information and stigmatizing it as characteristic of 'other' or 'unsuccessful' research and exploratory development met so much resistance that all attempts were abandoned very early in the project. Informally, it was made very clear to us by a number of people that it would be inexpedient to pursue this line at the present time." In spite of these

reservations, this study is a very fine addition to the knowledge we have of the factors affecting research and exploratory development. It is particularly encouraging that the Department of Defense is taking a careful, objective look at the actual events which make for success in this area. Work similar to the study reported here is being continued as a part of Project Hindsight under the general direction of Dr. Chalmers Sherwin of the Department of Defense Research and Engineering.

A Case Study of a Successful Development Project but Unsuccessful Diffusion of the Techniques Developed.

Edward Glaser's Human Interaction Research Institute is currently involved in an interesting study for the Vocational Rehabilitation Administration. In this study they are examining the factors which seem to have inhibited a number of vocational rehabilitation agencies from adopting the techniques and methods of a successful demonstration by the Tacoma Goodwill Industries of a project titled "The Development of an Occupational Evaluation and Training Center for the Mentally Retarded" (VRA 308). The objective of the Tacoma Project was to demonstrate the feasibility of rehabilitating severely retarded young adults to a level of sustained employment. The population consisted of young adults between 16 and 30 who had measured IQ's between 50 and 75. In addition to vocational training, the workshop emphasized training in work habits and in the various attitudinal and performance characteristics which would make these people acceptable to employers. A team consisting of a psychiatrist, a psychologist, a nurse, a social worker, and a vocational specialist worked with the individuals trying to impart the necessary skills. As a result of

this effort, 63 percent of the subjects were placed in jobs, with each person remaining on the job for a minimum of 3 months. Some of the individuals were retained in sheltered workshops but many were placed in competitive employment in janitorial, domestic, factory, and farm settings. Although the original project was sponsored by federal funds, the Tacoma Goodwill organization has been able to continue this work under local auspices. This study was completed in June of 1963, and the results were communicated through formal reports to VRA and distributed to a number of rehabilitation agencies. However, despite the successful demonstration by the Tacoma Goodwill Industries, no other organization is known to have adopted the procedures.

Glaser and his associates (3) have been studying the efficiency of various methods of communicating the results of this study. As a first step, a questionnaire was sent to 40 widely separate VRA-sponsored occupational training centers for the mentally retarded inquiring whether or not they were aware of the study and its results. Since very few knew of the study, they were sent reports and a special brochure on the study. As another communication step, a representative of the Tacoma workshop visited a selected sample of the agencies in the California area to communicate the Tacoma results to them. As a third technique, a conference and demonstration for 33 representatives of workshops was held in the state of Washington. In addition to the representatives themselves, consultants from Human Interaction Research Institute, the VRA, Tacoma Goodwill, and University of Washington participated in a discussion of the Tacoma Goodwill project. The amount of innovation resulting has been evaluated by (a) an assessment by the participating institution themselves,

(b) a specialist in workshop training centers, and (c) Glaser's staff. The results indicate the following: very little change resulted from the written reports; somewhat more innovation resulted from the personal visit; however, the largest, and statistically significant, change resulted from participation in the seminar and observation of the demonstration project.

Having studied the Tacoma project and a number of other projects which had been sponsored by the VRA, Dr. Glaser and his colleagues have formulated six factors which seem to be essential for the development of innovative programs in the rehabilitation field. Since these same factors seem to be relevant to other fields they are listed below.

1. The vocational rehabilitation agency must be a relatively thriving one so that there are adequate resources of personnel and money to be spared from the struggle for basic existence.

2. There should be a leading person with a vision of what might be accomplished, and the dedication, energy, and enthusiasm to inspire others to share this vision.

3. This agency leader needs freedom of action and encouragement from his executive board, and through them the implied consent of the community.

4. The agency director should be able to seek and select key staff members in sympathy with his aims and with the abilities required to carry them out.

5. It is highly desirable to have understanding and support from the state vocational rehabilitation agency and preferably from the regional office of the Vocational Rehabilitation Administration.

6. Some influential person in the agency needs to be interested in learning

about innovations elsewhere that might be of interest or relevance to the agency.

The Traveling Seminar and Conference for the Implementation of Educational Innovation

It is a common observation that American agriculture has undergone a profound revolution in the last 60 years. It is often asserted that the great increase in productivity of our farms is largely due to the application of research and development in the agricultural area. The Extension Service of the Department of Agriculture has played a leading role in bringing new developments to the attention of farmers. It is often argued that in other areas productivity and results have at times lagged because there has not been an adequate communication and demonstration technique employed to bring the fruits of research and development to the attention of practitioners. This was one of the motivating factors underlying the recent passage of the State Technical Services Act, and a similar suggestion has been made with regard to education. Since the agricultural example appears so frequently, it is worthwhile to describe it briefly. The mode of operation of the Agricultural Extension Service and the analogy to education have been well presented by Clark (2): "Education today may have roughly the same relationship to its practitioners that existed in the field of agriculture in the latter part of the nineteenth century. At that time, the primary vehicle of communication to the practitioner was the printed word--from research to practitioner. The impact on agricultural practice was slight. Interposed now between the researcher and the practitioner are two levels of translation. The extension specialist can

read the research and translate it into something the county agent can understand. The county agent, however, does not typically pass this information directly on to the practitioner. Instead, he provides an opportunity for the farmer to visit another farm in his neighborhood where the new practice is being employed. (The research has already been packaged for marketing.) The situation is a real one. The farmer using the new method is risking his own money on his own farm. The visiting farmer has a chance to see what is going on and talk to the experimental farmer about it. The same suspicion on the part of the practitioner in regard to new practices, noted as typical of the teacher, led the Department of Agriculture to adopt this technique."

It is noted that one of the important characteristics of the agricultural demonstration has been the assignment of personnel who have a full-time responsibility for helping individual farmers translate research and development into practical application. Further, the demonstration takes place in the "natural setting" of the farm. A particular farmer is persuaded to try a new technique in his real-world farm situation. His success is then demonstrated to other farmers who have agricultural problems very comparable to the situation of the demonstration farmer. The analogy in education is that new innovations need to be demonstrated in an everyday ongoing school situation rather than in special demonstration schools or university laboratories.

The System Development Corporation was interested in testing the feasibility of conducting traveling seminars and conferences as a technique for increasing education innovation. There was a near, but not exact, analogy between the way in which the traveling seminar was conducted and the agricultural model

mentioned previously. Under Title VII of the National Defense Educational Act the U. S. Office of Education supported SDC in its traveling seminar program. This program has been described by Malcolm Richland under the title "Traveling Seminar and Conference for the Implementation of Educational Innovation" (6). While Mr. Richland authored the report, a large number of people at SDC were involved both in conducting the seminar and conference and in evaluating the results. The remainder of this section will be devoted to describing the way in which the seminars were conducted and some of the conclusions which can be drawn regarding their effectiveness. Much of the material in this section has been quoted or paraphrased from the report.

"The project had four major objectives, as follows:

1. To conduct a survey of, and visitations to, school sites with outstanding innovations.

2. To implement and conduct a traveling seminar of some 120 educators to selected innovating school districts in four regions of the United States.

3. To conduct a conference on the problems of implementing tested innovations.

4. To perform research related to the testing of the field extension service concept in education.

"Principal activities of the project included a traveling seminar in which four groups of approximately 30 educators each, representing four regions of the United States, visited selected schools where significant innovations had been introduced and in operation for at least one year. Immediately following the seminar, a conference of tour participants was conducted at SDC on the dynamics of educational change; approximately one year later, on-site visitations

to the participants' own schools were implemented.

"The school visitation sites were analogous to the demonstration centers inherent in the field extension concept of the Department of Agriculture. Each tour was led by a well-known and respected educator ('outside change agent'), who was accepted by his professional colleagues as being especially qualified to interpret the experimental foundations upon which a particular innovation was based, if such foundations were, in fact, offered by the innovator."

These four tour leaders were responsible for conducting the tour, were involved in the selection of the sites to be visited by the traveling seminar, and made all the arrangements for the visits to the schools, including advance briefings to the officials of the schools involved.

The schools selected for visitations were ones that showed evidence of successful implementation of various educational innovations. The emphasis was on new educational media, major changes in curriculum, innovative teaching methods, and new school organizational patterns involving the use of teachers' time and classroom space. The schools selected also represented different sizes and urban-rural characteristics in the geographic region. Each of the schools visited had at least one year's experience with the particular educational innovation involved. To give a feeling for the kinds of innovations observed, the eastern tour, visiting one school in Massachusetts and two in New York, was exposed to the following:

Continuous Progress Plan

Lay-Personnel on Teaching Staff

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New Vocational Training Plan for Culturally Disadvantaged Students

Educational Media Center

Closed-Circuit Educational Television

New Curriculum Materials

Auto-Instructional Devices for Individual Study

Flexible Scheduling

The tour participants formed a somewhat heterogeneous group. A number of studies have shown the importance of the school superintendent and the need for positive and effective leadership at this level. In addition, the representatives of the various formal echelons of education are important and their concurrence is often needed in effecting innovations. Therefore, the final composition of each tour group included 15 local administrators, 8 state education department officials, and 7 representatives from teacher training institutions. The tour itself lasted one week. Each group met on Monday of the week of May 11, 1964, were briefed by the tour leader, and then began the site visits. At the site they observed a particular innovation and discussed its advantages and problems with the teaching and administrative personnel. The team often met among themselves to discuss further the particular activity observed and then moved to the next site. The complete tour involved visiting at least three different schools in separate geographic locations.

Following the tour, the tour members came to Santa Monica for a conference on May 16 through 19, 1964. This conference was attended by the tour leaders, the tour participants, and selected consultants and specialists from SDC. At the conference each of the tour directors gave a fairly extensive description

of the innovations observed by each team, as well as a summarizing report of the problems associated with the innovations observed. In addition, there were various addresses by leaders in the field of education and people who had studied problems associated with the introduction of change within various organizations. The following statement of general conclusions is quoted from the report.

"Using the reports of the four regional tours and the results of the work sessions at the conference as a departure point, certain conclusions are suggested upon which further investigation can be based and from which guidance may be obtained in planning new programs. The conclusions most consistently expressed by the traveling seminar and conference participants were as follows:

a. Innovations are in practice in many schools throughout the country. Although more prevalent in districts with above-average financial support, innovations are found in some districts with limited resources.

b. There is a patent lack of research upon which to evaluate existing innovational practices.

c. Innovations tend toward accommodating the spread in pupil abilities and achievement by individualizing instruction. This is displayed by greater instructional flexibility in the use of space, time, methods, and group size.

d. Wherever innovations have been implemented, there is evidence of strong, positive, and dynamic leadership. This conclusion tends to support Brickell's conclusion that the superintendent is the primary agent.

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e. Innovations often result from those crisis conditions that present problems needing new and dramatic solutions. Typical of such circumstances are radical population growth; major changes in the composition, structure, or economy of the community; and the onslaught of well-organized pressure groups.

f. Implementation is often facilitated by the acquisition of federal funds or foundation grants. These funds provide seed or risk money and incline to have a pump-priming effect.

g. There exists no structured program of planned change. No agency or institution is charged with the specific responsibility of aiding the implementation of innovations, nor is such responsibility designated in the formal line structure of school districts.

h. Laboratory schools and demonstration centers are thought to be miscast in the role of dissemination. They do not build conviction because they are not credible.

i. Although useful, the literature, conferences, workshops, and individual visitations are considered inadequate to the task of dissemination.

j. It is generally agreed that implementation comes after research and development, or design. The 25- or 50-year lag or gap between research and implementation is attributed to a failure to take effectively the next step(s) of demonstration, dissemination, implementation and evaluation.

k. The consensus among the conferees was that demonstration centers (not a part of a local school district) and laboratory schools are not the dynamic needed to build conviction (because they lack credibility) or

to facilitate action programs."

Although the participants in the seminar expressed great enthusiasm for the traveling seminar as a technique for observing innovations and for stimulating participants to try such innovations in their own school setting, a more careful evaluation of the results seemed desirable. This evaluation consisted of two parts. One was assessment of a large amount of anecdotal material, letters, discussions, etc. The easiest way to summarize this material, which is discussed at considerable length in the report, is to say that the participants seemed to be extremely pleased with the program, and expressed plans to attempt many innovations in their own school settings.

The second effort was to undertake a formal evaluation of the effects of the program. In this evaluation, 46 of the 60 participating school districts were used as the experimental group and 57 comparable districts formed a control group. Prior to the initiation of the tours the superintendents for schools in both the experimental and control groups had filled out a detailed questionnaire concerning the nature of educational innovations in their districts. Approximately a year later each superintendent was visited, and participated in a structured interview regarding the school district and its innovations. Following the interview, the questionnaire and interview material were assessed by SDC staff personnel, and degree of innovation was scaled on a 0 to 4 scale. Table 1 shows the innovation index for the participants and the nonparticipants. As can be seen, the participating districts have a higher innovation score than do the nonparticipating districts. This change score has been analyzed by analysis of covariance with the results being significant

at past the 0.1 level of confidence.

Table 1

Mean Innovational Index for Participants and Nonparticipants by Geographic Location and Year

		No. of Cases	1964	1965	Change	Mean Gain
Participants	East	14	34.7	39.5	4.8	
	South	12	23.2	29.5	6.3	
	Midwest	12	25.2	31.9	6.7	
	West	8	19.6	29.4	9.8	
						6.6
Nonparticipants	East	15	27.0	31.7	4.7	
	South	14	17.9	21.7	3.8	
	Midwest	14	23.9	28.5	4.6	
	West	14	26.3	29.5	3.2	
						4.1

In addition to the demonstration of the influence of the traveling seminar on innovation, we were interested in determining the various factors within a school district which seemed to be associated with the introduction of change. From questionnaires and interview material some 72 different variables were extracted and correlated against the change scale. The highest predictors of educational innovation are shown in Table 2.

Table 2

Predictors Selected for Multiple Regression and Their Correlations with the 1965 Innovational Index

Variable	Validity Coefficient
Highest Teacher Salary	.53
Superintendent's Ambition	.51
Superintendent's Autonomy	.50
High School Density	.44
Population Density	.42
Effect of Innovations on Finances	.40
Social Class of District	.36
Effect of Innovations on the Organization	.34
Percentage of Jews in District	.32
Percentage Going to College	.32
Influence of the Board of Education on the Implementation	.30
Community Support for Innovations	.30
Percentage Completing High School	.27
Urbanity	-.42

A multiple correlation of .78 is obtained from the variables shown in the table but a correlation of .66 can be obtained from using only the two variables "Highest Teacher Salary" and "Superintendent's Ambition." Using completely factual variables, such as "Highest Teacher Salary," "High School Density," "Degree of

Urbanity," etc., one can obtain a multiple r of .63.

These results indicate that the traveling seminar and conference was viewed by the participants as a highly successful endeavor. The formal evaluation of the results of having participated in the seminar shows that those having had such experiences do, indeed, initiate more innovations in their school districts than one finds in districts which have not had the opportunity to participate in the seminar. In addition, some insight into the conditions which seemed to allow for educational innovation can be obtained from a study of the factors associated with the introduction of innovation.

As a result of the study of the effectiveness of the traveling seminar, the following recommendations can be made.

"1. The traveling seminar and conference technique should be expanded and actively supported by adequate financial resources as an effective dissemination activity for spreading innovation by the U. S. Office of Education, state departments of education, and local school districts.

"2. The traveling seminar and conference technique should be considered for incorporation in the dissemination programs of the planned U. S. Office of Education regional laboratories for research and development, under Title IV of the Elementary and Secondary Education Act of 1965."

Implication for Regional Laboratories

The studies previously cited deal with a wide variety of research and development situations and the transition from development into the application of the new knowledge or techniques. It appears that all of the studies point

in a similar direction; an attempt will be made to relate this impression to the regional development laboratories being established throughout the country.

First, a few words with regard to the situations in which research will be applied. One of the impressive results from the studies just cited, as well as from other observations, concerns the importance of the innovator and leader in research and development activities. It appears that frequently there is an individual who has a unique idea and who sees the possibility of developing it into a useful activity. This individual may well start out in the fairly pure research aspects of the area. If he is successful in these activities he may, with great determination, carry on into the advanced development and application phases. One can speculate that there may be many very successful research people who develop ideas and demonstrate their feasibility, but then do not carry forward to the application phase. In these instances the fruitfulness and utility of the idea become lost until some later person picks it up in connection with some other project (and, to judge by the Arthur D. Little study, this seldom happens). The importance of forceful leadership, dedication to an idea, and the carry-through from research into actual application is extremely important.

In large organizations there are frequently procedural and organizational considerations relative to the transition from research to development and to application. Often these activities are assigned to different major divisions of an organization on the theory that ideas developed in research will be picked up by a different group of people who will transform these ideas into an advanced development which is ready for application in some other

part of the organization. The evidence seems to indicate that this is not a fruitful way in which to promote new developments. It would appear that considerable management and organizational flexibility is required, along with much crossing of organizational lines and management hierarchy, to carry forth successful developments.

Similarly, with respect to funding, large organizations, and particularly the Government, are constrained to develop budgets and administer funds under fairly rigorous financial procedures. However, this tends to inhibit the needed flexibility for development of new research. As was evidenced, particularly in the weapon development study, the funds used for various developmental research activities often do not come from the particular budgetary category which one would logically expect them to come from. Rather, the leaders of the new developments tend to find their funds wherever they can and to have little regard for the formal funding organization. While this is disruptive of both management responsibility and neat accounting activity, it may well be one of the prices to be paid for effective development activities.

Another area which is critical to the application of new knowledge has to do with the problems of communication. Traditionally, the researcher has taken the position that if he publishes his results in the formal scientific literature he has discharged his responsibility. From the evidence cited it would appear that the formal publication of new findings does not by any means assure that the results will be expeditiously translated into a useful development. Rather, the findings of the studies cited, as well as other material, tend to indicate that informal communication is by all odds the most important

method or technique for transmitting ideas from one environment into a different one, and that engineers and technical people concerned with the application in new areas tend not to be as familiar with or dependent on the formal technical literature as the research scientist would like to think. This observation tends to emphasize the responsibility of the research scientist to make his results broadly known and communicate in a form which is readily accepted by practitioners.

With regard to traveling seminars, the SDC study has demonstrated that these seminars have the potential of being a very effective technique to stimulate the wide adoption of new innovations. However, a number of conditions are necessary before the traveling seminar will be useful as a powerful force toward innovation. Obviously, there must be large support on an extensive geographical basis, just as the Agricultural Extension Service is very widely supported. Perhaps more important, however, is the requirement that the various innovations to be demonstrated must be credible--credible in the sense that they are demonstrations of innovation in the ordinary school setting, carried out by regular personnel and not by specialists who come into the school situation and then leave. This, of course, emphasizes that the environment in the demonstration school district must be appropriate for the reception and continuation of a particular innovation. The factors making such an environment appropriate have been spelled out in the traveling seminar research. They particularly emphasize the importance of a strong leader who is dedicated toward the introduction and maintenance of new innovations in his particular school.

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Finally, some comments directly appropriate to the regional laboratories. The assumption is made that the primary purpose of the regional laboratory is not to undertake research per se but rather to facilitate the introduction and demonstration of new techniques in the various real school situations. There are already many sources of research sponsorship, and it would be unfortunate if these centers become simply another alternative way of administering research funds. Secondly,the regional laboratories will provide a great service if they are able to arrange for credible demonstrations of new techniques. The regional laboratory can stimulate local school personnel to try out new ideas and innovations to determine if they are applicable in the actual school situation and then use these demonstrations as examples for application in other school settings.

Implicit in this mission of sponsoring demonstrations is the problem of evaluating the effectiveness of new innovations. Before introducing innovations, it is important that the regional laboratories evaluate them, so that the demonstrations shown to other practitioners are demonstrations which have a proven usefulness in a school setting. Too often new techniques are introduced into the schools and are adopted widely without any sound evaluation to demonstrate that they, indeed, increase the effectiveness of instruction or school administration. It is extremely difficult to do good evaluation work in the field, and the regional laboratories will demand high quality personnel and sophisticated techniques if they are to be successful in this mission.

If the regional laboratories take as one of their missions the fostering of the transition from research to development to application, they would be

well advised to adopt several policies which will be somewhat contrary to well-regulated organizational concepts. Among these are that the regional laboratories should promote the movement of personnel between various organizations. It would be valuable if they could assist university personnel to become members of the laboratory, to become members of regular school systems, and to go back into the research or university setting. The transition of new ideas depends very much on the transition of people from one setting to another. Often our institutional barriers make it difficult for an individual to leave one organization and move to another even though the efficient promotion of new knowledge requires it. If the regional laboratories can work out techniques which will allow people to move easily from one setting to another, they would be doing a great service. Second, it would be hoped that the regional laboratories will have considerable discretion in the way in which they can spend their funds, that is, that their funds not be earmarked for limited specific purposes but rather that the director and trustees of the different regional laboratories be given flexibility regarding the kinds of projects they will support and the nature of support given in the various projects. Finally, care should be taken that the regional laboratories maintain a high degree of objectivity and independence. It is clear that if the laboratories are to engage in promoting new innovations, and particularly in promoting innovations which are truly useful in the practical school setting, they must be independent of the many different special interests in education. This is not to say that the special interests should not have a concern.

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Clearly, the researcher is concerned, the school board is concerned, the parents are concerned, but if the new innovations are to be given an adequate trial and a fair evaluation, it is important that the innovator and evaluator be given as much freedom and independence as possible; otherwise, his objectivity may suffer, and he may unduly limit the perspective and scope of the various innovations he will feel free to sponsor.

One final comment--it appears that the regional laboratories may well be one of the important educational innovations of our time. The clear facing of the problem of introducing new ideas into the ongoing school situation is extremely important. If the laboratories achieve independence and strength, we may look forward to important gains in education; however, the regional laboratories must be extremely careful to guard against the easy tendency to become simply another bureaucratic and report-generating organization. There is a challenge before the educational community, and this challenge is to make the regional laboratories really effective change-agents.

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