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ABSTRACT

In the first paper of this set, a paradigm which was developed in communication and diffusion research is adapted to define the educational innovation process in the form of producer-product-dissemination-users-adoption. Dissemination and adoption are subject to a number of factors, which can be further detailed. Previously innovation was seen as a one-way flow from producer to consumer, but a deeper understanding of the process shows the influence of consumer feedback and participation in product development. Paper Two reviews the growth of educational dissemination systems which were generated by educational research and development (R&D). The atmosphere of the postwar "Big Science" knowledge explosion and the pressure put on American education by the launching of Sputnik brought about the ERIC (Educational Resources Information Center) which was modeled on the new scientific information systems. This strictly archival system proved inadequate, another formal communication method was added--a series of reports on current topics. However informal communications are also needed, in the form of "extension agents" who can mediate between ERIC and users in the field. Such a system, whether implemented nationally or locally, would make ERIC more accessible. (SL)

TWO PAPERS ON EDUCATIONAL INNOVATION AND DISSEMINATION

Matilda B. Paisley & William J. Paisley

1. EDUCATIONAL INNOVATION: SUBSTANCE AND PROCESS

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   June 1973

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EDUCATIONAL INNOVATION: SUBSTANCE AND PROCESS

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EDUCATIONAL INNOVATION: SUBSTANCE AND PROCESS

New technologies, curricula, and organizational structures confront the alert educator in a kaleidoscopic pattern. Equipment, materials, and conceptualizations help to refocus people and ideas. The new pattern represents change. Educators and observers of the educational scene all testify to changes taking place in schools. Ideas like accountability, alternative schools, black studies, flexible scheduling, computer-assisted instruction, year round schools, and open classrooms are being talked about and tried in many schools throughout this nation. Some who write about these changes lament the slow pace of change. Others feel that despite the apparence of change, educational practice remains the same. Still others want teachers to emphasize "reading, 'riting, and 'rithmetic" like they did in the good old days. But whatever the perspective, the conversations and the writings repeat the theme of a change process -- a process that brings new ideas, new materials, and new methods into the school.

Two literatures are important in a discussion of the change process. These are the diffusion research literature and communication research literature. The diffusion literature is well represented in a GUIDE TO INNOVATION IN EDUCATION (Havelock, 1969) and COMMUNICATION OF INNOVATIONS (Rogers and Shoemaker, 1972). Both review and synthesize much of the early research as well as develop new ideas. These books are important because they go beyond separate aspects such as adopters and adoption rates into the context of innovation.

The communication research literature has recently been summarized and synthesized in THE PROCESS AND EFFECTS OF MASS COMMUNICATION (edited by Schramm and Roberts, 1971). Diffusion and communication literatures share many of the same ideas and models, although the fields developed differently. Diffusion research evolved from the traditions of anthropology, rural/medical sociology, and education. Communication research grew from sociology, political science, and psychology. However, our current understanding of the two fields shows considerable overlap. An illustration of the extent of mutual concerns is that Schramm and Roberts devote 15 per cent of their book to innovation and change.

The overlap is again illustrated by Rogers and Shoemaker, who use communication models to describe the diffusion process. They tell us that in the 1930's and 1940's communication researchers subscribed to a "hypodermic needle" model that emphasized the immediate and powerful effects of mass media on the audience. This could be characterized as a one-step flow model of communication. Rogers and Shoemaker point out that the 1940 Presidential election simultaneously destroyed the hypodermic needle model and created the two-step flow model. In studying this election, Lazarsfeld and his colleagues found little evidence of direct influence of the mass media. Few voters altered their vote intentions directly on the basis of information presented in the media. Rather "opinion leaders" obtained information from the media and in turn influenced their friends and neighbors. Coleman, Katz, and Menzel (1966), used this two-step flow communication model in their study of the diffusion of a pharmaceutical, and expanded it to a multi-step flow of communications. Rogers and Shoemaker explain the current understanding of the multi-step flow model:

> It does not call for any particular number of steps nor does it specify that the message must emanate from a source by mass media channels. This model suggests that there are a variable number of relays in the communication flow from a source to a large audience. Some members will obtain the message directly through channels from the source, while others may be several times removed from the message origin. The exact number of steps in this process depends on the intent of the source, the availability of mass media and the extent of audience exposure, the nature of the message,

and salience of the message to the receiving audience.

One paradigm that is particularly useful in describing both the diffusion and communication processes is Harold Lasswell's well-known description of a communication act. Lasswell phrased it:

WHO SAYS WHAT IN WHICH CHANNEL TO WHOM WITH WHAT EFFECT?

If we break this sentence into the five steps it implies about the communication process, we find it also describes the diffusion process. To describe diffusion the paradigm becomes:

SOURCE MESSAGE MEDIUM AUDIENCE IMPACT.

To discuss the process of innovation, we need to modify the paradigm again by translating the original statement

	WHO		PRODUCERS
	SAYS WHAT		PRODUCTS
FROM:	IN WHICH CHANNEL	TO:	DISSEMINATION MEDIUM
	TO WHOM		USERS
	WITH WHAT EFFECT?		ADOPTION.

Each step helps us understand one aspect of innovation. We can discuss innovation in the context of where it starts, what forms it takes, how it is disseminated, who are the potential users, and what are the conditions for adoption.

EDUCATIONAL INNOVATION: WHERE DOES IT START?

Although there is no single classificatory scheme of the producers of educational innovations, we see the range by looking at individuals and groups who produce innovations INSIDE THE

SCHOOL, ACROSS SCHOOLS, and OUTSIDE THE SCHOOL. In the first category we find classroom teachers, principals, and curriculum committees. In the secondary category we find superintendents and specialists/consultants in the district and state offices. In the third category we find researchers in academic settings, researchers in non-profit/non-academic research and development laboratories, and developers in educational publishing companies.

Within this list we see the likelihood of developing and disseminating innovations increases as we move from inside the school to outside the school. Those in the school have many functions to perform. Their days are filled with teaching, meetings, preparation for class, administration, etc. And when they do innovate, there is rarely the motivation or opportunity to let others know about the innovation. Studies have shown that the teacher who creates new materials is unlikely to share them even with others in the building. Similarly the curriculum committee who works out a new sequence probably will not try to disseminate these materials.

At the other extreme we find the researchers in an educational publishing company. A great deal of time is devoted to developing and field testing new materials and to publicizing them. Here, as well as in research and development (R&D) centers, the reward system favors innovative thinkers who produce new materials, new ideas, or new methods of instruction.

A corollary question to 'Who produces?' is 'Who stimulates production?' Our list here includes administrators such as principals encouraging teachers to develop new materials; state superintendents providing sufficient money in state or local research units; private foundations supporting teacher centers, etc.; the federal government funding both academic researchers and non-academic R&D center researchers through agencies like NSF, USOE, and NIE; and private companies developing textbooks, audiovisuals, etc.

EDUCATIONAL INNOVATION: WHAT FORMS DOES IT TAKE?

There are many types of innovations. The range includes curriculum materials, technological advances, and organizational restructuring. Some innovations are quite tangible. Schools can purchase or rent films, textbooks, computer terminals for CAI, etc. Other innovations are less tangible. These include methods of teaching like team teaching, methods for organizing classroom lessons like behavioral objectives, and new physical structures like open plan schools.

EDUCATIONAL INNOVATION: HOW IS IT DISSEMINATED?

Once the producers of innovations have finished products, their job is not over. Or at least it should not be. The new materials, ideas, methods, etc. need to be disseminated to educators. How is this done? As we said earlier, the one-time or occasional producer rarely disseminates the product.

Lippitt (1965) says, in writing about this problem:

> In education, a great proportion of the significant new inventions in our field remain quite invisible, undocumented, inaccessible for consideration by potential adopters. There is a high level of inhibition to communicating. There is a lack of articulateness about what has been invented and a lack of documentation.

Pellegrin (1966) adds:

> There are grave weaknesses of channels and procedures for dissemination. Unlike many academic disciplines, education cannot rely almost exclusively on the printed media for disseminating information. ...there is a great deal of suspicion of sources of knowledge which are not known personally to the practitioner.

But some innovations do get into the schools. How are these innovations disseminated? What is the linkage system that informs the educator of the new practice? It is now apparent that research and development can reach practitioners in a wide variety of ways. Services provided by linkage programs can be characterized as information, instructional materials, technical assistance, and continuing education.

Linkage programs that provide information to educators include the federal Putting Research into Educational Practice (PREP) program, the federal ERIC system, Phi Delta Kappa's School Research Information Service, the Educational Products Information Exchange, as well as educational associations' national conventions, journals, state educational information centers, state research coordinating units, regional information centers, boards of cooperative services, and school/study councils. Linkage programs providing instructional materials include the federal Special Educational Instructional Materials Centers and some locally managed instructional materials centers. Technical assistance linkage programs include regional educational laboratories, research and development centers, some state education agency consultants, and a few school research offices. Continuing education linkage programs include education convention presessions, university evening and summer programs, and many teacher centers.

Since most innovations are not actively disseminated, the interested educator needs to know where to learn about them. Fortunately, there are several good sources. The federal program Putting Research into Practice (PREP) has published many documents that synthesize or interpret current educational practice. PREP-29 NEW PRODUCTS IN EDUCATION is a good first source. It describes the 13 "winners" of a USOE-sponsored assessment of the validity and utility of new products. Included are: Home-Oriented Early Childhood Education from the Appalachia Educational Laboratory; MATCH (Materials and Activities for Teachers and Children) Box from The Children's Museum, Boston; Parent/Child Toy Lending Library from Far West Laboratory for Educational Research and Development; Patterns in Arithmetic from Wisconsin Research and Development Center for Cognitive Learning; etc. Most of the innovations assessed in PREP-29 are also described in a USOE produced EDUCATIONAL PRODUCTS MINI-KIT. The kit contains 12 filmstrips plus audio cassettes.

A second useful report is CONSUMER'S GUIDE TO EDUCATIONAL INNOVATION produced by Council for Basic Education in Washington, D.C. It covers a few dozen of the most discussed innovations, including non-curricular innovations in staffing, use of space, etc.

Two directories worth noting are ALERT: A SOURCEBOOK OF ELEMENTARY CURRICULA PROGRAMS AND PROJECTS and CEDaR CATALOG OF SELECTED EDUCATIONAL RESEARCH AND DEVELOPMENT PROGRAMS AND PRODUCTS. ALERT is produced by the Far West Laboratory for Educational Research and Development, San Francisco. It covers all noteworthy elementary level products. It carefully addresses the hard questions of cost, staffing requirements, inservice training requirements, etc. CEDaR is produced by the Council for Educational Research and Development in Denver. Volume 1 covers existing products from ten national educational laboraties and nine university-based research and development centers. Volume 2 covers forthcoming products now under development. Each product is summarized in one page of information including product name, producer, target audience, product characteristics, product evaluation and price.

Some producers have filmed materials describing their innovations. After locating an innovation through ALERT or CEDaR, one can contact the producer to see what descriptive materials are available.

One access point to commercial producers is the WESTINGHOUSE LEARNING DIRECTORY, available from Westinghouse Learning Corporation, New York. It differs from the previously mentioned sources in two ways. First, it is a list of all available educational materials, not just innovations. Second, it provides no evaluation of products.

An additional source of information about innovation is the federal network of Educational Resources Information Centers (ERIC). A list of the 19 ERIC clearinghouses can be obtained from ERIC, National Institute of Education, Washington, D.C. The information system is responsible for collecting and indexing reports of innovative programs and significant efforts in educational research. Abstracts of all ERIC documents are published in RESEARCH IN EDUCATION, a monthly list of newly accessioned materials. All abstracts are also stored on magnetic tape that can be computer searched by using terms descriptive of interests. Full text of documents is available at low cost.

A somewhat different source of information is Educational Products Information Exchange (EPIE) in New York. Subscribers to the service receive EDUCATIONAL PRODUCT REPORT, a monthly technical journal and EPIEGRAM, a bi-monthly consumer report newsletter. These reports of new products evaluated in the field or in EPIE's laboratory are intended to guide educators' decisionmaking.

Regions and states (Kansas' Project Communicate is an example) have begun to compile directories of sites where innovations can be observed conveniently by educators in their service areas.

EDUCATIONAL INNOVATION: WHO ARE THE USERS?

Users range from individuals to entire school systems. For instance, a teacher might decide to add a new workbook to the course. A committee might decide to adopt a science curriculum. A school district might decide to try the 45-15 plan for year-round school.

Potential adopters, when considering a particular innovation, need to be aware of the types of people who might be affected, including pupils, parents, teachers, administrators, other school staff, employers of graduates, etc.

EDUCATIONAL INNOVATION: WHAT AFFECTS ADOPTION?

To understand the adoption process we need to examine both the factors influencing the adopter and the characteristics of the innovation.

First, let's look at the individual as potential adopter. We know he has characteristics or traits that affect his level of innovativeness. As illustrated in Figure 1, these can be viewed as demographic, cognitive, affective, motivational, life-cycle, and situational subsystems. The function of these subsystems is better understood if we think of the three phases necessary for adoption. Rogers, Carlson and others talk about the knowledge (awareness) phase, the attitude (persuasion) phase, and the behavior (adoption) phase. These three phases and their relationship to the subsystems are shown in Figure 2. Each phase is blocked to some extent by a line of resistance created by the subsystems. Only under certain conditions will the subsystems allow the person to accept the new knowledge, develop a favorable attitude, or adopt the innovation. For instance, a teacher who never goes to conventions, who subscribes to no educational journals, who is "closed minded" (as a personality trait), who has been teaching for 15 years, and whose principal does not tolerate changes in the classroom, is unlikely to have knowledge, attitudes, or behavior altered by information about innovations. The line of resistance is firm. On the other hand, a principal who goes to national and regional meetings, who subscribes to educational journals, who is willing to tolerate a certain amount of risk, and who is 'open minded' is likely to allow new knowledge, attitudes, and behaviors to cross the line of resistance. In these examples the educator is passive, with the profile of traits determining what crosses the line of resistance.

Figure 1: INTRA-PERSONAL SUBSYSTEMS AFFECTING INNOVATIVENESS

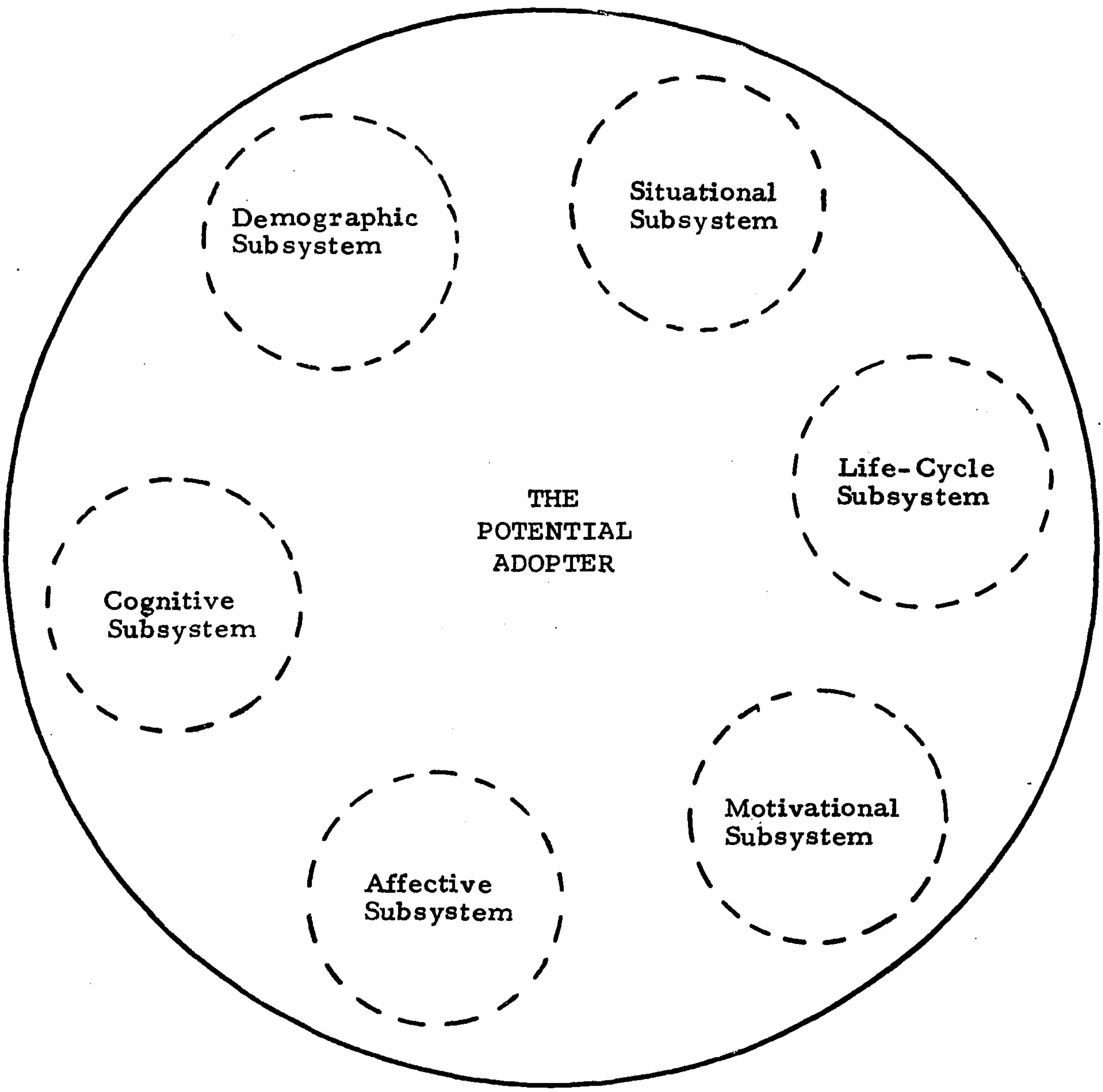
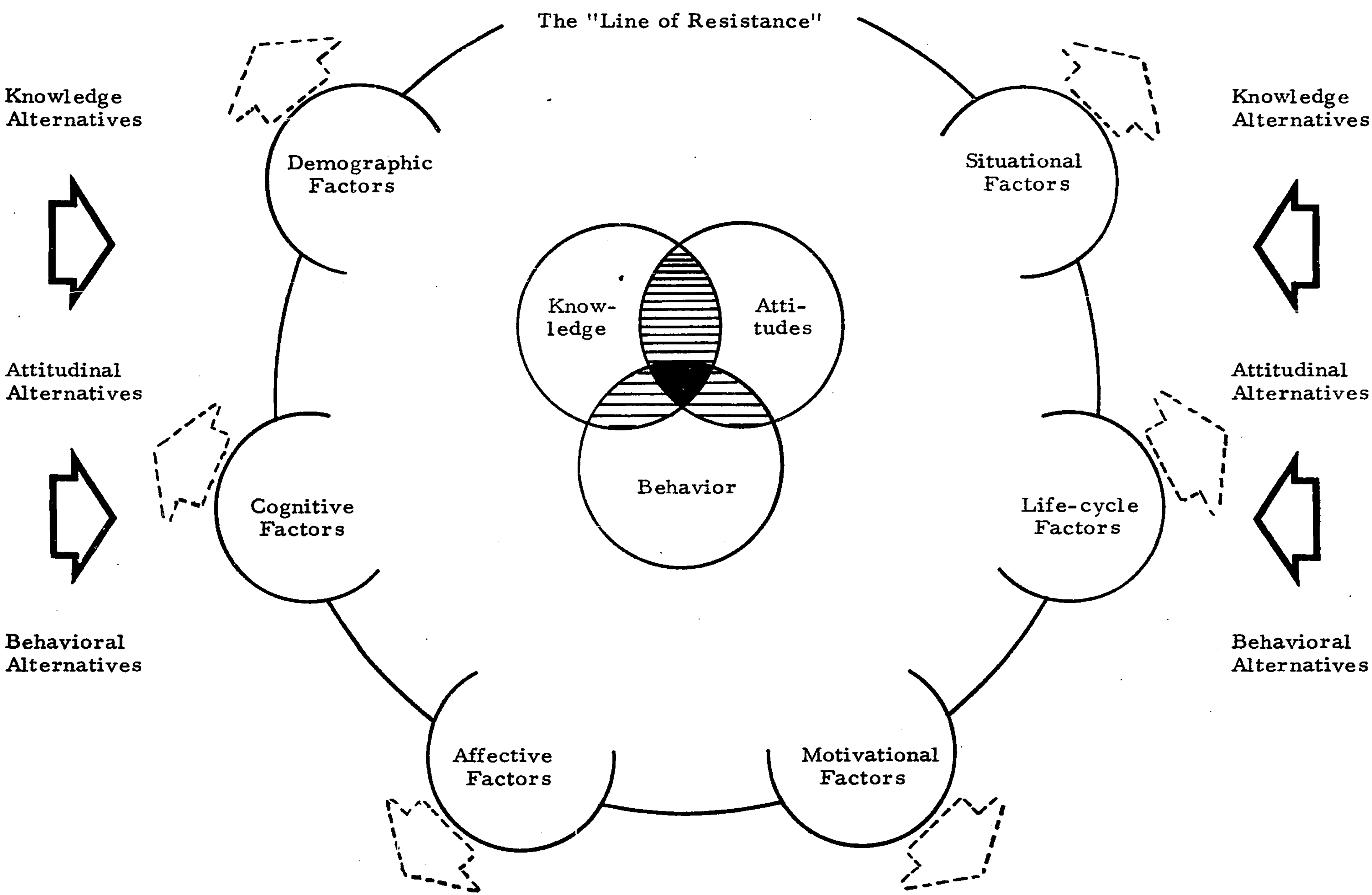


Figure 2: INTERRELATIONSHIPS OF INTRA-PERSONAL SUBSYSTEMS AND KNOWLEDGE, ATTITUDES, AND BEHAVIOR



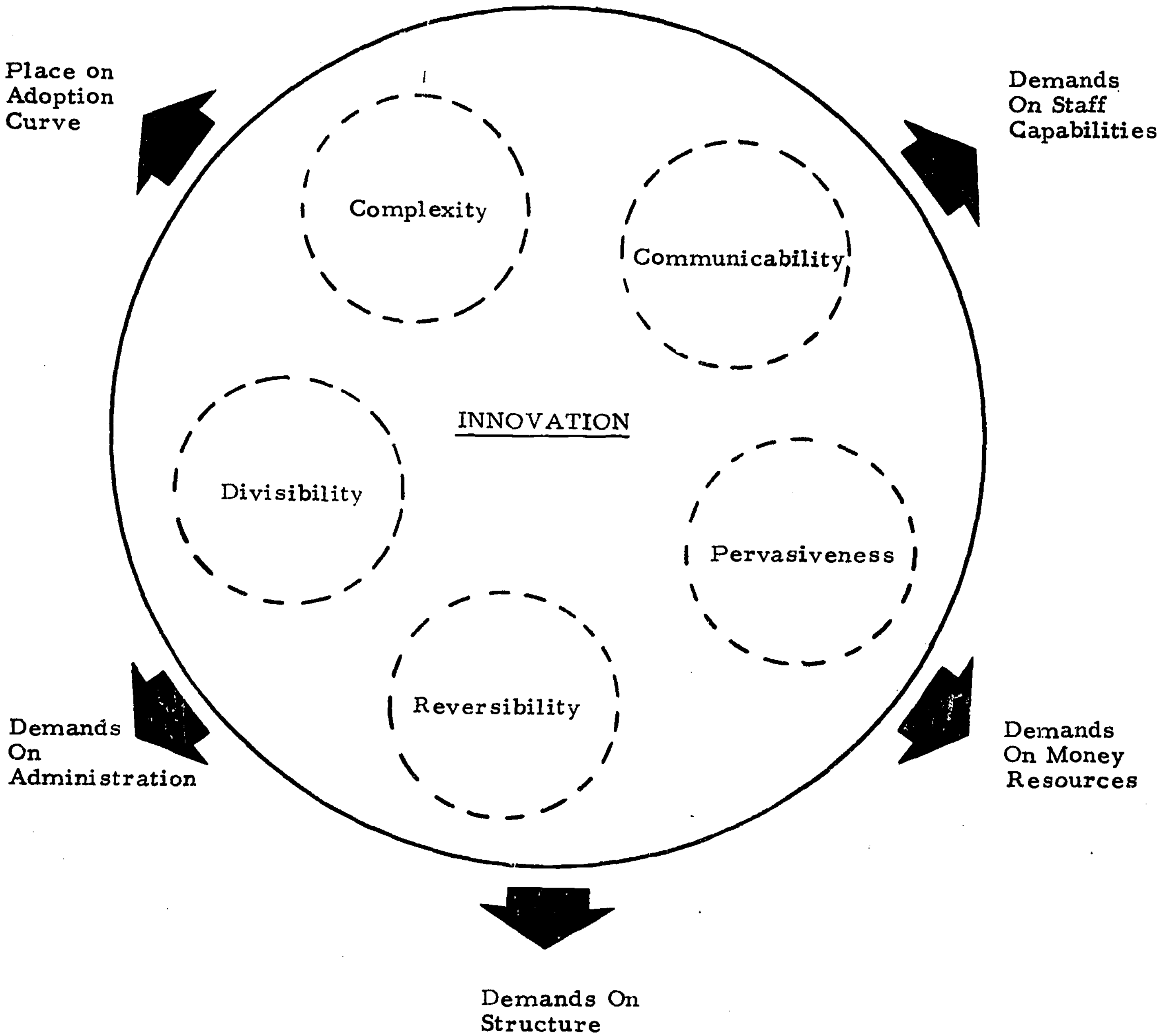
The dashed arrows extending out from the trait subsystems indicate that the educator can also be active. By purposefully seeking information about innovations, the line of resistance is crossed by the educator rather than by the information. This is also true for attitudes and behaviors. Some educators are active in the process, while others passively allow some information, attitudes and behaviors to enter.

However, we see in the center of Figure 2 that even when knowledge, attitudes, and behaviors have crossed the line, they may only partially overlap. Overlap between any two of the three is represented by straight lines. Overlap of the three, resulting in adoption of new innovations, is represented by solid black.

When a group rather than an individual is the adoption unit, multiple individual systems are operating as well as a group system. The group system, like the individual system, is also made up of subsystems. However, they have the added dimension of being strongly influenced by group dynamics.

An innovation also has certain properties that help determine the likelihood of its acceptance in a school. The internal properties are shown in Figure 3. They include complexity, trialability, observability (Rogers and Shoemaker, 1971), pervasiveness, and reversibility (Katz, 1965). External properties of the innovation include its place on the adoption curve, the demands it makes on staff capabilities, the demands on money resources, the demands on the school structure, and the demands on

Figure 3: PROPERTIES OF INNOVATIONS THAT INFLUENCE ACCEPTANCE IN SCHOOLS



administration of education. If these demands are particularly heavy, then adoption is unlikely. If they are light, then adoption is much more likely.

Of course it is possible to intervene in this process. Personal linkage systems or media-mediated linkage may provide the answer when print linkage systems prove inadequate. In a number of states personal linkage has proved effective in building bridges over lines of resistance. Sometimes linkage is provided by educational extension personnel, sometimes by teacher center/advisory staff, sometimes by school/study council consultants, sometimes by regional laboratory technical assistants, etc. In states where personal linkage is too expensive, it may be possible to develop effective media campaigns that rely on print and two way audio/video. Educational television, telephone hook-ups, information hotlines, and two-way cable all hold promise for media dissemination systems. Current examples of effective use of media include Arkansas' state department of education weekly television programs, Kansas State University's two-way teaching/learning device called Telenetwork, and University of Wisconsin's ETN network that reaches educators via telephone line with on-site audiovisuals.

Unfortunately, the innovation dissemination process has been tied to our early understanding of communication and diffusion. In general, the innovation process is still considered to be a one-way street that starts with a producer and ends with an adopter.

It is time to encompass feedback loops that are now recognized in the communication process. These feedback loops applied to innovations mean that practitioners have direct access to the producer both in reporting needs and in reacting to products. At present, the producer has limited interest in the user. And although it would be difficult to argue that the producer be limited to the stated needs of practitioners, we should argue that producers be responsive to these needs. A linkage system connecting user and producer may eventually be more significant than the linkage system connecting innovation to user. Products that grow out of an open, participatory, responsive system will already have bridges to carry them over lines of resistance.

CONCLUSION

Everyone involved in the educational process is also involved in educational change. We may try to ignore it and resist it, but change, at least at the micro level, happens anyway. What is needed is a better understanding of the innovation process so that we can become actors rather than reactors in the process. Then as actors we can begin working toward a more open and participatory process that provides feedback at many points along the continuum from producer, product, dissemination, and user to adoption.

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'POST-SPUTNIK' TRENDS

IN EDUCATIONAL DISSEMINATION SYSTEMS

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June 1973

'POST-SPUTNIK' TRENDS
IN EDUCATIONAL DISSEMINATION SYSTEMS

Educational dissemination systems have come into existence in response to pressure "upstream" in the flow of educational research and development knowledge -- that is, pressure emanating from researchers/developers and their sponsors. To understand the growth of educational dissemination systems, we must first understand, in some fashion, the growth of educational research and development itself.

If we were to look at the growth of educational R&D as an isolated phenomenon, we might be puzzled that, at one moment in history, the federal government suddenly began to double its investment in educational R&D each year for several years. Or, if we were not now past that period of exponential growth, we might conclude that such increases are simply "modern times," that a technologically based society regulates itself through vast expenditures in research and development (which is partly true anyway).

We can see now that the sudden growth in educational R&D was more of an historical episode than a projection of the future. Funding of educational R&D is now leveling off, but at the high post-growth level of support rather than the low pre-growth level.

Educational R&D is the offspring of more rigorous sciences such as psychology, sociology, and statistics. Its sudden growth began at a moment in history when:

(1) the post-war emergence of "Big Science" had clarified the relationship between the federal government as a new sponsor of research and scientists as unaccustomed beneficiaries of large-scale support;

(2) the source fields on which educational R&D depends, psychology in particular, had developed theories and methods that promised to be productive when focused on educational problems;

(3) external pressure was applied for rapid, major improvement in the quality of American education.

Let's examine the convergence of these trends. The post-war emergence of "Big Science" was a striking occurrence in the history of mankind. It signaled a different approach to control of the environment, to production, to the provision of services, to social planning, etc. Industries that had been labor-intensive became knowledge-intensive. New knowledge industries were born. And, most indicative of all, the pre-war model of small-scale "solo science" gave way to large-scale organized science with teams of researchers, specialization, and division of labor.

"Big Science" was a by-product of the Second World War. It is the post-war extension into all fields of science of the organizational principles of the Manhattan Project and other ordnance-related projects. It could be argued that "Big Science" was born in Nazi Germany, since Hitler mobilized the scientists of that country somewhat earlier than their counterparts were mobilized in the United Kingdom and the United States.

In recent decades, according to the historian of science Derek de Solla Price, various forms and products of science have been doubling every 10 to 20 years. Thus it can be shown that the number of practicing scientists doubles every 15 years or so, and that some of their products (such as technical reports) double faster than this rate while other products (such as substantial or "classic" journal articles) double slower than this rate.

The traditional first step in research is to acquaint oneself thoroughly with the work of one's predecessors, then to choose a promising topic from their legacy of unsolved problems. From the 17th century (when science became a recognized activity of certain men through the founding of associations such as the Royal Society of London) to the early 20th century, there was an orderliness in this process that derived from the relatively small number of scientists and the relatively show pace of their work.

With the advent of "Big Science," however, twin new pressures overstressed the existing dissemination systems of science. First, there was the immediacy of one's "predecessors." If the number of practicing scientists doubles every 15 years or so, it follows that, at any moment, most scientists who ever lived are now alive. Working with hypothetical data, a doubling period of 15 years would produce a world population of scientists in 1930, 1945, 1960, and 1975 of 2 million, 4 million, 8 million, and 16 million. Since all the scientists who had lived before a given period (e.g., 1930) would not exceed the doubling value of that period (the doubling value of a period is the limit for cumulated previous doublings), we see in the post-war period a great immediacy in research. One's predecessors are one's contemporaries, and their work is not to be read in leather-bound journals from the past.

Second, the team approach, a hallmark of "Big Science," produces documents at a prodigious rate. Individually, the documents at not as valuable as the documents of "Little Science," but there are vastly more of them and they conceal their differences in quality.

Between them, these two factors produced what is now referred to as the "knowledge explosion." Existing dissemination systems sagged under the unprecedented volume of documents, and new systems had to be invented to avoid disastrous amounts of duplicative and erroneous research.

To understand the timing of educational R&D's growth, we must note that "Big Science" did not come to all fields of science at the same time. The war-time managers of science, chiefly James Conant and Vannevar Bush, were especially concerned for the support of post-war physics. The National Science Foundation, whose legislation they lobbied through Congress and past one veto by President Truman, provided large-scale support first for physics, then for chemistry (after chemists organized to complain, in the "Westheimer Report," that they were disadvantaged), then for geology and other hard sciences.

The advent of "Big Science" in the life sciences came with a series of bills introduced by Senator Lister Hill in the 1950's. Lister Hill's patronage of biomedicine is the major single reason for the growth of the NIH research empire.

After the physical sciences and the life sciences had each, in their turn, made the transition into "Big Science," the time was ripe for the social sciences and, finally, educational R&D. Some support for the social sciences had come from the Department of Defense throughout the war-time and post-war years. These funds were greatly augmented when NSF and NIMH appeared on the scene.

In the late 1950's the stage was set for large-scale support for educational R&D in the sense that conditions #1 and #2 (see page 3) had been fulfilled. What was lacking was a trigger or catalyst that would cause Congress to draft the new legislation, pass it, and appropriate funds for it.

The trigger was Sputnik I. Indicating, as it then seemed to, a superiority in Soviet science and hence presumably in Soviet education, Sputnik I spurred Congress to pass, in 1958, the National Defense Education Act. It was not the first educational R&D legislation passed by Congress. It had been preceded by the Cooperative Research Act of 1954. "Coop Research," however, was a vestige of "Little Science," an invitation to solo researchers to continue doing whatever they had been doing before, but under small-scale federal sponsorship, while "NDEA" was a mission-oriented, focused act that placed specific priority on certain kinds of research that the government wanted from "Big Science" teams of researchers.

A series of federal authorizations for educational R&D, contained in legislation such as the Vocational Education Act of 1963, the Elementary and Secondary Education Act of 1965, the Higher Education Act of 1965, and the Educational Professions Development Act of 1967 (to name only a few acts), created a situation in which researchers were force-fed funds that they converted to paper in unprecedented volume. Tables 1 and 2 (pages 8 and 9) show how rapidly the budgets of educational laboratories and R&D centers increased from 1966 through 1969, doubling on the average each two years. Figure 1 (page 10) shows how the total "research and training" outlay of the U.S. Office of Education grew from almost nothing in 1956 to more than $100 million in 1969, most of it channeled through the Cooperative Research Act as amended by the Elementary and Secondary Education Act of 1965.

As other federal agencies had discovered since the Second World War, the U.S. Office of Education discovered that each million dollars awarded competitively to researchers buys a vast amount of paper, some of it in the form of technical reports directly related to grants and contracts but perhaps an equal amount in the form of papers, articles, books, and other proofs of busyness.

TABLE 1. **BUREAU OF RESEARCH SUPPORT FOR REGIONAL EDUCATIONAL LABORATORIES***

	1966	1967	1968	1969
Appalachia Educational Laboratory Charleston, W. Va.	$ 319,880	$ 1,200,000	$ 993,795	$ 895,478
Center for Urban Education—New York, N.Y.	918,900	2,539,000	2,675,000	2,633,794
Central Atlantic Regional Educational Laboratory—Washington, D.C.		570,257	780,000	390,000
Central Midwestern Regional Educational Laboratory—St. Ann, Mo.	695,082	805,640	1,350,000	1,700,000
Cooperative Educational Research Laboratory, Inc.—Northfield, Ill.	188,580	410,000	600,000	270,000
Eastern Regional Institute for Education Syracuse, N.Y.	199,613	633,715	943,385	998,700
Education Development Center, Inc. Newton, Mass.	168,270	267,000	1,041,162	959,655
Far West Laboratory for Educational Research and Development—Berkeley, Calif.	375,000	730,249	1,250,000	1,685,170
Michigan-Ohio Regional Educational Laboratory—Detroit, Mich.	184,240	299,600	800,000	384,500
Mid-Continent Regional Educational Laboratory Kansas City, Mo.	600,000	900,000	730,000	937,713
Northwest Regional Educational Laboratory Portland, Oreg.	420,810	1,333,000	1,543,500	1,690,000
Regional Educational Laboratory for the Carolinas and Virginia—Durham, N.C.	190,209	349,472	693,744	820,000
Research for Better Schools, Inc. Philadelphia, Pa.	406,447	1,603,377	2,089,240	2,700,000
Rocky Mountain Educational Laboratory Denver, Colo.	285,700	646,156	514,039	346,000
South Central Region Educational Laboratory Little Rock, Ark.	180,705	451,000	870,000	320,000
Southeastern Educational Laboratory Atlanta, Ga.	362,100	739,000	670,000	670,000
Southwest Educational Development Laboratory Austin, Tex.	216,349	1,399,939	1,400,000	1,700,000
Southwestern Cooperative Educational Laboratory Albuquerque, N.Mex.	294,200	696,900	751,867	862,244
Southwest Regional Laboratory for Educational Research and Development—Inglewood, Calif.	830,225	1,570,000	2,235,000	2,486,726
Upper Midwest Regional Educational Laboratory Minneapolis, Minn.	530,000	525,000	678,000	800,000
Total	7,366,310	17,669,305	22,438,732	23,250,047

*Actual obligations to laboratories for fiscal years, ending June 30.

Source: Educational Research and Development in the United States. Washington: National Center for Educational Research & Development, 1970.

TABLE 2. COOPERATIVE RESEARCH SUPPORT FOR RESEARCH AND DEVELOPMENT CENTERS, POLICY CENTERS, AND THE NATIONAL LABORATORY ON EARLY CHILDHOOD EDUCATION*

	1964	1965	1966	1967	1968	1969
Center for Research & Development for Cognitive Learning–Wisconsin	------	$499,600	$808,081	$1,034,000	$1,687,849†	$1,200,000
Center for the Advanced Study of Educational Administration–Oregon	$508,769	533,586	663,186	675,558	590,000	493,812
Center for Research & Development in Higher Education–Berkeley	------	------	315,657	849,307	1,459,000†	938,128
Research & Development Center in Teacher Education–Texas	------	------	459,175	762,730	1,190,419†	820,000
Learning Research & Development Center–Pittsburgh	490,000	753,531	641,794	1,308,702	1,465,482	1,454,332
Research & Development Center in Education Stimulation–Georgia	------	------	401,118	731,552	1,237,326†	758,000
Stanford Center for Research and Development in Teaching–Stanford	------	------	349,625	796,701	1,597,000†	995,432
Center for the Study of the Evaluation of Instructional Program–UCLA	------	------	408,981	533,973	867,882†	809,415
Center for the Study of the Social Organization of Schools and the Learning Process–Johns Hopkins	------	------	------	172,717	741,618†	613,880
National Laboratory on Early Childhood Education	------	------	------	1,448,630	1,561,500	1,700,000
Educational Policy Research Center (SRI)	------	------	------	110,000	499,154	500,000
Educational Policy Research Center (SURC)	------	------	------	110,000	499,951	500,000

*Actual obligations to Centers for indicated fiscal years, ending June 30.

†Contracts for these centers were extended by from 1 to 7 months beyond the normal 12

Source: Educational Research and Development in the United States. Washington: National Center for Educational Research & Development, 1970.

APPROPRIATIONS FOR "RESEARCH AND TRAINING"
U.S. OFFICE OF EDUCATION, 1957–1969

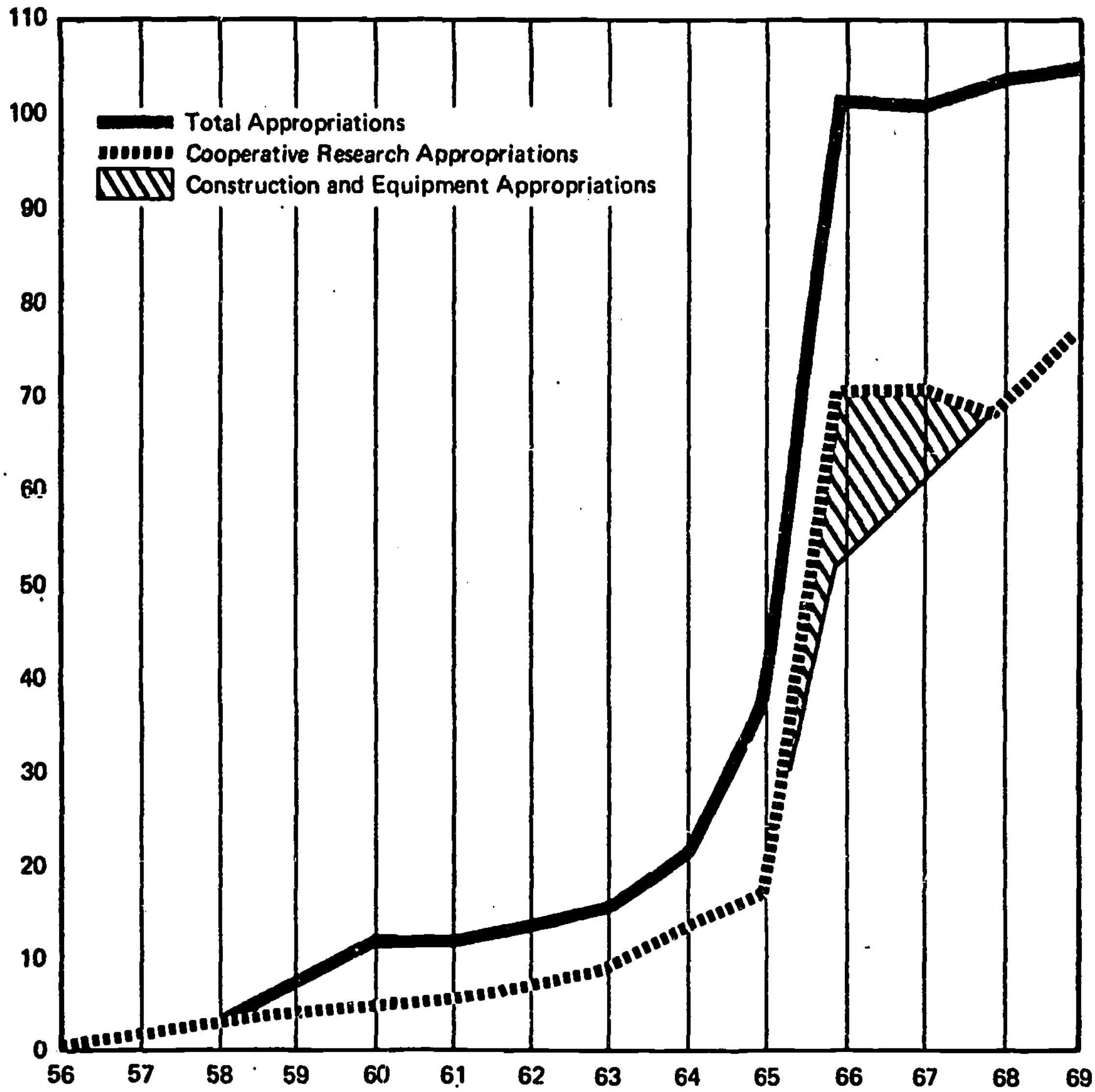


FIGURE 1.

Source: <u>Educational Research and Development in the United States</u>. Washington: National Center for Educational Research & Development, 1970.

The earlier forced-feeding of physics, chemistry, biomedicine and other fields created information problems that federal agencies dealt with in various ways, ranging from the establishment of new federal information systems to the subsidy of private information systems. Spurred on by early symptoms of an information crisis, NSF established an Office of Science Information Service to support research and development on documentation, bibliographic processing, computer information retrieval, etc. OSIS invested heavily in the information systems of the American Institute of Physics and the American Chemical Society, hoping that these professional associations could expand their bibliographic services fast enough to stay abreast of documentation on its 10-15 year doubling cycle.

Biomedicine was fortunate enough to have one of the three national libraries (the Library of Congress, the National Library of Medicine, and the National Library of Agriculture) as its base for new information systems. NIH invested only to a limited extent in external information systems and instead developed MEDLARS as an access system for the National Library of Medicine.

With initially vast sums at their disposal, the Department of Defense and the National Aeronautics and Space Administration chose to establish wholly new information systems for themselves and their contractors. Despite some retrenchment, the Department of Defense still operates the country's largest network of specialized information centers.

It was in the context of these varied "solutions" to the information crisis that the U.S. Office of Education had to decide, in the mid-1960's, how to cope with educational R&D information.

USOE's first solution, the network of Educational Resources Information Centers (ERIC), was conceived in the early 1960's by non-governmental researchers under NDEA funding. If ERIC came into existence looking like a physics or chemistry information system, the answer lay in the limited number of information system models then available. Principles that are now well understood, such as necessary differences in information systems for researchers and for "practitioners" and differences in vocabulary control between "hard" and "soft" sciences, were hammered out in the late 1960's at the expense of information systems that were failing in their missions and had to be reconceptualized.

The 10-year-old concept of ERIC as a network of decentralized processing centers or "clearinghouses" and a central coordinating office was never invalid insofar as the important functions of acquisition, processing, and archiving were concerned. However, it was thought at first that users (educators, researchers, and policymakers) would relate directly to ERIC, searching out relevant documents through its bibliographic tools and ordering microfiche or "hardcopy" from the ERIC Document Reproduction Service. While some users (especially researchers) went through these steps, other users ignored ERIC quite simply because access to it lay above the "ceiling" of effort that they felt educational information justified. Even with the promise of more accurate and complete information, ERIC could not compete with the popular press of education, the interpersonal grapevine, and the common alternative of not knowing at all.

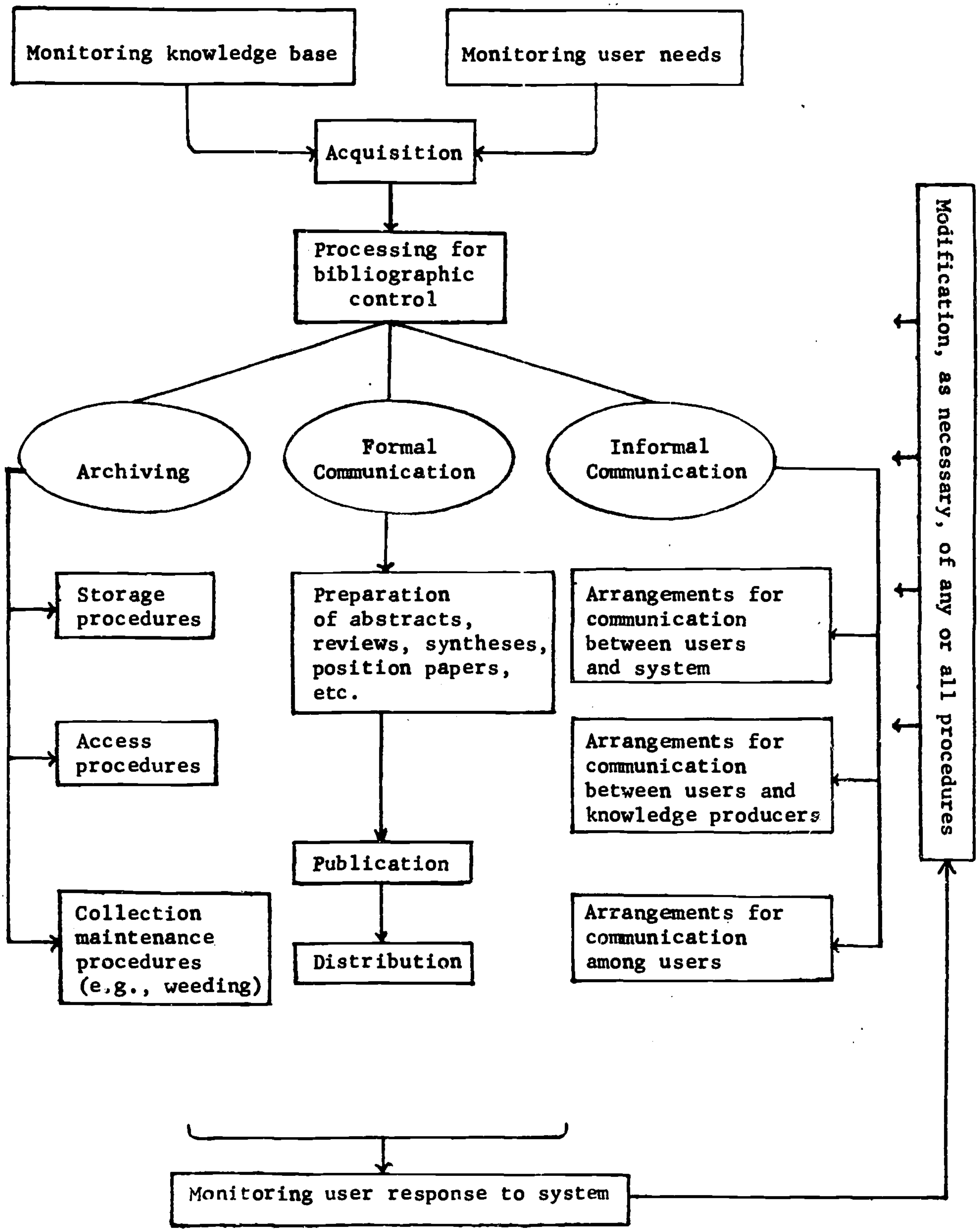
Expressed in the terminology of Figure 2 (page 14), early ERIC stressed archiving and subordinated the parallel functions of formal and informal communication. Although clearinghouses were encouraged to produce reviews and state-of-the-art papers, there was no procedure for distributing these products widely. To 99 out of 100 educators, they didn't exist.

A far more successful strategy for formal communication was initiated at the close of the 1960's. A continuing series of reports was published under the heading Putting Research into Educational Practice (PREP). PREP reports were commissioned on topics of highest current interest among educators. Writing and editing were relatively polished according to prevailing standards in educational R&D. PREP reports were directed primarily to state departments of education, with the suggestion that the states republish freely, under their own banners if desired.

Data from field studies showed that PREP reports were reaching much wider audiences than other ERIC products. Certainly far more educators read PREP than conducted ERIC searches.

PREP reports were only the vanguard of a series of user-oriented publications. Booklets on model programs (e.g., reading, compensatory education), an audiovisual "educational products minikit," and catalogs like ALERT (Alternatives for Learning through Educational Research and Technology) were created under ERIC and other auspices to apprise educators of the most promising programatic outcomes of educational R&D. "Repackaging the educational knowledge base" moved from the status of concept to successful practice in just a few years.

Figure 2. Simplified flow-chart of information system functions.



Yet to be solved, however, was the problem of bringing the full resources of the ERIC system to educators who were incapable or unwilling to conduct searches themselves. What could be done, for example, for the teacher who seeks research-based alternatives for teaching science concepts, or dealing with classroom behavior problems? What could be done for the guidance counselor who has been asked to recommend drug education films or career education materials?

Since it is not possible to pre-assemble and publish all kinds of wanted information in PREP-like formats, a system was needed that would establish contact between users and the ERIC knowledge base itself. An effective answer has been found recently in the extension model that is such a familiar part of Department of Agriculture service in this country. "Extension agents" can serve as intermediaries between users and the ERIC knowledge base, translating requests into the controlled language of the ERIC Thesaurus, conducting searches of ERIC resources, obtaining documents that are relevant to requests, conveying these documents to users, and in some cases translating from researchers' language to practitioners' language.

With the addition of an extension system, educational dissemination encompasses the three sets of functions shown in Figure 2. According to the sophistication of the user and the nature of his information needs, it becomes possible to approach ERIC via the traditional access procedures of an archive, via formal communications like PREP, or via informal communication with extension agents.

The important lesson to be gleaned from the ten-year history of federal effort in educational dissemination is not that some systems are ineffective, as early ERIC was, but that systems can evolve toward effective combinations of functions and channels for particular users. Systems that were established in the mid-1960's by professional associations and other organizations to rival ERIC have largely disappeared because of their inability to evolve beyond the archival phase.

The National Institute of Education is deliberating whether to operate an entire dissemination system, including cadres of extension agents, or operate only the archival and publication systems in support of extension agents deployed by state departments of education, school districts, and others. The emerging NIE policy will be of some consequence to states and school districts that cannot afford to field their own extension personnel, but other states and districts will proceed with the full multi-function/multi-channel service because they see the advantages of practicing education in an information-rich context. If the federal government adopts a retrenchment policy, it will be a state or consortium of states that develops and tests the next evolutionary phase of educational dissemination, whether it turns out to be multimedia packages using cartridge/cassette technology, local comprehensive one-stop resource centers, two-way cable video between schools and researchers' laboratories, or one of the many imminent developments we lack the imagination to predict.