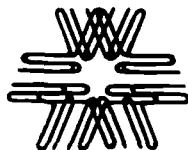ABSTRACT
        This paper addresses the problem of building the
capacity for continuous renewal and reform in the educational system.
The authors contend that the paradigm of R&D previously used has been
too narrow, and that it is based on restrictive assumptions about how
to help schools solve problems. They feel that any revised concept of
"the R&D system" should include (1) how and by whom problems are
formulated, (2) a range of likely resources for solving them, and (3)
the organizational life of operating systems which will affect the
possibility of implanting a solution. The document first presents
some history of the R&D system, from the Cooperative Research Act
through recent construction of new facilities and the letting of
multi-year contracts to regional educational laboratories. An overall
framework is presented to make the case for stimulating the "R&D way
of thinking" and refreshing the "user way of thinking" within the
system. The authors opt for reinforcing the existing research,
development, and information system to make its problemsolving less
dependent on federal whim; and its solutions more possible,
economical, valid, and communicated rapidly to those in need. They
describe the needs of an make specific recommendations for operating
agencies to strengthen their ability to set goals, identify
achievement barriers, call on resources for solutions, and
directionalize analysis results and creative thinking. No substantive
agency for research and development or school improvement is
presented, and the policy and program recommendations with respect to
implementation apply only to the improved performance of K-12
schools. (Author/EA)

BUILDING CAPACITY
FOR RENEWAL AND REFORM

An Initial Report on
Knowledge Production and Utilization
in Education

DECEMBER 1973

NATIONAL INSTITUTE OF EDUCATION
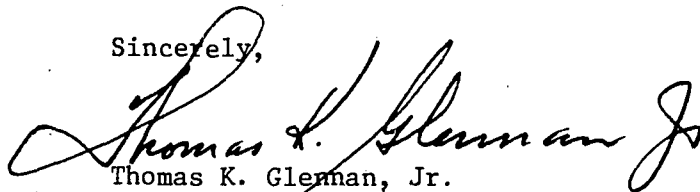
OFFICE OF THE DIRECTOR

Dear Colleague:

The enclosed paper describes a particularly important initiative of the Institute. In many respects, the success of the NIE rests on our ability to stimulate the development of an R&D community that is genuinely useful to educators and students, to make research results available to educators, and, perhaps most important, to recognize the role of educators not as passive recipients of R&D products but rather as innovators for whom research is but one resource for a continuous process of renewal and reform.

Our concern is to learn how to build organizational capacity--the capacity of the R&D community to create information and alternative practices and products of value to educators, the capacity of a variety of agencies to link research to practice, and the capacity of schools and State agencies to engage in a process of continuous improvement that makes the most effective use of local resources as well as the products of external R&D.

The recommendations made in the second half of the paper represent an initial response to the problems and opportunities identified in earlier sections. Though present budgetary constraints limit severely the investment we can make in the proposed activities in the current fiscal year, our intention is to devote considerably increased resources to capacity building as the funds become available.

This paper reflects the efforts of the NIE staff, as well as the thinking of numerous experts in research, development, publishing, communications, knowledge utilization, and institutional change. In addition, we have visited practitioners at the State and local levels to elicit their views and to observe exemplary renewal and reform programs. As we refine our plans and thinking in the coming months and years, we shall continue to rely on views from individuals like yourselves. We look forward to your comments and suggestions.

Sincerely,

Thomas K. Glennan, Jr.
Director

Enclosure

BUILDING CAPACITY FOR RENEWAL AND REFORM:

AN INITIAL REPORT ON KNOWLEDGE PRODUCTION AND UTILIZATION

IN EDUCATION

Task Force on Resources Planning and Analysis

Marc Tucker, Chairman
Mary Harahan
Berlin Kelly
Ward Mason
Saul Yanofsky

Office of Research and Development Resources
National Institute of Education

December 1973

BUILDING CAPACITY FOR RENEWAL AND REFORM: AN INITIAL REPORT
ON KNOWLEDGE PRODUCTION AND UTILIZATION IN EDUCATION

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INTRODUCTION

This paper is addressed to the problem of building *capacity* in the educational system for continuous renewal and reform.

The Education Amendments Act of 1972 declared it to be the policy of the United States to

  (i)   Help to solve or to alleviate the problems of, and
        promote the reform and renewal of, American education;

  (ii) Advance the practice of education, as an art, science,
        and profession;

  (iii) Strengthen the scientific and technological founda-
        tions of education; and

  (iv) Build an effective educational research and development
        system.

The Act created the National Institute of Education in order to carry out this policy.

But the listing of these four separate intentions, one after the other, without a hint of their "true" causal or even historical order, is a nice metaphor for the present situation in our thinking. The Act provides no guidance as to the proper balance between long-term research to improve the science of education, multi-year development of widely-marketable tested products for schools, or more immediate efforts to solve or alleviate pressing problems. On which should scarce resources be spent, for the "best" results?

The Office of R&D Resources, assigned to analyze the fourth general domain, the R&D system and its improvement, quickly found the complex interlocking of all the above policy goals. While the record of sheer

growth in the R&D system is astonishing, the task force preparing this

review was faced also with the necessity of analyzing past policy decisions,

as well as the aggregate result:

- The apparent choice not to support development of local-
  school-system R&D capacity.

- The growth of targeted R&D towards nationally-defined
  problems, and the resulting rapid increase of money
  flowing to non-university, non-profit organizations
  equipped to respond quickly to new possibilities.

- The concomitant decline of basic research funding, at
  least within the United States Office of Education,
  and the resulting decrease of university faculty
  involved in the R&D system.

- Few resources remaining to be used in relating the
  R&D system to its ultimate clients in the operating
  school system.

The result of past choices seems to have created a system of external

agents, new institutions for the most part, anchored neither in any well-

tested scholarly understanding of a domain of practice, nor in any intimate

knowledge of operational problems. This may have been inevitable, and does

not preclude the creation of useful products. It may also have been enor-

mously important politically, as R&D funds grew to significant size, to

have specific targets being worked on by contractors who could be held to

performance standards spelled out by the Government. The amorphousness

of traditional research, not to mention the likelihood of its irrelevance

in the short-run, are stiff barriers to political success. However, the

result, in relation to the reform of education, seems to have been weak;

an R&D system with growing resources flowing to it, does not seem to have

articulated well with the operating schools and school districts of the

nation.

Thus, we have not felt it adequate to analyze only within the confines
of the existing institutions or to suggest solely rearrangements in those
terms. A commentator looking at the system on the eve of NIE's creation
said:

> "The whole paradigms of R&D thinking have been firmly
> implanted, the institutional domains that participate
> in R&D are securely established...."

He saw no reason to predict any change in the second decade of Federal
support for education R&D. In our view, however, it is precisely the
"paradigms" that need rethinking, and a fresh balance of support for
activities sought. This report is intended to both review the existing
accomplishments, and to support recommendations for redirection.

To foreshadow later chapters here, we want to suggest that the paradigm
of R&D used in past policy has been too narrow, and based on restrictive
assumptions about how to help schools solve problems. Further, we feel a
revised concept of "the R&D system" must include attention to how and by
whom problems get formulated in the first place; to what might be a range
of likely resources for solving them, whether through systematic exernal
development or some other means; and to the organizational life of operat-
ing systems which will affect the possibility of implanting a solution
to a problem.

The chapters that follow give some history of the growth of the
narrowly-defined R&D system, from the first steps of the Cooperative
Research Act through the massive construction of new facilities and the
letting of multi-year contracts to Regional Educational Laboratories in

recent years. In the service of our argument about the need for balance, however, we then describe the nature of the operating educational system. The intent is to highlight the variety of actors involved, their varied interrelationships, and their varied difficulties needing systematic analysis.

To integrate the data on these two somewhat independent systems, we then present an overall framework to make the case for an "R&D way of thinking," which must be stimulated within the operating system, and a "user way of thinking" which must in turn be refreshed within the research and development system. We suggest that research and development must be seen as a general approach to the world, a way of organizational life distinct from much current organization functioning in a wide range of institutions. In the specific recommendations which follow, the overall goal is to reinforce such a general approach wherever possible. This means reinforcing the existing research, development, and information system so that its ways of finding problems to work on are made less dependent on Federal whim; so that its solutions are possible, economical, and valid; and so that they are communicated rapidly to those in need. From our sense of current styles in operating agencies, we in turn draw a picture of needs to strengthen their ability to set goals, identify barriers to achievement, call upon resources for solutions (whether outside developers or not), and put firmly in place the fruits of analysis and creative thinking from all their sources. In each of these aspects of our redefined system, we have suggestions for specific study, demonstration, or project support activities.

Two points need to be made concerning topics this report will not
address. First, we will not present a substantive agenda for research,
development or school improvement. The question of what changes should
be made in American education and what research and development should
be supported to facilitate those changes is addressed in other Institute
papers--our concern here is to develop institutional capacity to carry
out that program of R&D and implement effectively worthwhile innovations.

Second, although the Institute's mandate encompasses formal and
informal education at every level, our policy and program recommendations
with respect to implementation have as their primary goal the improved
performance of elementary and secondary schools. We are aware that
formal schooling constitutes just part--some say a very small part--of
a child's total educational experience; we also recognize that our focus
on elementary and secondary schools eliminates vast numbers of influential
educational institutions: colleges and universities, technical institutes,
Headstart Centers, alternative and free schools, proprietary schools,
industrial and corporate training centers, etc. Given our limited
resources, however, we have decided to place highest priority initially
on grades K-12 in the public schools for two practical reasons: most
of the Institute's R&D program is focussed on the public schools and
what little we know about implementation of education research and
development is derived from work with public schools. As the Institute
broadens its program to include other institutional and non-institutional
elements of the society, we will broaden our inquiry to address questions
of broader implementation accordingly.

If NIE is to be as rational in its own affairs as we would wish the thousands of local schools to be, we must not simply assume that the problem-as-given is the right one. We wish to stress again that despite the notable achievements of the past decade of research, product development, evaluation, and dissemination, the schools are much as they have always been, and not always by choice. We attribute this in part to the whole way R&D has been thought about--as an external activity whose results will inevitably be found useful by operating agencies. However true this may be in the hierarchy of the Department of Defense, where innovations can be passed without question down the chain of command, experience has taught us it is not possible in education. Improvement of the overall systematic problem-solving capacity of education requires a fresh look at the operating system, and support of its own internal activities towards renewal, as well as encouragement of the private market, foundation, and Federal R&D response to the schools. Not to redress the balance of emphasis will be to continue a poorly conceived paradigm when we have the knowledge to revise it.

I. THE EVOLVING FEDERAL ROLE IN
EDUCATION RESEARCH AND DEVELOPMENT

The history of education research includes periods of vigorous scholar-
ship and inquiry. In the hundred years prior to 1940, names such as

Henry Barnard, William James, John Dewey, and Edward L. Thorndike came to

be as eminent in education as those in the pantheon of any other field.

However, the fifteen or twenty years prior to 1955 was a period of decline.

Education research and development activities were largely conducted by

faculties of schools of education, supported by university general funds and

modest assistance from private foundations. The performers operated in

virtual isolation from the other academic disciplines and, therefore, from

much of the intellectual leadership in the social sciences. Partly as a

consequence of this isolation, education research and development in the

thirties and forties was generally lacking in vigor and intellectual power

and had little effect on the practice of education.

THE ADVENT OF FEDERAL SUPPORT

The critical role played by the research and development (R&D) commu-

nity in World War II led the Federal Government, in the decade following

1945, to assume support of research and development activities as a matter

of national policy. This role is reflected in the rapid growth of all

Federal R&D expenditures since 1940:

1940	$ .07 billion
1948	.86 billion
1950	1 billion
1953	3 billion
1958	5 billion
1962	10 billion
1968	17 billion
1973	17 billion

By far the largest part of this expenditure has been related to national
security. Successes in defense and space produced a growing faith in
R&D as an effective instrument of technological progress, in turn lead-
ing to its application to various areas of social concern. Between 1963
and 1972 the "civilian" portion of the Federal research and development
budget increased from 14% to 27%.

The education sector's participation in this growth began in 1954,
with the passage of the Cooperative Research Act, authorizing the Office
of Education to support education research and related activities, and
with the initiation of the Course Content Improvement Program, through
which the National Science Foundation supported curriculum reform in the
sciences. In 1958, the National Defense Education Act was passed, giving
the Office of Education authority to support program development in foreign
languages, guidance, and uses of media and technology. Both CCIP and NDEA
were intended to support education in fields considered vital to the
nation's military and technological strength, but they also established
important precedents for Federal support of mission-oriented inquiry into
other educational problems. In succeeding years, the broad authorization
of the Cooperative Research Act was further supplemented by new legislation
focussed on specific educational problems: Foreign Currency Financed

Research (1961); Research Component of Media Services and Captioned Films (1963); Education of the Handicapped Research and Demonstration (1964); Vocational Education Research and Training (1965); and Library Research and Development (1967).

By 1963 the Office of Education's annual expenditure on research had grown to 14 million dollars, and the NSF Course Content Improvement Program had reached 13 million dollars. Some success was achieved in attracting the interest of researchers located outside schools of education. The number of proposals from university scholars located outside schools of education increased four-fold while the number from professional educators remained about the same. By 1963, the majority of proposals originated with members of the social science disciplines. The research agenda continued to be determined largely by the initiatives of individual researchers rather than those of Government policy makers. Projects tended to be quite small, typically one investigator with several graduate students. There was little action to build specialized institutional capacities, to encourage training of R&D personnel, or to establish links between research and practice.

A CONCERN FOR CAPACITY

Reviewing the Cooperative Research Program in 1964, the Government concluded that in its first few years the program had "stimulated qualitative improvement and quantitative expansion in educational research." However, it also noted that (1) "...the results of the projects...

did not lead directly enough or quickly enough to observable change and
desired improvement in educational practice and (2) "...the results of
small scale project research tended to be fragmented, non-cumulative,
and inconclusive."

This review led to several conclusions regarding the conduct of educa-
tion research and development:

1. Interdisciplinary teams of personnel--including social
   scientists and practitioners as well as school of educa-
   tion faculty--should be involved.

2. Attention must be given not only to the production of
   knowledge but to its utilization, indicating a need for
   improved relationships between research, development,
   dissemination, and implementation.

3. Sustained support on an institutional level was
   necessary to provide continuity and sufficient
   personnel and financial resources for addressing
   major educational problems.

These conclusions led to a redirection in Federal policy: the stimu-
lation and support of new institutional arrangements for education R&D.

Between 1964 and 1969, the Office of Education funded twenty-one
university-based research and development centers. Each was intended, in
the words of the initial announcement, "...to concentrate human and financial
resources on a particular problem area in education over an extended period
of time in an attempt to make significant contributions toward an under-
standing of, and an improvement of educational practice in, the problem
area."

The ten original centers proposed their own content emphases (e.g., teacher education, cognitive learning, evaluation). The other eleven centers were created later to focus on Government-chosen problems (i.e., vocational/technical education, early childhood education, and education of the handicapped). Most of these centers had a close relationship to a school of education. Though the mandate of the centers included the full spectrum of research, development, and dissemination, most concentrated initially on research. Over time, many began to allocate significant portions of their resources to applied research and prototype development.

In 1966, twenty additional organizations, called regional educational laboratories, were established by the Office of Education under the authority of an amendment to the Cooperative Research Act contained in the Elementary and Secondary Education Act of 1965. Policy direction for the laboratories was at first neither clear nor consistent. While it was generally understood that these organizations would not conduct basic research, it was unclear what function, or combination of functions, they were to perform: applied research, product development, dissemination, training, or service to schools. By 1968, product development had been established as their primary function.

The Elementary and Secondary Education Act amendments to the Cooperative Research Act also authorized funds for research training and for the construction of specialized research facilities. By 1970, seven laboratory or center facilities had been completed or were under construction, and by 1973, some 1500 students had graduated from R&D training programs supported at over 100 institutions.

During this same period, the Office of Education began development
of an information system to serve both the R&D community and the schools:
the Educational Resources Information Center (ERIC). Over the years, eighteen
"clearinghouse" organizations have been established at various universities
and professional societies to collect, screen, catalogue, index, and abstract
current education literature in selected subjects. These data are sent to
a central organization to become part of a computerized data base from which
several publications and indexes are produced. The system includes document
reproduction services, computer search capability, and reference services.
It also produces specialized bibliographies, research reviews, and syntheses of
the literature in particular fields. By 1973, ERIC had become one of the
largest information storage and retrieval systems in the world.

RAPID GROWTH--1965 TO 1972

On the basis of the above legislative authorities, appropriations
for R&D in the Office of Education grew rapidly to $130 million in 1972.
Meanwhile, support for education R&D in other Federal agencies had been
growing apace. The total Federal effort in 1972 was as follows:

Federal Obligations for Education
Research and Development, FY 1972,
by Agency (Millions).

Agency	Oblig.
National Science Foundation..	$ 19.5
Office of Child Development..	17.2
Office of Economic Opportunity	10.9
Office of Education.........	130.1
Total Federal...........	$177.7

The magnitude of the education R&D effort can be better appreciated by comparison to other key indicators. This dollar amount for FY 1972 represented 3.0% of the $5,988 million overall Federal investment in education, and .4% of the $48,600 million expended by local education agencies for elementary and secondary education. From another perspective, education R&D represented 1.0% of all Federal research and development obligations ($16,802 million). Nevertheless, an investment of $177 million must be considered substantial.

The rapid growth of Federal commitment to education R&D culminated in 1972 with the establishment of the National Institute of Education as a separate Federal agency charged with the conduct of education R&D. The Institute's initial program consisted largely of R&D projects transferred from the Office of Education and the Office of Economic Opportunity. As it began operations, NIE faced the immediate task of integrating these projects and some new initiatives into a coherent program structure that would fulfill the mandate expressed in the Education Amendments of 1972.

The establishment of NIE was expected to inaugurate a new phase in the development of Federal initiatives for educational renewal and reform. In the next chapter we will attempt to assess the effect of Government initiatives during the 1964-72 era and the present status of the system to produce and utilize knowledge in education.

II. THE NATURE OF THE R&D SYSTEM

Looking back over the past decade, we can see measurable progress in building an education R&D system. Financial support has increased appreciably, participants now include personnel from a much broader range of fields and disciplines, new institutions have been established, and new technologies for the conduct of R&D are emerging (including research management, the development process, evaluation theory and methodology, and information storage and retrieval). Yet, as NIE began operations, there were significant problems to overcome in promoting an R&D system with the capacity to carry out activities responsive to crucial educational problems. Government policy toward education R&D had suffered from a rapid rotation of priorities and wide fluctuations in funding from year to year; there seemed to be an overemphasis on activities which promised quick payoff; personnel resources still seemed to lack the quality and mix required by the complexity of the problems faced; linkage roles and relationships among the various specialized institutions were largely haphazard; and, most importantly, the Government seemed to lack an overall strategy for bringing the capacities of education R&D to bear in a manner that resulted in improved educational practices in schools.

In this chapter, we will attempt to characterize the current status of the R&D system: the sponsors and organizational performers, the R&D personnel, the nature of the system outputs, the linkage and support systems, and the impact of R&D on educational practice. However, it is important to note that the data on the R&D system are fragmentary and uneven in quality, making assessment of systemic performance and trends extremely difficult.

RESEARCH AND DEVELOPMENT INSTITUTIONS

Among the sponsors of education R&D, Federal agencies have dominated the scene, with obligations for FY 1973 of $245.3 million. Somewhat less than half this amount is administered by NIE. Private foundations contributed roughly an additional $14 million. It is difficult to estimate the investments made by universities, by State and local education agencies, or by private industry.

Universities

The universities' primary contribution to the education R&D system has been in the area of research. However, a number of important changes has been taking place. Either in response to feelings of social concern or in pursuit of the Federal dollar, universities have undertaken work in development, dissemination, and service well beyond their traditional research domain. Increasingly, they not only seek grant support for faculty initiated research, but also compete for contract work.

Specialized centers and institutes have been formed to bring together university resources in new combinations requiring full-time non-faculty investigators and technicians. As mentioned earlier, these have included a number of centers established in response to OE initiatives:

- Eight R&D centers (now funded by NIE on a program basis rather than through institutional support).

- Seven centers for early childhood research.

- Two centers for research on the handicapped.

- Fourteen instructional materials centers for the handicapped.

In addition there are many other centers, some focussed entirely on educational problems, and some focussed primarily on another problem but having a capacity for work on education.

University R&D is not, however, without its share of problems. New structural arrangements have caused strains on the coordination of expanded research functions with the instructional role. The continued dependence on shrinking "soft" money sources contributes to the current financial crisis in universities. Some critics believe that the scientific community has become alienated by Office of Education R&D programs due to the shift from general research support to targeted research, the uncertainty of funds as targets came in and out of fashion, and the heavy emphasis on development.

Independent Non-Profit Organizations

Largely in response to the availability of Federal funds, a large number of non-profit organizations has been established in the last two decades capable of performing quality education research and development. In addition to the regional educational laboratories, the larger non-profits include some that have special competence in the behavioral sciences and others that specialize in policy studies. In a number of cases, non-profits and profit-oriented firms organized originally to provide high quality R&D services to the Department of Defense have reorganized and diversified and offer significant R&D capability in the social sector, including education. The non-profits are not without their problems. Working in the entrepreneurial mode, living from contract to contract, can be a precarious existence, particularly for a new organization which

has been unable to accumulate unrestricted working capital. Financial
insecurity and the resulting difficulty in offering long term careers
have led to problems in recruiting quality personnel. Finally, respon-
siveness to sponsor initiatives may have been achieved at the expense
of the educational systems which are the ultimate clients for respon-
siveness to research and development.

Profit-Oriented Organizations

A large but undetermined number of small to medium-sized firms
exists, oriented either to the grants economy of Government procurement
or to the market economy of sales to schools. The movement toward
Federally sponsored programs of directed R&D has significantly increased
the share of Government contract work going to private business.

Between 1969 and 1971, allocations from the Office of Education to
higher education institutions increased 8%; allocations to non-profit
institutions increased 200%. Among firms oriented to school sales, a
few years ago there was a spate of mergers and acquisitions combining
publishers and systems-oriented companies in attempts to form new capa-
bilities for developing instructional materials and systems for the
schools. While many of these ventures may not have been greatly successful,
it is probable, however, that instructional materials are being developed
by private business firms under far more disciplined methods than was
true a decade ago. This is partly the influence of the systems technology
developed within other areas of the private sector and partly the influence
of disciplined development as practiced by the laboratories and centers.
Reliable estimates of the extent of this activity are not, however, available.

School Systems and State Education Agencies

The capacity for systematic problem-identification and product- or solution-development and testing is uncommon in local schools, school systems, or even States. Research offices in urban districts are generally oriented to the collection of school statistics, although in recent years many have expanded to carry out required evaluations of Federally financed programs. A small number of districts has begun to carry out disciplined R&D activities, particularly in the area of curriculum development, modification, and evaluation. Some State Education Agencies have planning, research, or evaluation offices that carry out disciplined R&D, generally at a modest level. State assessment programs, in many cases patterned after the National Assessment of Education Progress, are becoming increasingly common and sophisticated. However, the extent and magnitude of these various activities within State and local education agencies are not known.

R&D Activities

Information about the relative participation of these performers in various types of R&D, the allocation of funds among them, and their potential capacity to perform particular R&D functions is very sketchy and unreliable. The data we present below--on the mushrooming evaluation industry, the testing industry, participation in NIE's Fundamental Research Program, and the overall distribution of Fiscal Year 1972 NIE funds by performer community-- may be indicative of broader trends, but may also be very misleading and certainly should not be read as a complete picture of the capacities and participation of the R&D system in education research.

In 1971, HEW alone spent $29.6 million for evaluation research, a specialty area created by frequent evaluation requirements accompanying the proliferation of social legislation in the 60's. Of this amount, $12.5 million was spent on education programs. The distribution of those HEW funds by type of performer provides evidence of the importance of the non-profit and profit sectors in this particular specialty.

Type of Performer	% of Funds
Profit organization.......	45%
Non-profit organization...	29%
College or university.....	21%
State and local agencies..	4%
Individual consultants....	1%

Another specialty area of research is education testing, also dominated by the profit and non-profit sector. Test publishers define testing requirements, develop and standardize tests, and provide scoring and feedback services. They play an important role in research and development in providing standardized and comparable measures of educational phenomena that are essential to the conduct of education R&D and the evaluation of education programs. The six largest firms account for three-quarters of the total test sales in the country and for probably a higher percentage of education test sales.

A third example of specialization is basic research. In 1973, NIE operated a Field Initiated Studies Program of grant support for unsolicited proposals, primarily for fundamental research. As expected, the universities dominated this particular arena, receiving 85% of total FIS funds. However, the allocation of NIE funds for all programs reduces university participation in NIE sponsored activities to the status of a close second.

Type of Performer	% of FIS Funds	% of all NIE Funds
Profit organization.....	0	6.3
Non-profit.............	11.7	40.8
College or university...	82.0	34.6
State and local agencies	1.8	17.6
All other.............	4.5	.7

Private business may be increasing its participation in Government-
financed education R&D, but it tends to specialize in areas like
evaluation research and is still a relatively minor factor in NIE's
program.

R&D PERSONNEL

The rapid growth of funds for R&D during the 60's significantly
increased the number of professional personnel in education research.
As a rough index, the membership of the American Educational Research
Association has grown from 1,205 in 1955 to 9,952 in 1972. Little
current information is available, however, on the extent of the total
pool of professional researchers involved in educationally relevant
subjects. There is also little information on the backgrounds, characteris-
tics, functions, and productivity of such R&D personnel. A 1968 study of
AERA members revealed that 75% of the researchers surveyed listed their
major field of study as education. This finding was substantiated by a
1971 study of the educational backgrounds of those who published in
education related journals.

Federal emphasis on the support of development activities in educa-
tion has led to a significant shift away from research personnel and
toward development specialists. Some sources estimate that in the decade

between 1964 and 1974, the numbers of development specialists increased
from 3% to 45% of the education R&D force while research scholars dropped
from 96% to 38%.

The advent of large scale programmatic R&D performed within
specialized laboratories and centers has also affected the nature of
R&D personnel. Academic researchers in the classic mold are in a
minority on the staff of a modern R&D center or laboratory. Their
efforts must be supplemented by those of subject matter specialists,
computer experts, media specialists, evaluators, trainers, field
agents, etc. Thus, the great increase in demand has not been for academic
researchers but for other kinds of specialists.

While data are scarce, there is little if any reason to believe
that shortages of skilled personnel are attributable to lack of *supply*
from the colleges and universities. However, there continue to be nagging
criticisms about the *quality* of personnel, a problem which may be related
to the general environment in which R&D is conducted. For example:

   . Instability in the funding of education R&D and
     the consequent undermining of the growth of strong,
     independent R&D organizations have negative effects
     on the career decisions of qualified personnel.

   . When the "great leap forward" began in 1964, the
     field was almost totally devoid of tested models
     or theories for producing planned change in an
     enterprise as complex, tradition-bound, and fragmented
     as education, and equally devoid of the technologies
     required for emergent activities such as development,
     evaluation, and research management. Thus, it was not
     possible to recruit people with these skills; rather,
     people were needed who could invent the new technology
     or adapt it from that in other fields.

- Studies of other fields have shown the great importance
  of informal scientific communities in setting standards
  of performance, providing incentives for excellence,
  providing channels of communication that short-circuit
  the lags in the more formal mechanisms, and generally
  socializing new members to the "rules of the game."
  Such communities were very weak and fragmented ten years
  ago and even now are only beginning to gain some
  strength. Quite possibly, Government policies have
  mitigated against their development.

- If there has been one dominant target of education
  R&D efforts in the past ten years, it has been the
  concern for education of minority groups and the
  disadvantaged. This concern is now embodied in
  the legislative charter of NIE. R&D personnel who
  are themselves members of minority groups can be
  expected to have insights into these problems not
  available to others. Yet minority groups are
  generally under-represented in the R&D work force.

Baseline data and policy studies are badly needed before long-range

programs for upgrading personnel can be proposed. In the meantime, our

working hypothesis is that the problem can best be attacked indirectly

by strengthening and stabilizing the system so as to make careers in

education R&D attractive and by promoting the development of scientific

and technical communities and new R&D technologies.

THE PRODUCTS AND THEIR EFFECTS

Most research is not designed by scholars for immediate application,

but rather to contribute to a body of knowledge. Developers may ultimately

find it useful as a point of departure in constructing products that will

have short-term utility. The exception would be policy research or

evaluation research, both of which are carried out specifically to inform

decision-makers.

As noted earlier, many Government-funded development efforts have been oriented to the production of new materials and teaching techniques, apparently based on the assumption that the curriculum was the crucial leverage point in affecting the instruction and learning of children. Thus the goal was to be a tangible product that could enter the classroom in the form in which it was designed and that would shape teacher and student behavior and convey appropriate subject matter in predictable ways at a reasonable cost. A great variety of new curricula has been developed with Federal funds in the last two decades in the physical and social sciences, mathematics, and to a lesser extent, in the arts and humanities.

Partly because curriculum developers recognized that many features of the school impeded their attempts to install new curricula properly, and partly due to a natural variation in the interest of people who chose to engage in Federally funded development, a wide range of development products has emerged from disciplined R&D in the last two decades. These range from new pedagogical techniques (the Improving Teacher Competencies Program) to new approaches to school organization (the Multi-Unit School) and to methods for producing major systemic changes in the basic structure of education (the Voucher Program).

Unfortunately, little is known about the effects of disciplined R&D on practice. Support for major Government-funded research usually terminates when findings are published or the developed product enters the market. Rarely have funds been provided to trace the patterns of implementation for new practices after the first surge of adoptions has been reported.

What is known is not encouraging. An Office of Education report
prepared in 1969 for the Organization for Economic Cooperation and
Development (OECD) attempted to assess the effects on practitioners
of Government-sponsored R&D activity in education. The report concluded
that "...we have not been able to collect very good evidence on the
impact of specified research and development activities and where that
evidence has been collected, it has generally tended to demonstrate
rather low levels of effect." Much the same can also be said of
innovations generated outside the formal R&D system. According to a
study conducted by John Goodlad and his associates in 1970:

> A very subjective but nonetheless general impression
> of those who gathered and those who studied the data
> was that some of the highly recommended and publicized
> innovations of the past decade or so were dimly conceived
> and, at best, partially implemented in the schools....
> [Teachers and principals] claimed individualization of
> instruction, use of a wide range of instructional materials,
> a sense of purpose, group process, and inductive or discovery
> methods when our records showed little or no evidence of
> them.

Both reports call attention to the difference between adoption and
implementation. Most of the data on utilization of education R&D relate
to counts of textbook sales, participants in workshops, or superintendents'
reports that their school system has adopted a specified product or
practice. But, as the quotation above suggests, on the few occasions when
trained observers have actually visited classrooms to look for changes
in practice that reflect the nature of the innovation reportedly adopted,
they have found either a very low level of change or no change at all.

Though the empirical reports available on the implementation of R&D are few in number and generally several years old, they do tend to agree in their findings and confirm the intuitive judgments of many observers. They certainly suggest that implementation may be a major problem for the Institute.

A concern for increasing the impact of education R&D has fostered serious interest in the concept of linkage and support systems to better relate the producers and consumers of education R&D. We turn now to a brief look at some of the institutions and mechanisms which attempt to carry out this function.

THE LINKAGE AND SUPPORT SYSTEM

Studies of knowledge production and utilization in education and many other fields have consistently pointed to the need for linking mechanisms and institutions to connect the products of R&D with the practice world. These studies assume that there are useful products and processes being created by the R&D community which must be communicated to (and often adapted by) users so that the results of research and development can be put into use more effectively. The linking organization becomes the middleman and translator in this process by being knowledgeable about the products of R&D, communicating R&D results to practitioners, and often helping with implementation.

In some sectors, most notably agriculture, there is an extremely well developed system of linking and support organizations and people. Interestingly, the Federal investment in agricultural linking activities, $100 million in 1973, exceeded the Federal contribution to

agricultural research and development ($90 million). The linkage funds

help support 16,000 extension staff, most of whom are based in the field

to provide information and technical assistance. There is no comparable

system to support the nation's educational sector. There is, however,

a variety of institutions which has assumed some responsibility for

bridging the research and operating school communities.

One of the oldest linking agents between education R&D and

practice is the education publisher. Traditionally, the Government

has relied on the industry to produce and market those instructional

systems that have a profit potential, once prototype development and

evaluation have been completed by the non-profit or university developer.

The largest American publishing company has less than 10% of the total

market. There are fifteen to twenty companies of significant size, and

there are literally hundreds of smaller companies publishing materials for

the educational market.

Thus the industry is diverse and highly competitive. On the other

hand, the small size and fragmentation of the industry limit the amount

of capital available to each and therefore limit the risk a publisher

may be willing to face on the production of an unusual product or the

investment he is able to make in research and development.

The education publisher's ultimate success or failure depends upon

the purchase of his product. In 23 states there is a system commonly

known as adoption or listing, in which a state-wide body selects a

limited number of texts for use in that state. The selections are made

known to local districts, and each district chooses from among the

publications on the list. Such a system operates conservatively. When

a limited list of materials is to be approved for an entire state, mater-
ials that are too innovative or too different have little chance.

In 27 states there is a system of materials selection called local
adoption or open territory. Practices in these states vary widely, but
the common thread is that the local district selects the materials. When
local districts are the size of Chicago or New York, the process takes
on many of the aspects of state adoption.

Some of these factors are changing. As we noted above, those publishers
purchased by major industrial corporations have access to a large capital
base and, in some cases, R&D capacity. Some publishers are beginning to
sell services, as well as instructional materials. And selection procedures
at all levels of the operating system are becoming more flexible. Never-
theless, many of the factors cited above still continue to discourage
innovation.

There are problems connected with the articulation between
developers and publishers. Publishers often get involved only when
development is complete, therefore lacking the opportunity to help shape
a product's development to make it more marketable. Insufficiently
involved in the distribution process, developers cannot assist effectively
in providing teacher training and other support services to the schools.
The system as it presently operates does not provide a means to adequately
forecast the market potential of a development product either when a
decision is made to develop or when publishers are invited to distribute.
Nor does the system provide for description and analysis of the strategies

used by developers and publishers to disseminate products,
with the result that little is known about the costs and effects of
various strategies. Lastly, it is not clear that the Government's
policy with respect to the conditions under which copyright may be
held and royalties paid has produced the most favorable incentives to
widespread and effective utilization of development products.

Another form of linkage, the Educational Resource Information
Center (ERIC), described previously, has played an important role in
the communication of research results. The total ERIC collection has
grown from 5,000 documents in 1967 to 130,000 in 1973. Standing orders
for microfiche copies of the entire collection go to 456 organizations, and
single orders are placed annually for 50,000 hard copy reports and 150,000
microfiche. Although ERIC has enjoyed some success in producing an
information base and in preparing general kinds of information products,
it is not clear that it is adequately serving the needs of its multiple
clients, particularly practitioners. Many critics of the ERIC system
believe it is almost entirely an instrument for university researchers
and rarely serves the real needs of teachers, administrators, and
parents. The potential of the ERIC system has also been hindered by a
limited base of information, an inadequate range of services, under-
utilization of current technologies, as well as insufficient attention
to the training of potential clients in its use. New approaches to
information communication need to be based on the characteristics of
potential users and their communication behaviors and information needs.
These approaches should also provide for user feedback to assist in
modifying the system.

Many other linking roles and organizations have sprung from the flurry of education research and innovation in the 60's and the Federal concern that increased support for education research result in demonstrable effects upon schools. The initiation of Title III (ESEA) supplementary centers, vocational education research coordinating units, the resource materials centers and regional media centers for the handicapped, the Follow-Through program, laboratories and R&D centers, and extension agents were all, at least in part, a response to the concern for linking research with practice and sustaining the effects of that research.

In addition to the Federal concern for linkage, State Education Agencies have attempted to coordinate the bulk of research information and make it more accessible to users. For example, the BOCES in New York State and the Intermediate Districts in Pennsylvania attempt to fulfill this role as one of their functions.

Finally, a broad range of professional support arrangements is now evolving which links together teachers, principals, students, parents, and the general community to stimulate and provide a setting for problem-solving in the schools. These linking strategies, which include teacher centers, advisories, technical assistance programs, parent advisory groups, and various school based in-service education strategies, view the traditional consumers of R&D (teachers, principals, parents, etc.) as "designers" of educational improvements as well as the recipients of externally developed reforms. In this

conception, it is assumed that unless people in the schools possess the capacity to identify and generate solutions for their problems, either through the creative adaption of R&D products to meet their local needs or through the generation of locally developed initiatives, little in the way of beneficial reform will occur.

The goals of this type of linking activity contrast rather significantly with linking arrangements designed primarily to relate the research community to the schools. The former emphasizes a delivery strategy, although often providing for interaction between the research and practice systems. The latter is based on practitioner desires for self-improvement and provides an organizational base and access to resources for translating these desires into useful forms of assistance.

Few efforts have been made to document the nature, extent, or impact of the various linking organizations and strategies mentioned above. It is important to understand the response of schools to external arrangements which attempt to implement specific R&D products; the effects of internal and external mechanisms which provide professional support to sustain self-initiated reforms; as well as the natural processes of change which occur as schools attempt to alter their behaviors. At this point, little is known about the various types of linking roles, their effects on client groups, and their potential for promoting educational reform and renewal.

One thing does appear rather clear at this point: linking and support mechanisms as well as each of the other elements of the R&D system must be grounded in the educational contexts which they are

attempting to affect. It is the operating system of public elementary
and secondary schools which provides formal instruction for the vast
majority of school age children. Whoever presumes to participate in
the improvement of public education must understand the nature of the
current system. In the next chapter, we present a brief portrait of
this vast enterprise.

III. THE NATURE OF THE OPERATING SYSTEM

It is logical, but perhaps misleading, for us to have begun a discussion of the knowledge production and utilization system in education with a discussion of the structure for research and development. The locus of knowledge utilization--and a good deal of knowledge generation--in public education is in the institutions that have legal responsibility for education in the United States: the State Education Agencies and the schools.

Education is not like the defense or space sectors of our economy: the Federal agency that supports research and development in education cannot and should not mandate its use. The decisions as to what should be changed and how changes should be made are highly decentralized in education, and they take place in a social and bureaucratic structure that is highly complex and very far removed from the structure and values of the Federal R&D establishments.

Research and development will influence practice in the schools only to the extent that it reflects the needs, values, and ideas of practitioners and to the degree that practitioners have incentives to use effectively the ideas and innovations that might help them do a better job.

Our initial focus on research and development may, in particular, have been misleading to the extent that it placed implicit emphasis on formal R&D as the principle engine of change and improvement in education. This is the form of myopia that has marked the R&D establishment for some time. Given the decentralization and local autonomy that characterize education, the degree to which it is subject to highly localized influences and constraints, and its non-technological craft character, the primary source of energy for reform and renewal must be found within the operating system and in the lay community served by that system. Research and development can be a very important resource for change and improvement, but not the prime mover.

For all these reasons, the role of the operating system, and in particular the schools, must be a central focus of our inquiry. To provide some basis for defining that role, we will try in this chapter to describe some of the more important features of the operating system as they relate to its capacity for innovation and reform, or, in the language of this report, for knowledge production and utilization.

To begin with, it may be useful to note the scope of the national enterprise and to present some data on the distribution of problems, resources, and authority that have a direct bearing on relative need and capacity for local innovation and knowledge utilization.

The operating education system is composed of more than 17,000 local school districts, education agencies for each of the 50 states and outlying territories, and in 26 states more than 1,500 intermediate

units for public school administration between the state and local levels. In 1972, American taxpayers paid over $51 billion to support 94,000 public elementary and secondary schools. An instructional staff of 2,350,000, including more than 2,100,000 classroom teachers, was employed to provide educational services to over 45 million students.

Although education remains the legal obligation of the states, the actual operation of schools generally is delegated to local education agencies (LEA's). Within certain parameters established by the state (which vary considerably from state to state with regard to areas such as textbook selection, curriculum mandates, school building codes, minimum personnel requirements, and assessment procedures), local districts are responsible for location and size of schools, procurement, staffing, organization, evaluation of pupil performance, and instruction.

The degree of local autonomy depends on the ways in which the various states have organized and financed their educational system. In Hawaii, there is a single statewide system. Twelve states have school district boundaries coterminous with those of county units, whereas in New England and several other states the school districts are organized on a town or township basis. Many states are organized with a school district serving each of their larger cities and the remainder of the state consolidated into regional districts. Thirteen of the states have less than 100 operating school districts; the nationwide median is 236, ranging from Nebraska's 1,250 districts to Nevada's 17.

The variation is similar with regard to state financing of
education. In New Hampshire, 89.8% of public school revenue is from
local sources, compared with a nation-wide average of 51.2% and
Alaska's low (excluding Hawaii's unitary system) of 11.7%. In 1972-73,
14 state governments provided 50% or more of the revenues for public
education in their states while four states provided less than 20%.

There is frequently as much variation among school districts
within a state as there is between the different states. Size is one
critical variable. In the fall of 1972, less than 1% of the nation's
school systems enrolled 30% of the student population and 41% of the
systems had fewer than 300 pupils each. In more vivid terms, the
chancellor of New York City's schools is responsible for the education
of more children than are enrolled in 39 of the 50 states.

Another important variable relates to the local resources
available to support education in different communities, a factor most
critical in those states in which the state government contributes a
relatively small share of the overall support for schools. In
California, for example, per pupil expenditure in 1970-71 ranged
from $577 in Baldwin Park to $1231 in Beverly Hills. In New Jersey,
the Deal School District spent $1746 per pupil in 1971-72,
compared with a low of $691 spent by the Pine Hill School District.

Data from the 1970 census indicate that more than 63% of the
nation's elementary and secondary school students--almost two-thirds--
lives in metropolitan areas. Over 25% of our student population lives
in central cities; most of these are from low-income families and many

score below national norms on standardized achievement tests. Results

on the 1970-71 reading tests administered as part of the National

Assessment of Educational Progress show nine-year-old students from

inner city areas with a median percent of correct answers of only

56.6, compared with 67.0 for rural students, and 81.9 for children

from suburban areas.

Research has shown that urban schools generally differ from

suburban schools in several other important respects. Studies

conducted by Howard Becker, Patricia Sexton, and others indicate that

schools serving children from lower-class families tend to have lower

morale and performance among teachers and principals than schools

serving a middle-class clientele. Dropout rates and vandalism are

higher in cities than in suburban areas.

This quick sketch of the nation's educational system reveals

considerable variation in arrangements for governance and finance

and in the distribution of resources and problems. There is comparable

variation in the system with respect to organizational capacity to

engage in systematic renewal and to generate and use knowledge for the

improvement of the schools.

THE STATE EDUCATION AGENCY

Any discussion of the organizational structure for the improve-

ment of public education must begin at the state level. State agencies

traditionally have been responsible for:

- Regulatory functions such as teacher certification, building inspections, minimum curriculum and text-book guidelines, and student attendance requirements; and

- Operational functions such as running specialized schools or providing direct services, including vocational rehabilitation and teacher placement.

Since 1965, however, increasing numbers of SEA's have developed a capacity for substantive educational leadership. Among these leadership functions are:

- development of long-range planning and needs assessment procedures,

- identification and diffusion of successful programs,

- provision of information services and technical assistance,

- provision of professional support services for innovation, and

- redesign of in-service education programs and revision of certification requirements.

The capability of SEA's to undertake any of these leadership functions is dependent on several key variables: relations with the governor and legislature, the role of the State Board of Education, the agency's internal leadership, and the available resources. (The average number of professional staff members in SEA central offices is 191, ranging from a low of 47 in South Dakota to almost 1000 in New York State.)

In some respects, a strengthened leadership role for the SEA's implies centralization at the State level of the education policy-making function, and in practice, it has certainly made the State Agencies important factors in the knowledge production and utiliza-tion process. To the degree that they assess needs (with increasingly

sophisticated techniques); engage in substantive policy planning;
establish program priorities; systematically search for, develop,
test, and disseminate information about improved programs and practices;
and stimulate innovation through direct technical assistance to
schools--the State Agencies have a uniquely important role to
play in the knowledge production and utilization system for education.

The movement toward this leadership function, however, is less
than ten years old in all but a few states. Capacities to perform
its component operations have generally evolved in bits and pieces,
frequently in response to provisions of many different Federal laws
providing categorical aid to education. They remain, in many instances,
only partly developed and often not integrated into a coherent design.
No study has yet been made of the nature, extent, and quality of the
State Agencies' organizational arrangements for exercising the leader-
ship function, nor have the various strategies employed by the states
to stimulate innovation and improvement in the schools been described
or their relative merits assessed.

THE LOCAL EDUCATIONAL AGENCY

We turn now to a discussion of the schools' capacity for
participation in education's knowledge production and utilization system.
We noted earlier that formal R&D is not the only, and perhaps not the
most important, source of ideas and innovations that the schools use--
or should use--to improve their effectiveness. The practice community
is constantly perceiving problems, inventing solutions, and sharing those
solutions with colleagues.

Knowledge generated by the R&D process, then, takes its place alongside

knowledge generated by the practice community as both are utilized by

the schools to solve their problems.

In considering our discussion of the schools' capacity to solve

problems through the generation and utilization of knowledge, bear in

mind the data we presented above illustrating the diversity within the

operating system and the difficulty therefore inherent in making

generalizations about the process of reform and renewal in the schools.

The problems of a Philadelphia high school with 5400 students on double

sessions clearly are different from those of a regional high school in

Montana serving 300 students from a 400 square-mile geographical area.

The organizational structure and resources available to cope with those

problems are equally different. Yet despite the extensive variation among

schools, school systems, and State departments of education, there are some

common features that characterize the capacity of the operating system to

generate and use new knowledge to solve problems.

To begin with, there seems to be a considerable amount of innovative

activity in schools across the country. In a recent survey of innovation

in a diverse sample of school districts, Ronald and Mary Havelock found

a "ubiquitousness of innovation." Of 353 districts, 346 reported an

innovation of significant proportions during the 1970-71 school year. These

findings, the authors conclude, seem to "run counter to the ideas that many

have of U.S. educational 'establishment' as frozen in its ways, indiffer-

ent to change and unresponsive to the needs of students." While their

reliance on superintendents' self-reports of innovation can be faulted--
and definitions of what constitutes a "significant" innovation vary--
there is little doubt that "being innovative" is a desired characteris-
tic for most school systems.

Yet it is not clear that local innovation is organized and
supported in a way that leads to sustained improvement. Most local
innovations are limited in scope and tend not to generalize to other
populations. Idiosyncratic features of the innovation (e.g., a charismatic
leader, a special group of students, a unique developmental history behind
the innovation) frequently have precluded its continuation as part of
the larger system after initial funding ended or its original staff
had left.

Nor is it clear that the reported adoption of innovations generated
by others--either the schools or the R&D system--leads in fact to the
genuine implementation of the substance of the innovation. As we noted
above in our discussion of the effects of R&D on practice, the very
sketchy evidence we have generally shows that when trained observers
visit schools that report "adoption" of a given innovation, the observers
have seen little evidence of its actual implementation.

One might ask how we can suggest on the one hand that the schools
are characterized by "a ubiquitousness of innovation," and on the other
hand report that little real change may have taken place as a result.
However, it is precisely this condition that leads some observers to speak of
"faddism" as characterizing the innovation process in education.

INCENTIVES FOR INNOVATION

At a deeper level of analysis, however, the explanation may lie
in an examination of the incentives for innovation in the schools.
In some respects, these incentives may be perverse--that is, they may
promote only certain types of genuine innovation and lead to the desire
to produce the appearance but not the reality of others.

Schools do not exist in a market economy. That is, the schools
cannot choose to specialize in a particular class of clients and the
clients cannot freely choose among contending suppliers of educational
services. The "product" that the schools have to offer is not clearly
defined; the means of most efficiently or effectively producing that
product are not known; and the degree to which schools produce that product
independent of other influences is a matter of conjecture. Further, while
the schools are trying to make their uncertain contribution to these
uncertain goals using uncertain means to assist a clientele they did
not choose and which did not choose them, they operate in a fishbowl
amidst a wide variety of usually conflicting influences.

In a report we recently commissioned on this subject, John Pincus
and Daniel Weiler suggest that these factors may in fact produce a set
of incentives not wholly supportive of vigorous generation, adoption,
and implementation of innovations.

In particular, they suggest that there are virtually no incentives
to implement innovations that would seriously disturb the bureaucratic
structure of the school, redistribute authority within that structure,
change the balance between capital investment and labor investment, or

change the market structure of education in ways that would force the
schools to compete for clients with other providers of educational
services. Within the limits of these constraints, however, the schools
have an incentive to be responsive to the demand of their clientele
(and their own sense of professionalism) and to take advantage of recent
advances in educational practice and knowledge (provided, of course, that
they can produce some consensus as to what constitutes an advance).

This last proviso may be of particular significance. The difficulty
of achieving political consensus on goals and methods (these being often
hard to distinguish), the vulnerability of the professional educator to
criticism from even small groups or determined community opponents,
and the difficulty of conclusively demonstrating the superiority of
one approach over another, all combine to produce incentives to engage in
the rhetoric of innovation ("Our school system is among the leaders in
the state.") but to stop short of actually implementing innovations that
might badly alienate significant elements of a very diverse consti-
tuency ("I don't want you experimenting on my kids!").

Against this set of somewhat gloomy observations one must weigh
the commitment of most educators to their profession and to the
children their profession serves. One must also acknowledge a certain
restlessness within any system that resists the status quo and seeks
change and improvement as a matter of personal satisfaction. These
factors--hard as it is to calculate their influence--may be the crucial
factors as we consider the schools as a market for innovation.

THE CAPACITY FOR INNOVATION

Having assessed the incentives for innovation in the schools, we turn to a discussion about organizational capacity and resources for renewal, innovation, and knowledge utilization in the operating educational system.

Starting at the most basic level, that of the individual teacher, it is clear that in many school districts teachers are provided with few supports or resources that enable them to be either thoughtful consumers of R&D or agents in a self-generated process of renewal and reform. For most teachers, once their student teaching experience ends, there are few opportunities to receive substantive feedback on their performance or assistance in analyzing their problems. They have insufficient opportunities and tools for making intelligent choices among the range of textbooks, instructional systems, and hardware they are continually urged to purchase. And they generally lack the time, facilities, and financial resources to adapt commercially-available materials to meet their own needs.

To a large extent, teachers' lack of opportunity to develop the capacity to systematically identify and address their major problems is attributable to the ways in which most schools operate. In most

schools teachers are isolated in their classrooms, with little time and few mechanisms for a total staff to identify common problems and collaborate on finding solutions to them. Teachers generally have very little role in making decisions regarding school policy or major instructional issues, and very little control over the manner in which those decisions are implemented.

A similar lack of capacity for sustaining the process of reform and renewal characterizes the next organizational context within the operating educational system, that of the school district as a whole. Few school systems are organized in ways that allow them to anticipate and analyze problems, to search for or generate knowledge that might be useful in solving those problems, or to make management plans for the utilization of that knowledge.

The investments school districts make to support their own R&D activities are miniscule. A 1969 survey by the Bureau of Social Science Research showed that three-fifths of the school districts studied had no budget provision for research and development; another 20% reported expenditures of less than $2,000 a year. A 1965 study by the National Education Association showed that once operational programs (e.g., testing, data

processing) are eliminated, no school districts in this sample spent
more than .5% of their budget for offices of research, planning, and
evaluation. A telephone survey we conducted in October 1973 revealed
that research and evaluation offices of the country's 15 largest urban
school systems continue to receive meager support. Of the 12 systems
for which data were received, the largest commitment to a research/
evaluation office was .73% of the system's budget, and the smallest
expenditure was a .02% commitment for research. The average for all
12 was .16%.

The formal school system is just one element within the overall
community, however, and that broad community has resources that could
be directed toward an ongoing process of educational renewal. Unfor-
tunately, this is seldom the case. In most communities, education
remains the carefully-guarded prerogative of the professionals; there
is little provision for the productive involvement of parents and
non-professionals in school decision-making. Despite its membership
of more than 9 million people in over 43,000 local chapters, Parent-
Teachers Associations generally do not play important roles in the
formulation of school district policies or in the determination of
major instructional matters.

Yet the community can serve as a principal stimulant for major
changes the schools would not otherwise consider, either because the

community feels the schools are not meeting traditional goals or because
it redefines in some ways the objectives of education.   Thus changes in
the basic market structure of schools (use of public funds to support
private schools, for example), or changes to significantly affect the
resource mix or institutional structure of the schools, may be more
likely to be initiated by the layman than by the educator.

Despite this rather negative analysis of the current capacity at
any of the four levels (individual teacher, school, school district, and
general community) to sustain a process of educational renewal, there are
indications that this situation can be changed.   For example, over the
past several years a number of teacher centers, advisories, and extension
agent programs has been established which show some success in supporting
the innovative efforts of teachers, introducing them to new materials,
helping them implement those materials in their classrooms, and assisting
them generally to devise appropriate solutions for the problems they
face.

With regard to schools, it is encouraging to see the development of
mini-schools and alternative schools in many communities.   These insti-
tutions often are structured in ways which allow the faculty to
participate in decision-making, creating mechanisms to identify and
address the school's major problems.   Perhaps most encouraging are the
examples of some "real schools" in cities--those without additional funds,
exotic programs, or extensive pre-opening staff training--in which student
performance and staff morale are high.   It can be done, in spite of all
the traditional factors that would lead one to expect poor results.

Likewise, there are some school districts which have developed
capacities for problem identification, experimentation, and assessment.
Some school districts have created an organization development office
responsible for helping staff members diagnose and devise solutions to
their problems. Several other school systems have strengthened their
planning and evaluation offices so that they can provide needed analysis
and support for personnel throughout the district. Still others have
developed mechanisms for systematically collecting, analyzing, and dissemi-
nating information about new ideas, practices, and procedures that provide
alternative solutions to problems at many levels in the systems.

There also are communities in which lay citizens have joined with
the professionals in a cooperative effort to improve the schools.
There are examples of influential and sophisticated parent advisory
councils, community-wide planning groups, citizen-run information
centers, and student advocacy groups where the productive involvement
of non-professionals has led to more and better use of resources for
school improvement in addition to serving as a constructive stimulant
for change.

The existence of these successful situations is encouraging.
They demonstrate that it is possible for elements of the operating
educational system to build and sustain a capacity to generate and utilize
knowledge for self-improvement. However, we presently know very little

about how these institutions operate, and in most cases we must be
tentative in assessing their effectiveness. We cannot now identify
those factors which seem to contribute to their apparent successes;
nor can we say much about the problems encountered by each institution
in the development of their programs. We are unsure as to which elements
are idiosyncratic and which ones can be replicated elsewhere. Even if
we were more confident about the elements that were transferable, we
lack the necessary knowledge to replicate them effectively.

As we learn more about the ways in which these relatively new
institutional arrangements can contribute to the schools' capacity to
solve the problems they confront, we should also learn much about
the ways in which formal R&D systems and the related linkage and support
systems can contribute to the improvement of public education in the
schools. The products of the research and development system will be
used only to the extent that practitioners perceive those products to
be related to problems they face and to the degree that they have incen-
tives and capacities to use R&D products and other knowledge products
to further their objectives.

IV.   RESOURCES FOR PROBLEM-SOLVING:
TOWARD AN INTERACTIVE MODEL OF EDUCATIONAL CHANGE

The preceding survey of the various institutions participating
in the knowledge production and utilization process notes some of the
progress that has been made and the problems that remain. We believe
that Government policy during the period under review has been dominated
by a seriously deficient conception of the change process. This chapter
will critique that conception, the "linear model," and make some pro-
posals which should lead to a more balanced and interactive
process.

THE "LINEAR" VIEW OF THE CHANGE PROCESS

During the last decade, a great deal of the thinking about research
and development and its relation to change in education was based on
the nation's experience in rationalizing the process of invention and
change in the industrial, military, space, and other primarily "hard
science" sectors. In this conception of education change, the change
process begins with, and depends on, the accumulation of a body of basic
knowledge and theory about the fundamental processes of education. This
basic research function is carried out by university-based
researchers working on problems posed largely by the state-of-the-art of
their respective disciplines. In this conception, the next stage of the
process is development: making use of research results to create products
to solve practical problems. "Products" would include physical objects,
processes, organizational arrangements, or anything else that can be

designed or created. Though many variants exist, the process associated with development generally includes the following stages: specification of objectives, initial design, prototype construction, several stages of testing, final design, large scale field testing, summative evaluation, and, if appropriate, production.

When development is complete, this view assumes that a product exists which meets the objectives it was designed to meet and is available for wide distribution to the consumer at a relatively low--or at least competitive--unit cost.

This model of the change process projects a rather passive or compliant role for the school-based consumer. In those cases where the development products include physical objects--textbooks, for example-- the post-development process entails: (1) informing the practitioner that the product is available and has certain effects on its target population (sometimes this includes demonstration), (2) offering training in the use of the product, and (3) making the product itself available, usually through the services of a commercial publisher. The last step is unnecessary if the products do not include physical objects.

This approach to change assures that the schools will adopt and faithfully install R&D products in some uniform manner, provided only that the R&D community demonstrates that they "work," supplies some training in their proper use, and gets the product to the school. The implicit Government policy in this view would be to make R&D products available to the schools but, beyond the steps outlined above, do nothing to assure that such products were implemented.

Among the difficulties with this conceptualization, three seem
fundamental:

- *As it is a researcher's view of the world, it suffers
  from tunnel vision.* That is, it sees educational
  practice--or at least innovative educational practice--
  as a simple function of external research, development,
  and linkage. Yet what actually goes on in schools is
  a function of many other influences as well, including
  traditional lore and craft knowledge, the perceptions
  practitioners have of the success or failure of trial
  and error innovation, and the particular needs and
  circumstances of specific schools and communities.

- *It assumes that the results of research and the
  products of development maintain their identity
  throughout the process and fully specify what
  happens in the classroom.* Yet the real world of
  human behavior is never fully subject to standard-
  ization, and the analogy to hardware production
  quickly breaks down. Knowledge and products flowing
  from research and development become switched, re-
  combined, and transformed as they become involved in
  processes of linkage and utilization.

- *There has been a tendency to assume a one-to-one
  correspondence between institutions and functions--*
  i.e., that universities do research, non-profit and
  profit organizations do development, and that schools
  utilize--and all of the "disciplined inquiry" takes
  place outside the schools. Yet it is clear that
  these various performers often play multiple roles.

SOME PROPOSALS FOR CONCEPTUAL MODIFICATION

The last point becomes the basis for moving toward a new conceptu-
alization. There is one basic distinction among the institutions concerned
with educational innovation: some institutions do in fact operate
schools, while others serve as resources. At the same time, operating
systems participate in the process of knowledge production and utilization
(KP&U). The matrix which follows shows the array of institutional per-
formers on one axis and the various KP&U functions on the other.

INSTITUTIONS	FUNCTIONS			
	Research	Development	Linkage	Utilization
Universities				
Non-Profits	External Research		External Linkage	
Profits	and Development		and Support	
Federal Govt.				
SEA's	Internal Research		Internal Policy, Linkage & Support	
LEA's	and Development		Internal Problem-Solving	

External Resource System

Operating Education System

Figure 1. The Institutional and Functional Structure of Knowledge
Production and Utilization in Research

Major types and domains of activity can be defined by making analytic distinctions on these two axes. We have already introduced the distinction between the operating system (LEA's and SEA's) and the external resource system (the Federal Government, universities, other non-profits, and profit-making corporations). On the horizontal axis there is an important break between R&D on the one hand and linkage and utilization on the other. The end of the R&D process is usually the point at which some specific product emerges, and so this point constitutes a "milestone" in the total process. However, at that point there may be a fundamental change in the nature of the process, and products may lose their identity as they become switched, re-combined, and adapted.

The cells identified by this process define domains of activity which are fundamentally different in important ways. Nevertheless, all constitute important elements in an overall strategy for building a system of knowledge production and utilization in education. Each of these domains deserves separate comment.

External R&D

In many ways this is the most well developed domain. There has been a growth and differentiation of specialized institutions, and there is an emerging technology and methodology associated with R&D functions in those settings. By far the largest part of the Federal investment in research and development (narrowly defined) has gone to this sector. Nevertheless, this domain is still in its infancy and has experienced a number of difficulties as noted in earlier chapters.

In particular, the institutional relationships among the Federal
Government, universities, non-profit organizations, and industry need to be
re-examined; ways need to be found to support continued development of the
technology and methodology of conducting and managing education R&D;
and ways need to be found to improve the quality of personnel and ensure
greater minority participation. All of this needs to be done in a manner
which incorporates new understandings about the nature of the other three
domains and the interrelationships among all four. A later chapter
presents a set of program initiatives focussed on those problems.

External Linkage and Support

Although linkage activities take place across all levels of the resource
and operating systems, it is convenient to identify a separate set of initi-
atives which focus on an external national effort. Among these are the
operations of a comprehensive information system linking all the partici-
pants in the resource and operating systems with the external institutions
involved in delivering products and related technical assistance to the
schools. As we shall argue below, internal linkage is better understood
as part of a more comprehensive process of internal problem-solving.

By definition, external agencies do not use "ultimate" R&D products;
only operating agencies do. However, external agencies do support inter-
nal innovations by operating agencies. Indeed, much of the Office of
Education's support for educational innovation in the past decade (e.g.,
ESEA Title III, the Right-to-Read Program) took this form rather than the
support of external research and development. To the extent that we

are successful in developing new forms of systematic innovation within

operating agencies (either internal R&D or internal problem-solving),

we might define new programs for external support of internal innovation.

Internal R&D

This cell in the matrix indicates our conviction that elements of

the operation system--the SEA's and LEA's--should be regarded as legitimate

performers of education R&D. The nature of their activities generally is

different from those conducted by agencies within the external resource

system; there is less basic research, for example, and a far less rigorous

process of development/field testing/evaluation.

Nevertheless, we have discovered that there are some SEA and LEA

activities that produce generalizable knowledge and materials. State

Agencies play a role in such areas as policy research, the development of

systematic procedures to identify successful programs, and the design

of diffusion processes. In addition, some school district personnel

argue for their own R&D capability on the grounds that external R&D

agencies frequently are insensitive to or unwilling to address certain

areas of immediate concern to school district.

While we have encountered scattered forms of R&D conducted by

elements of the operating system, there is little to guide us in determining

how, and in what domains, SEA's and LEA's can play more effective roles

in the production of generalized knowledge and materials. Accountability

to local taxpayers would tend to limit the extent to which SEA's and LEA's

can make investments in R&D activities whose results are intended primarily for audiences outside their immediate jurisdictions. The monitoring system and several of the surveys recommended later in this paper will provide us with data on the present and potential capabilities of these agencies and should help us reach more definitive conclusions about what, if anything, NIE should do to strengthen State and local R&D capacities.

LEA's: Internal Problem Solving

As defined by the matrix in Figure 1, this domain encompasses the functions of linkage and utilization conducted by LEA's. However, our analysis indicates that the role of practitioners must be conceived not as passive or unaware consumers but as professional individuals who have their own insights, goal structures, and decision roles. Further, they seem to view the external R&D community not as a provider of techno- logical "fixes," but rather as a source of alternate goals, description of problems, and options for dealing with them.

The preceding section has indicated the importance of practitioners reaching out for new ideas, becoming more sophisticated in their demand for particular types of innovations, and assessing critically the extent to which any given innovation meets their needs.

Our aim here is not only to help practitioners become more sophisticated consumers but to help build capacities in local school districts for ongoing analysis and improvement independent of the schools'

use of products developed elsewhere. Among the set of practitioners' skills

we have in mind are the abilities to diagnose problems accurately,

to identify and search for resources addressing those problems, to devise

and test experimentally appropriate responses to the diagnosed problems,

and to evaluate the effects of those responses. This evaluation would

then lead to further refinements both in the problem definition and in

understanding the relative merits of the various alternatives.

The line between internal R&D and the types of internal problem-

solving described above is a fuzzy one. In addition to some difference

in methodology, the chief distinction is the degree to which a genera-

lizable solution is sought; research and development seeks generaliz-

able knowledge and generally useful products, while problem-solving

is more concerned with the local and unique.

SEA's: Internal Policy, Linkage, and Support

This domain refers to the linkage and utilization functions of

State Agencies. Earlier sections have discussed the growing role of SEA's

in providing services and support to local innovative activities. State

departments of education also have the responsibility to assess state-

wide needs and to design programs of dissemination and diffusion that

allow school districts to learn about and profit from each other's

activities.

SUMMARY

None of these domains can be treated in monolithic terms; each needs
to be differentiated internally. For example, the roles and activities
of the different institutions operating in the external resource system
need to be sorted out more carefully; and the flow of scientific and
technical information within the R&D community must be understood and
strengthened--not just the flow of information to practitioners.

By the same token, although we have described the five domains
of activity separately, we must be careful not to treat them in isola-
tion; indeed much of our attention must be on how they interact with each
other. Since our earlier analysis indicates that the interaction among
the domains presently is very poor, we suggest the following normative
considerations for the system which needs to be built:

.   Researcher, developer, and user should participate
    in an interactive network to influence activities
    at any other point in the network.

.   Incentives should be built into the R&D subsystem
    to make it more responsive to the needs, values, and
    ideas of its clients.

.   Institutional and communication links should be
    built between the external resource community and
    the operating sectors to facilitate user access
    to the skills and products of the external agencies,
    and to provide channels through which those agencies
    can receive feedback from practitioners,

RECOMMENDATIONS

INTRODUCTION TO THE RECOMMENDATIONS

Our conceptualization of the knowledge production and utilization
system and the analyses which preceded it provide both a framework and an
orientation for the program recommendations.   We have suggested that
there needs to be a better balance among the elements of the system,
especially with regard to the role of school people as generators as well
as consumers of knowledge.

Although we must stress the interactive nature of elements within the
proposed system, for convenience we have divided the recommendations into
the following categories:

- *Developing a monitoring system within NIE* to systematically
  and periodically gather and analyze data about the function-
  ing of the knowledge production and utilization system
  which will provide a base for the continued improvement
  of the system.

- *Strengthening the external R&D system* by developing an
  understanding of its structure and functions; improving
  technology for conducting R&D; increasing the interface
  between the R&D system, the linkage system, and the
  operating system; and devising strategies to improve NIE's
  management of R&D.

- *Building a linkage and support system* between the external
  research and development system and the schools, including
  an information system, procedures for delivering develop-
  ment products to the schools, and means of building
  capacities of intermediary organizations that link and
  help schools implement R&D products and provide feedback
  to the formal R&D system.

- *Building problem-solving capacity in the operating system*
  through the creation of new institutional arrangements in
  the schools and SEA's, development of resource organiza-
  tions outside the schools to assist them in the problem-
  solving process, and strengthening the ability of lay
  members of local communities to contribute to the solution
  of problems in their schools.

Chapters V through VIII present the elements of our directed research program. They describe the nature and sequence of activities we think necessary to provide sufficient data and analyses to determine future program directions. We cannot rely solely upon our current sense of what is needed, however. We must continually allow our perspective to be challenged and broadened by studies that we have not, and might not otherwise, consider. Consequently, Chapter IX proposes an ongoing program of field-initiated studies whereby support would be provided for undirected research in the general area of knowledge production and utilization.

V. MONITORING THE SYSTEM

PROBLEM

It should be clear from earlier sections of this paper that there is a great need for better data concerning the knowledge production and utilization system and the operating school system it serves. To be sure, information is not entirely lacking, but where it exists it is often out-of-date, incompatible with data from other sources, or of questionable validity.

Before we can determine how best to intervene to improve the system, we need to develop a much better understanding of system dynamics.   The basic assumption is that there are ways to systematically improve the efficiency and effectiveness of the knowledge production and utilization system and that we are not entirely dependent on occasional flashes of insight.   A body of knowledge has begun to accumulate concerning R&D systems, but primarily in non-education fields.   We need to test, verify, and revise this knowledge base as it relates to the constraints and contexts specific to education R&D.

Generally we have lacked both the data base and the understanding of system dynamics needed for effective, rational policy-making. In their absence, policies have been determined on the basis of the resolution of cross-pressures, analogies drawn from other fields, and the imagination and foresight of a few individuals.

Lacking a strong data base, NIE's various publics--practitioners, the academic community, the state and Federal power structure, and the lay public--have lacked an understanding of the scope, magnitude, and nature of education R&D activities.

An R&D program must be firmly rooted in an understanding of the nature and problems of the operating system it seeks to serve. It must also have reliable information on the impact of its programs, i.e., a "feedback loop" permitting judgments about the impact of NIE initiatives on both the external R&D system and the operating system (recognizing that the effectiveness of both systems is a function of other factors as well).

To understand the knowledge production and utilization process, much less to develop an Institute policy with respect to supporting widespread innovations in the operating system, we need to know a great deal more about the system indicators. Principal indicators might include data on: types and numbers of personnel and institutions devoted to the creation, production, dissemination, and evaluation of innovations; the financial resources committed to such activities and their sources; the facilities and equipment existing for these activities or developed to meet specific local needs; legal and administrative regulators; and indicators of product and practice adoption, adaption, or innovation.

OBJECTIVES

The objectives for the program to monitor educational change are as follows:

. *To achieve an understanding of the process of knowledge production and utilization in education.* This objective is fundamental to the success of other objectives of the Office of R&D Resources, and indeed, to the achievement of all NIE objectives.

. *To provide the data base needed for policy analysis.* Such a data base would (1) provide an early warning system to identify problems requiring policy initiatives, (2) assist in weighing policy alternatives by supplying data on the context of decision-making and the predictable impact of policy alternatives, and (3) provide feedback on the consequences of policy initiatives.

. *To provide for public accountability.*

STRATEGIES

This program is intended to establish an internal NIE capability to monitor the external R&D system and the operating system of education. Its three major components are (1) designing and assembling the necessary data base, (2) formulating theories and models of system dynamics, and (3) providing analyses and reports to internal policy-makers and NIE's various publics.

The concept of "monitoring" is borrowed from the literature on social indicators. That literature was originally focussed largely on the identification and measurement of outcomes at a macro-scopic level. More recently it has come to emphasize the need to conceptualize models of society or significant social sub-systems and to

use the models to identify the variables in all parts of the system.
As they are concerned with the dynamic interaction between model
elements and the measurement and understanding of change, the indicators
must be time-series. Once the interrelationships in the model have been
established empirically, monitoring change in the variables becomes a
means of anticipating change in other parts of the system. As development
of such a model is a very long-term goal, it must be approached through a
process of successive approximations. Even so, a beginning must be made.

There are many existing sources of data which already provide, or have
the potential of providing, important components of a system to monitor
educational change. These include OE's National Center for Educational
Statistics, NSF's Science Resources Division, and the Census Bureau, as
well as units with NIE which are developing a management information
system and other documentation and reporting services. There is no
desire to be redundant with these operations. The utility of their
outputs, however, can in many cases be greatly enhanced if we can work
with them to achieve some modifications in their data systems, such
as obtaining data at a more disaggregated level. The cost of such a
strategy is largely that of staff time, although in some cases we might
obtain valuable additional data by using program funds to support
"piggyback" studies.

While attempting to make maximum use of intellectual and empirical
resources in the field, we will find that there remain important kinds
of information for which no data are currently being collected, or even
for which no measures have yet been developed. In such cases, NIE should

undertake to develop appropriate measures and design appropriate new
data-gathering efforts through a combination of intramural and contract
research. The activities listed below will provide a starting point
towards developing NIE's capability to monitor changes in education's
R&D and operating systems:

- *Conference on Alternative Conceptualizations of the
  Knowledge Production and Utilization System.* As a
  first step towards a better understanding of the
  knowledge production and utilization process, a multi-
  disciplinary conference will be held to present papers
  summarizing the knowledge and insights which those
  disciplines can offer about this process. Leading
  experts in the sociology of science, social indicators,
  philosophy of science, economics, information theory,
  and educational change would be among those invited.
  In addition to presenting and discussing their papers,
  the participants would be asked to work together to
  provide the outline of a possible reporting framework.
  NIE would also publish the conference papers.

- *Fact Book and Predesign Studies.* The design of the
  data system will take at least two to three years.
  In the meantime, it is important to make use of exist-
  ing data as best we can. The inventorying and analysis
  of existing data, when juxtaposed with the theory
  development conference described above, will constitute
  the first step in the design of the data system. One or
  more contracts will be let to inventory existing research
  studies, Federal statistical systems, management informa-
  tion systems, and other sources for information concerning
  institutions, personnel, finance, facilities, laws and
  regulations, activities, products, and their apparent
  impact. From this information we will distill a
  parsimonious set of data for a Fact Book on Knowledge
  Production and Utilization in Education; analyze the
  data with respect to a set of policy issues determined
  by NIE; identify gaps where new data are needed; and
  make recommendations regarding the development of new
  indicators or the modification of existing data systems.

· *Design of a Survey of Educational Practice and R&D Impact.* Is American education changing rapidly, or is it still essentially the same as it was a generation or two ago? One can find support for either premise in the research literature or the popular press. Schools are accused both of changing with glacial slowness and of chasing after every new fad. Baseline data are needed on the number of children being exposed to different kinds of educational programs (materials, organizational arrangements, and teaching-learning strategies), by level and the characteristics of schools, communities, and pupils. All of this is needed as a framework for the investigation of R&D impact. It has been pointed out that adoption of an innovation does not guarantee that it will be implemented in a manner visualized by the developer. But how many variations of "individualized instruction" are there and how does one determine whether a pupil is receiving it? With some innovations, in some situations, "prudent rejection" may be a wiser choice than adoption or adaption, but one must know what the pre-existing practice was or what alternate practice was preferred. The design and measurement questions raised by these issues are considerable. This project would develop operational measures of educational practice and design a survey which would measure the utilization of a range of traditional and innovative educational practices and R&D products.

VI.   BUILDING THE R&D SYSTEM

PROBLEM

The past decade of growth in education knowledge production and
utilization has witnessed the creation of new R&D institutions, the
introduction of rapidly increasing numbers of new technologies, and a new
role for the Federal Government as both a major initiator and sponsor of
education R&D.   However, that system is still in its infancy.   R&D
models often borrowed from the "hard sciences" have not always been
appropriate to the solution of complex social problems.   New models
more closely related to the requirements of social research must be
invented.   The new institutions and functions have yet to become part
of an interrelated and mutually supportive endeavor.   Present financing
arrangements leave the viability of some new institutions in doubt.   At
the same time, the appropriate role of market forces and non-market inter-
ventions is unclear.   Scientific communities which seem so vital to the
growth of knowledge in other fields are still weak and fragmented.   Strat-
egies for increasing the responsiveness of R&D performers to the client's
needs are underdeveloped.

OBJECTIVES

The objectives for a program to build the R&D system can be described
as follows:

. *To achieve greater understanding of the structure and
functions of the education R&D system,* including the
identification of factors contributing to the produc-
tivity of the system.

. *To strengthen the infrastructure* of institutions,
personnel, and technology for conducting education R&D.

. *To improve NIE management of R&D.*

. *To strengthen the interface* between the research and
development systems and the systems for linkage and
utilization.

STRATEGIES

Because we have a very limited knowledge base from which to work,

the conduct of further policy studies and research is essential to

formulating long-range intervention strategies.   The monitoring function

described earlier is a major feature of this set of activities.

In addition to long-term research and analysis, we also propose a

series of special studies aimed at particular issues which we regard as

crucial to NIE.   These issues should be addressed in the near future, prior

to the initiation of the comprehensive data collection strategies embodied

in the monitoring system.   A long-range program of policy studies and

research would focus on the following areas:

The internal operations of the knowledge production system. The

studies will examine the manner in which various Government policies

influence system development and would describe and analyze the current

status of the three sub-systems:

- The institutional sub-system of performers: what they do, how they do it, and how well.

- The personnel sub-system: including nature, distribution, and competence of personnel and the influence of training, selection, and recruitment strategies.

- The special facilities sub-system.

The dynamics of the system's interaction with the client groups.
The studies will examine the relationships of the schools' market struc-
ture to the producers of R&D and the incentives in the R&D system for
being responsive to the problems faced by schools.

R&D systems in fields other than education and the education R&D
sector in other countries. The studies will compare the nature,
operations, and effectiveness of other systems with those of the U.S.
education R&D system.

NIE management strategies. The studies will identify alternative
planning, procurement, monitoring, and evaluation strategies; assess
their implications for attracting to NIE high quality research and
development; and propose new management strategies.

All of these studies are designed to gain a better appreciation of
the dynamics of the knowledge production and utilization system and the
problems which effect its ability to facilitate improvements in the
nation's schools. These endeavors will identify new intervention strategies
for improving system operations and for assessing the effects of proposed
interventions on the total education enterprise.

The following short term projects are proposed for the near future.

Policy Studies and Research

1. *Policy analysis of the roles and problems of non-profit and university contractors.* With the transition of the educational laboratory and R&D center program to NIE, a major shift in policy from "institutional support" to "program purchase" was made, severing the special relationship between the Government and these institutions. It is time to assess the policy's effect on these institutions. More generally, it is time to consider the impact of Government procurement policies on universities and other non-profit organizations, and to identify other factors affecting the productivity and viability of these organizations. Key issues would include:

   . What has been the effect of the program purchase policy on the effectiveness and viability of the laboratories and centers?

   . Does the non-profit sector need strengthening, or is it viable and effective under present arrangements?

   . What policy should NIE have on management fees?

   . What is the effect of the copyright policy in providing independent research funds or contributions to the capital structure, and is it contributing to and encouraging the dissemination of products in an optimal way?

The utility of this project depends on securing the effort of experts who have studied these issues--possibly in fields outside of education R&D--to assess available information, supplemented by limited field visits to some of these institutions. The expected product would be a series of

short-range policy recommendations for an NIE procurement policy and

the identification of key issues for more intensive study.

2. *Policy study of alternative methods of increasing*

minority participation in education R&D. We have noted in an earlier

section of this report that for the past ten years education of minority

groups and the disadvantaged has been one dominant target of education

R&D, that this concern is now embodied in the legislative charter of NIE,

that R&D personnel who are themselves members of minority groups can be

expected to have insights into these problems not available to others,

and that minority groups are still generally under-represented in the R&D

work force. As it is not clear what strategies would best alleviate

this problem, a policy study is proposed to assess the various options.

3. *Study of incentives affecting career decisions of R&D*

personnel. From a strictly supply and demand point of view, there is no

reason to believe that education R&D should not be able to attract the

quality and mix of persons needed for effective work. Yet it would appear

that education R&D continues to be a low prestige field not attractive to

our best talent. Clearly, more definitive data are needed to confirm

these impressions. We need to know more about the incentives and

motiviations affecting the career decisions of scientists and technicians,

with particular reference to structural elements of the system which

might be altered to improve the field's attractiveness and holding power.

We propose to initiate a project to design and pre-test such a study.

Strengthening Institutions, Technology, and Personnel.

1. *Workshop on research management.* R&D on a scale sufficiently large to require sophisticated management techniques is relatively new to education, but clearly the present situation requires such skills and technologies. The sponsorship of a workshop on research management would signal NIE interest in this field, provide support for the growth of a related scientific community, improve the skills of personnel employed in management positions, and add to the technological base.

2. *Workshop and seminar series on problems in evaluation methodology.* Evaluation has emerged as a key specialty contributing to the conduct of R&D in education and other social problem fields. Evaluation research is important to policy analysis, formative evaluation is essential to product development, and summative evaluation provides product validation data needed by clients and consumers in order to make rational adoption decisions. Pure forms of experimental design are rarely feasible, and new designs and methodologies are needed to cope with the complexities of the problems and the vagaries of working in ongoing social institutions. This project would sponsor a series of workshops and seminars on evaluation methodology with objectives comparable to those for the workshop on research management, i.e., to signal NIE interest in the field, provide support for the growth of a scientific community, improve the skills of personnel working in evaluation, and add to the technological base.

VII. BUILDING THE LINKAGE AND SUPPORT SYSTEM

The rapid growth of education knowledge production has not been
accompanied by a parallel surge of educational reform. There seem to
be many reasons for the apparently limited impact of education R&D.
One problem is certainly related to the nature and quality of R&D products.
The previous chapter suggests some ways to begin increasing the quality
of the system's outputs. There are other problems, however, which may
be responsive to strategies we can more rapidly initiate. These are
generally related to difficulties which confront the operating system.
For example, school staff:

- Has trouble in locating and using information
  which is relevant to its needs and which is in
  an understandable form.

- Has trouble selecting between vast numbers of
  R&D products which seem undifferentiated in
  terms of effects.

- Needs to have access to a wide variety of alter-
  native solutions to particular problems.

- Has trouble implementing and sustaining new
  educational approaches which are often unfamiliar
  and sometimes perceived as threatening.

One strategy to alleviate these problems may be to develop a much
more comprehensive and interactive system, linking together the producers
and consumers of education knowledge and products and providing profes-
sional support to the operating system. We have previously discussed
several organizations and strategies which now carry out the linking
and support functions. These included publishers, ERIC, State departments

of education, and teacher centers. There are many others. We propose here three initial program strategies designed to understand, improve, and strengthen this system. They are:

- *An Information Dissemination Strategy*
- *A Consumer Information Strategy*
- *A Product Delivery Strategy*

Recommendations related to external linkages are also contained in the chapter "Building Capacity in the Operating System." Taken together, the several strategies relating to linking mechanisms proposed in this chapter and the next are intended to provide a knowledge base that will eventually permit governmental units at the local, State, and national levels to build together a network of linking mechanisms uniquely adapted to the needs of education.

CONSUMER INFORMATION

Education decision-makers, chief state school officers, legislators, school boards, superintendents, parents, principals, teachers, and children all determine the content and style of education in our schools. Often, they must make important decisions without much information about the possible effects of the various alternatives. Customarily, most evaluation reports have concentrated on the degree to which a particular product or program produces the desired outcomes for the target population. Occasionally they have commented on unintended effects as well. Only rarely have they included other information that has a direct bearing on the decision to adopt and the process of implementation--information as to community reaction, financial costs

of implementation, organizational consequences, effects on classroom
discipline and vandalism, anecdotal accounts of how schools and teachers
have coped with those problems, and so on. Yet this kind of information
is often more important to those who must adopt and implement the product
than is data on target group outcomes. Not only is information of this
kind generally unavailable about Government sponsored programs, it is
very rarely generated for innovations developed in the operating system.
State Education Agencies, among others, are increasingly interested in
disseminating information about good practice but have often lacked
the resources and methodology to determine the value of innovations
developed in the schools beyond intuitive grounds.

Objectives

What is needed is a program of consumer information to provide:

- Better means to *identify and test* promising
  practices.

- Better *verification* of product evaluation procedures
  and results.

- More and better *information* on product performance and
  the process of adoption and implementation.

- Alternative strategies for providing this information
  in an *appropriate format* to consumers.

Strategies

In order for the Consumer Information Program to provide useful and
credible information to its intended audiences it must:

- Stimulate improved evaluations of NIE sponsored programs and
  products which generate reliable information about the effec-
  tiveness of alternatives, essential conditions for their
  implementation, and limits of their adaptability to local
  constraints.

.   Identify promising products and practices generated by the
    operating system as well as by R&D sponsors other than NIE,
    and develop a procedure for collecting and verifying similiar
    consumer information.

.   Experiment with a variety of ways to effectively communi-
    cate consumer information to interested client groups.

We propose to initiate the following experimental programs:

1. *A product verification unit* will be established in the

Office of R&D Resources. This unit will collate and review information

about NIE products, and verify the evaluation procedures used. This would

include verifying the presentation of information related to adoption and

implementation.. Appropriate courses of action will also be identified to

determine procedures to verify non-NIE sponsored programs and products.

2. *A conference of State Agency personnel, evaluation specialists,*
Government representatives, and others will be held to identify means of

producing consumer information about promising school practices. The

results of the conference will be used to develop a cooperative program

with State Agencies and others to identify and verify school-based

practices, to be implemented in future years.

3. *A product format study* will be initiated to determine how to

format information about promising products and practices so that it is

useful to consumers. A contract will be let in FY 74 to empirically

assess the relative merits of different content and presentation styles

for educators and school boards.

4. *A catalogue of NIE sponsored and verified products* will be

developed in FY 74 based upon initial results of the product format

study described above. This catalogue will be designed to facilitate the

selection and implementation of alternative products. In the future,
similar catalogues should be produced at least on an annual basis,
and should include non-NIE products and school-based programs. In
future years, other methods of communicating such information will
also be attempted.

5. *A program of research and evaluation* will be carried out
in future years to improve the knowledge base upon which consumer
activities rest and to determine if the program is achieving its
objectives.

THE INFORMATION DISSEMINATION AND COMMUNICATION PROGRAM

Problem

The foregoing analysis indicates that externally generated knowledge
is a major resource in the process of educational reform. The results of
research shape future research, direct the development of new educational
solutions, and provide new insights into operating educational problems.
The experience of one school district which has designed or implemented
an innovation can simplify the task of another school district in adapting
or implementing a similar solution to its own problems.

To varying degrees, members of the educational community have access
to a substantial number of information resources. Some of these are
focussed on specific groups of clientele, such as professional associ-
ations and their journals,and others may deal with specific educational
problems, such as the network of over 400 special education instructional

materials centers. One, the Educational Resources Information Center (ERIC), has undertaken--with only partial success--to provide the full educational community access to the comprehensive body of documentary English literature about education. An earlier portion of this document has given a brief description of ERIC and characterized it as one of the largest information storage and retrieval systems in the world. It is, of course, operated with funds from the National Institute of Education.

Both because of ERIC's scope and its NIE sponsorship, any NIE plan for improved access to educational information must take into account its strengths and weaknesses. Hundreds of thousands of uses are made of ERIC resources by educators every year, yet its users make up only a fraction of the educational community. If one takes the perspective of a potential user of an information service, the reasons for under-utilization of educational information become apparent.

From the user's perspective, there are four major requirements of a responsive, serviceable information system:

- Comprehensiveness: few educators (or performers in other fields, for that matter) have the time or inclination to seek information from several sources prior to making a decision or undertaking a course of action.

- Relevance: the information provided must be germane to the needs of the user. If one is seeking empirical evidence, he should not receive speculative papers; if one is interested in descriptions of practices in the school, he should not receive reports of laboratory experiments.

- Utility: the information should be as directly usable as possible; it should be compatible with the current skills and knowledge of the user.

. Accessibility: the user should be able to have
    preliminary access to the information system
    locally, and preferably in his own work setting;
    the response to the information request should
    be timely for the user.

From this perspective, neither ERIC nor any other educational informa-

tion system, nor all of them together, are meeting the needs of the educa-

tional community. However, even if all these requirements are met, the

information system will not be acceptable unless its costs are reasonable

to the user, to the system operators, and to its sponsors.

Objective

The objective of the Information Dissemination and Communication

Program can be inferred from the preceding discussion; namely,

    To provide timely access to all relevant and useful
    knowledge relating to education for the diverse
    members of the educational community, including
    teachers, administrators, school board members and
    other policy makers, researchers, and developers.

Strategies

Attainment of the objective requires an information system which

performs the following functions in a cost-effective manner:

. *Acquisition* of all relevant documents and other
    knowledge relating to education;

. *Screening* the acquired information for authenticity,
    relevance, and utility;

. *Indexing* the acquired information so that individuals
    addressing the information system may readily identify
    needed and relevant information;

. *Storage* of information in a manner to facilitate...;

. *Retrieval* of required information by system users in
    a timely and economical manner;

. *Dissemination* of information in forms required by
the user including print, microform, computer tape,
interpersonal communication;

. *User Services* for ready and timely access to the
system and assistance in fully exploiting the
system;

. *Development Information Products* such as bibliog-
raphies, state of the art papers, and interpretations
and syntheses of knowledge on significant educational
topics, tailored to key user groups.

For any system to perform these functions appreciably better than exist-

ing services, it will be necessary to design and implement it over a

period of several years. All of these functions are being performed

to a greater or lesser degree by ERIC at the present time, and their

performance is essential in providing information to educators while a

newer, more viable system is emerging. We shall, therefore:

1. Initially maintain the ERIC system, making such improvements

as are possible with our current knowledge about the requirements of

education and the state-of-the-art in information science and technology.

2. Initiate necessary experiments, economic studies, and policy

analyses which will provide specifications for a more viable and

responsive information system.

3. Design, incrementally, necessary major modifications or alter-

natives to the emerging information system. Our initial efforts, both

in short-term ERIC modifications and longer-range system designs will

center around four improvements:

. Scope of Information Covered. We shall determine
whether the currently available knowledge in ERIC
should be broadened or narrowed, examining the
feasibility of providing either physical access
or references to such information as data files,
instructional materials, and school-based information.

. <u>Improved System Access</u>. Beginning with attention
to the list of functions above, we shall determine
whether other functions are required, and whether
some of those listed can be left to the attention
of other instrumentalities. It will also be neces-
sary to determine the types and location of performers
of these functions and the possibility of cooperative
use of local, State, and Federal resources in maintain-
ing the system developed.

. <u>Transformation of Information into Usable Forms</u>.
An expanded program for generation of problem-
oriented information products will be begun
immediately and further expanded in future years.

4. Field test, adapt, and implement design alternatives for the

improved educational information system.

Two activities intended to provide immediate improvement will be

initiated at once:

. <u>User Study</u>. Support will be provided for a series of
activities intended to identify current satisfaction,
dissatisfaction, and information-using styles of
individuals in various roles in the educational
community. These user studies should provide an
initial basis for making decisions about changing
the coverage of literature and other educational
information. In addition, they will provide the basis
for initial plans for modification of local user services.

. <u>Information Transformation</u>. NIE is currently in the
process of identifying high priority topics on which
interpretations and distillation of knowledge into
more usable forms are required. Among the sources
used are feed-back of stated user needs from extant
information service centers and the results of a
survey of information requirements supported in
preceding years. Using these data and staff analyses,
NIE will issue requests for proposals for state-of-the-
art papers and other information products on high
priority topics.

Three other activities will be initiated during the current fiscal
year or early in FY 1975, contingent upon the availability of funds:

- Economic Analysis of ERIC. This study will address
  the issues of costs, markets, and the utility of the
  current system. A cost allocation model will be
  developed to examine the costs of each system component.
  The market analysis will answer such questions as: the
  degree to which demand for products and services depends
  upon price structure, the degree to which an information
  system can be self-supporting, and the effectiveness of
  marketing techniques in increasing the user population.
  These data will be used in future policy decisions and
  system design.

- User Services. Awards will be made to operating informa-
  tion centers to design or implement improved or expanded
  information services to user groups. In one case, this
  may be little more than providing referral services to
  sources of technical assistance; in still others, an
  operating information service center may be supported in
  providing its services to a contiguous area which does
  not now have such services. In still another case, a
  center might be supported in the design of broader and
  more responsive information services.

- Continued Experimentation with On-Line Computer Retrieval.
  Experience to date suggests that on-line, interactive com-
  puter search capability permits more rapid retrieval and
  generally higher user satisfaction with the results of a
  search of the ERIC file. Further experimentation with
  these techniques, both to improve their utilization and
  to explore means of reducing their cost will be undertaken.

The objective of this program is addressed to serving the
manifold needs of a variety of different groups in education, each
having differing areas of expertise and each operating under a dif-
ferent set of constraints. This requires that the ultimate configu-
ration of an effective educational information system have a wide range
of products and services, tailored carefully to the diverse requirements
of the various client groups.

Whatever may be the inadequacies of the current ERIC system for researchers, developers, and graduate students, they have the capacity to make use of the system (i.e., access to the products of the system and skill in reading and interpreting the results of research) and some level of incentive to seek out and use information products. Most individuals in the operating sector, be they policy makers, executives, or teachers, have relatively less capacity to seek out and exploit the products of an information system whose collection consist largely of research reports.

We believe, therefore, that the primary, but not exclusive, focus of our initial efforts should be to enhance the utility of ERIC and whatever system grows out of it for the educational practice and decision-making community. Every effort will be made, however, to ensure that these efforts will concurrently serve the interests of the scholarly community.

These few initial activities will permit some immediate upgrading of the responsiveness of ERIC. In addition, however, they will provide the basis for a preliminary design for an improved and expanded information dissemination system.

DELIVERY OF DEVELOPMENT PRODUCTS

Improving educational practice is dependent in part upon the existence of a wide variety of program and product alterna.ives,

generated by both the R&D system and the operating system, which decision-
makers can select, adapt, and implement at an acceptable cost with reason-
able assurance of effectiveness.

However, a variety of problems with current mechanisms for delivering
R&D products to the operating system limits their accessibility and, con-
sequently, their utilization. These include a lack of continuity and
articulation between developers and publishers, problems with products
with low profit potential, problems of coordinating technical assistance
with product delivery, lack of market forecasting, lack of knowledge
about the costs and benefits of different dissemination strategies, and
lack of incentives for developers and publishers to promote widespread
effective utilization of their products and to revise material in the
light of implementation effects.

Objectives

A series of strategies will be developed to improve education's
product delivery system by:

- Increasing our understanding of the relative effects of a
  variety of dissemination strategies.

- Increasing the continuity between product development and
  dissemination.

- Experimenting with a variety of incentives for improving
  the delivery of high quality R&D products.

Strategies

We propose to initiate the following experimental activities:

1. *A managed copyright program.* NIE should devise a series of

experimental strategies to: manage the incentives and rewards NIE

makes available to developers/distributors; and demonstrate, create or,

in rare instances, subsidize markets for NIE sponsored products. This

would include:

- Demonstrating the existence of a market before inviting
  distributors to handle the product.

- Where a market cannot be demonstrated, NIE should create
  an initial market before inviting distributors to handle
  the product.

- When an initial market can neither be demonstrated nor
  created, NIE should consider the possibility of sub-
  sidizing the limited distribution of products which may
  meet uniquely important needs.

This program would include other experimental strategies to: provide

incentives and rewards for cooperative arrangements between agencies that

specialize either in development or in distribution; provide incentives

and rewards for agencies to extend their internal capacity to handle the

full array of functions from product development to broad-scale distri-

bution; and vary royalty sharing and royalty rates in contracts with

developers/distributors in exchange for expansion of such services as

evaluation and training.

2. *Research on the effects of alternative dissemination strategies.*

NIE should initiate a systematic series of experiments to test the effects

of a variety of dissemination strategies to market education R&D products.

These experiments should compare both costs of the strategy and its effects

on the products' actual implementation.

3. *Integration of dissemination requirements with product develop-*

ment. As each NIE sponsored product approaches the field test and

dissemination stage, the responsible program office should solicit from

the contractor plans for its dissemination/documentation and for a
subsequent evaluation of the effects of those strategies.   Approved
plans should be built into the contract and funds made available to
carry them out.   The Institute should establish a mechanism for
collecting and analyzing the reports on che costs and effects of
various strategies to provide future guidance to program officers and
contractors.

VIII.   BUILDING CAPACITY IN THE OPERATING SYSTEM

Previous chapters have discussed proposals for monitoring various
aspects of the overall knowledge production and utilization system, for
building the capacity of the R&D system external to the schools, and for
developing the linkage and support system.   In this chapter we address
the problem of building capacity within the operating system.

The chapter is divided into two parts, one relating to the State Educa-
tion Agency (SEA) and the second concerned with building problem-solving
capacities at the school district level.   There are obvious relationships
between the two. SEA's not only have legal responsibility for the operation
of school systems, they also are an important resource for the development
and support of local problem-solving activities. In addition, the diver-
sity of State Agency functions and responsibilities makes it important to
summarize in a single section the variety of program recommendations
concerning SEA's made elsewhere in this paper.

STATE EDUCATION AGENCIES

As indicated in Chapter III, State departments of education in the last
decade or so have begun to exercise leadership in several aspects of the
knowledge production and utilization process.   Despite these indications
of increased SEA capability, we know very little about the overall quality
of SEA planning, assessment, or dissemination activities, or even about the range of
variation that exists.   To help SEA's develop capacities for linkage and
support, we must learn more about: existing SEA programs in information
services and dissemination; what the various states have done to identify

successful programs and promising practices; the range of SEA activities
to support innovation and problem-solving behavior in local districts; how
states have been involved in product delivery systems and have provided
local school districts with technical assistance to implement new programs;
the extent to which SEA's have conducted their own R&D activities to
identify and devise solutions to state-wide educational problems; and how
State departments of education have been reorganized to provide better
services to local districts.

Strategies

A number of strategies for achieving this objective is outlined in
other chapters of this report.   Those chapters have discussed appropriate
roles for State departments of education with regard to:

- The existing ERIC system and the development of a new educa-
  tion information system. .

- Consumer information programs, including product validation
  and the identification of promising practices.

- How SEA's can assist in the development and support of
  problem-solving activities at the local school district
  level.

- Strengthening State Agency capabilities, as part of our
  study of the internal R&D system.

- Product-delivery systems, where SEA's can be involved
  in dissemination, demonstration, and technical assistance
  with regard to new educational products and practices.

In addition to the above strategies, we propose that NIE support two
major activities:

(1) *Surveys and analytic studies* of the role of State

    departments of education in the field of knowledge

production and utilization. These studies will
determine present and potential capabilities of the
various SEA's to assume leadership roles in each of
several areas: information services, identification
and validation of promising practices, support for local
school district problem-solving, development of R&D
capac:ties at the State level, involvement in
product-delivery systems, and the diffusion of exemplary
programs.

(2) *A series of working conferences*, jointly sponsored by NIE
and the SEA's, to examine various states' experiences in
a particular activity area (e.g., diffusion of exemplary
programs); develop procedures for conducting activities
that profit from the states' previous experiences and
show promise of success; determine some systematic
way of pilot testing the new procedures and, if the
procedures seem successful, making them available to all
the SEA's; and establish appropriate working relation-
ships between NIE and the states to carry out this
process. A series of papers on the respective topics
would be cor,n. ·sioned as part of the planning for each
conference.

PROBLEM-SOLVING IN THE SCHOOLS

Contrary to traditional models of educational change, in which
products are generated by the formal R&D sector and then "delivered" to

the schools, practitioners can themselves be the source of ideas and materials for educational improvement. In our view, the R&D community is one resource for innovative activity in the schools; other resources reside within the practitioner and lay communities. They must be identified, given support, and utilized more effectively.

Because of the diversity within the operating system and the decentralized decision-making processes, reform and renewal of local school districts will occur only if those districts develop the capacity to be more analytic in their behavior, more sophisticated in the choice and use of resources (those generated by the R&D community as well as others), and better able to assess critically the effectiveness of what they are doing. We call this set of skills "problem-solving behavior."

As we indicated earlier, we currently know very little about how to build these capacities at the local level. The program described below is designed to discover, in a planned, deliberate fashion, those elements that contribute to the development and maintenance of problem-solving behavior in schools, and to test systematically the extent to which those elements can be combined in a few selected school districts.

Objective

The recommendations that follow are intended to help schools, school systems, and local communities build an organizational capability for problem-solving behavior. We believe that such capability will lead to:

- More effective use of the products of the external R&D resource system.

.   Increased and better articulated demand from the schools
    for more appropriate R&D products.

.   Increased ability at the local level to utilize local
    resources effectively for reform and renewal in a manner
    responsive to locally perceived problems.

Strategies

Our major strategy is a program of *directed experimental studies* to

develop, test, and disseminate approaches for building problem-solving

capacities in schools. The experimental program is designed to examine

the effects of these approaches within the four contexts discussed earlier:

.   The teacher level, where the target population consists of
    individual or small groups of teachers and the strategies
    are directed at changes in individual classrooms.

.   The individual school level, where an entire school or mini-
    school is the unit of analysis and change strategies
    consequently must take into account organizational and
    inter-personal dynamics.

.   The school district level, where the emphasis is on building
    problem-solving capacities within an entire school system
    or sub-system.   The focus here is generally on the redefined
    roles of central office administrative and support staffs.

.   The school and community level, where citizens outside the
    formal school system stimulate and help to sustain a problem-
    solving orientation in the operation of the community's
    schools.

The recommendations are grouped into four contexts or levels of

educational change because there appears to be little consensus regarding

the most appropriate or cost-effective leverage points for improving the

educational system. Many observers have noted that the number of inter-

connected elements in an educational system is so complex that there is an

ever-increasing series of options which can be selected as entry-points for change at each level, especially with respect to the capacity-building orientation we are suggesting. We must also explore more systematically the relationship between levels.

Consequently, the program recommendations below are designed to accumulate information--from surveys, case studies of existing programs, and the initiation and replication of promising alternatives--to assess the effects of the proposed activities at each level. As we begin to understand the effects and potential of proposed alternatives at each level, we will attempt to integrate the most promising components at a few carefully selected sites or "assembly" districts. We will identify at least three school systems of contrasting characteristics where, beginning in the third year of the program, we will have an opportunity to test combinations of programs, working toward some optimal integration of components for each level.

Throughout the development of this program we will be concerned with the policy implications of our findings. If our research indicates, for example, that a particular kind of teacher center is successful in promoting problem-solving among teachers in urban elementary schools, we must address the question of how to utilize these findings: What is the optimum number of clients this type of center can serve? What are the policy options for funding large numbers of these centers? What roles might SEA's play in the process? What are the policy implications for the Federal Government in terms of new legislation, cooperative efforts between NIE and the U.S. Office of Education, or new relationships vis-a-State and local education agencies?

Program Elements

The program begins with four parallel sets of activities. For each
of the four levels--teacher, school, school district, and school/community--
there will be a program consisting of the following elements:

(1) Surveys, Syntheses, and Analyses. In the first year, surveys will
be conducted to determine the extent and nature of existing variation within
each of the four levels. The initial surveys will include historical
reviews as well as current practices, and will identify situations to be
included in the series of longitudinal case studies described below. After
the first year or two, the surveys will be more analytic in emphasis,
integrating findings from the ongoing case studies, and analyzing the policy
implications of what is being learned.

(2) Three-Year, Longitudinal Case Studies. For each level, a prime
contractor would be chosen with broad experience in observation and
interview techniques to conduct longitudinal case studies. Although the
methodological emphasis will be placed on anthropological case study
techniques, we will expect the contractor to conduct sample surveys and
assessments of student outcomes where appropriate.

Each series of case studies will consist of about six sites. *Series*
1 case studies will be initiated prior to the availability of final survey
results. We will select programs at each level that we have identified
from initial field work as having promise in promoting problem-solving
behavior. The survey findings and experience with studying these six sites

will help to identify sites for the *Series 2 case studies*. Among the programs included in this second series will be new interventions that have been developed specifically for this program. The sites in the *Series 3 case studies* will consist of two kinds of programs: new interventions designed in response to what has been learned from the analyses and prior case studies; and deliberate attempts to replicate programs that have demonstrated success.

(3) <u>Program Development</u>. Funds will be provided to selected sites to initiate, replicate,or strengthen specified activities that are related to our problem-solving framework. For example, grants might be given to help sites develop training or technical assistance programs, or to initiate a communications and support network among several agencies.

In addition to support for the field sites, the development program will include an intensive design phase for new interventions to be tested in the Series 2 and Series 3 case studies. This design activity will draw on projects currently being supported by other NIE units as well as developments in the educational field generally. In the former category, for instance, there are a number of NIE contractors currently working on projects related to our definition of problem-solving. We will review those projects to determine whether there are program elements that can be further elaborated and tested within our problem-solving framework.

We also will be responsive to more general developments that have implications for proposed interventions. At the teacher level, for example, many colleges and universities are showing increased interest in in-service teacher education, due primarily to the reduced need for new

teachers and the resulting financial difficulties for schools of education.

In addition, the competency-based teacher education movement--currently

affecting certification requirements in more than half the states--presents

opportunities for new program designs that we can test in Series 2 and 3.

Among the interventions that might be developed are:

.   Clinical training and development centers which
    use a school setting for instructional research,
    curriculum development, and in-service teacher
    education.

.   Portal schools which use competency-based procedures
    to select and train new teachers for urban schools,
    and then provide in-service support for them during
    their initial years of teaching.

.   Programs of joint faculty appointments and other
    incentives for acquiring the time and commitment
    of college and university faculty members in
    providing sustained research, development, and
    training help to teachers in their school settings.

(4) Technical Assistance and Policy Analysis. The primary intent of

of the surveys and case studies is to provide information for consumers

and decision-makers--for teachers' associations considering whether to

negotiate for a teacher center; for a group of parents engaged in the

design of an alternative school; for a school superintendent in the

process of reorganizing his central office; for a principal creating a

new governance system for his school; for State legislators drafting a

teacher certification bill; or for Federal policy-makers considering how

USOE and NIE might relate to State and local education programs.

At each stage of this program's development, and for each of the

four levels, we will concentrate on making relevant findings available

in appropriate ways for various audiences. The evaluation contractors

will provide technical assistance, and a major element of their charge

will be to develop ways for transforming what they are learning from

their evaluations into print, audio-visual formats, or person-to-person

communications arrangements so that others may profit from the intensive

studies being undertaken. As indicated earlier, contractors engaged in

the ongoing syntheses also will have to address the policy implications

of the findings at each stage of the program.

Integration and Utilization of Findings

During the third year, we will add another dimension to the program,

on. which begins to integrate findings from the four parallel lines of

activity. In our "assembly districts," we will experiment with combina-

tions of program elements which were found to promote problem-solving

behavior at each of the four levels. Our aim will be to discover how

these elements can be implemented and adapted in combinations and/or

sequences that are consistent and mutually-reinforcing. Although we

believe that findings from any one of the four levels can be extremely

useful for many consumers and decision-makers, we are most interested

in the interactions among the components. A community has an

increased likelihood of sustaining a continual process of reform and

renewal, we feel, if it supports problem-solving activities in

appropriate combinations at multiple levels, from individual classrooms

to the wider community outside the schools. Our experimentation in
the assembly districts is designed to help us discover how best to
integrate these elements.

In the chart below we summarize the general research plan for the
next five years. The reader should note that the sequence below is
for _each_ of the four levels. In addition to the syntheses and cross-
level experimentation in the assembly districts in later years of
the program, there is a separate series of surveys, case studies,
program development, policy analysis, and technical assistance activities
for each level.

We do not anticipate that this program will "terminate" in 1979.
We have projected a five-year timetable primarily for planning and
budgeting purposes. NIE has made a major commitment to building problem-
solving capacities at the local level and we anticipate that this issue
will continue to be a focus for further experimentation and development.
Our aim, however, is to make this issue a concern of other Government
agencies as well, at the State, local, and national levels. As a result
of our technical assistance and policy analysis activities, we intend
to engage such groups as LEA's, local community agencies, teachers unions
and associations, State departments of education, and the U.S. Office of
Education in discussions of how this work might assist them in their
own activities.

	(Fiscal Years)					
	74	75	76	77	78	79
Surveys, Syntheses, and Policy Analyses	x	x	x	x	x	x
Case Study Series I						
Program Development		x	x	x		
Documentation/Evaluation		x	x	x		
Case Study Series 2						
Program Development			x	x	x	
Documentation/Evaluation			x	x	x	
Case Study Series 3						
Program Development and Replication				x	x	x
Documentation/Evaluation				x	x	x
Assembly Districts				x	x	x
Dissemination and Implementation Assistance		x	x	x	x	x

The Four Levels: Issues and Initiatives

Much of the discussion to this point has been general and concerned with sequence and methodology; the four levels have been mentioned briefly, but little has been said about their substantive orientation. Although it is not possible in this paper to provide much substantive discussion about the content of the four levels, the following sections describe generally the surveys, case studies, and development programs that might be designed for each level.

Teacher Level. The surveys in the first year or two will concentrate on teacher support agencies (often called "intermediaries"). These might include teacher centers, advisories, and extension agents which provide individual teachers with the knowledge, resources, and motivation necessary to become more effective in: diagnosing their classroom problems, locating information and materials to address those problems, adapting and applying

those resources in the classroom, and evaluating the effects of their teaching. A major aim of the surveys will be to construct a typology or analytic framework that encompasses the broad range of organizations and strategies designed to provide professional support to teachers. The typology and surveys as continuously refined will form the basis for identifying cases for Series 2 and 3 longitudinal studies; for research and analysis to compare variables across sites; for stimulating new intermediary arrangements; and for replicating promising models.

For the initial series of case studies, we propose to select one class of professional support strategies--teacher center/advisory arrangements--which appear to be promising means of facilitating problem-solving behaviors in teachers. While we have also identified other useful classes of support (e.g., extension agents, technical assistance programs in SEA's, Follow-Through delivery strategies), we believe that the teacher center movement has sufficient currency, momentum, and promise that it is useful to analyze this potential as rapidly as possible.

Sites for Series 2 and Series 3 case studies will be selected on the basis of survey data and Series 1 case study results which will indicate the relative importance of several variables (organization, financing, leadership style, ideological orientation, etc.). We also will be designing new interventions and reviewing other NIE-supported programs to determine whether they relate to problem-solving at the teacher level.

We are also planning to provide support for field sites participating in the case study series both to strengthen their capacity to affect client groups and to introduce variations which can then be compared across sites under a variety of conditions. For example:

. Funds would be provided to a limited number of teacher center sites to add on new services. For example, teacher centers in rural areas can be funded to add on advisory and outreach services similar to those which already exist in many urban sites.

. Funds would be provided to organizations to increase their interaction with each other so that the effects of networking strategies on the individual capacities of sites can be analyzed. This could include developing communication mechanisms to share information and experience, sponsoring seminars or conferences on areas of mutual interest, joint staff training, and conducting research across sites.

. Funds would be provided to a limited number of sites to enable them to render technical assistance to other agencies that want to implement teacher support interventions. Funds could be provided for training staff of new sites, exchanging personnel, and providing ongoing advisory assistance.

School Level. The surveys will identify and assess strategies that have been used to effect whole-school change. We are interested in the recent history of externally-generated efforts (e.g., COPED, EPDA Differentiated Staffing Programs) to stimulate organizational change in schools, and what key variables can be identified to guide the development of our own program.

For the case studies we will follow the same format outlined above for the teacher level. Among the existing programs to be studied in Series 1, we might look for: schools with internal research staffs;

examples in which staffs have been trained in preparation for the opening of new schools; and schools whose faculties have participated in intensive organization development programs.

In the design of interventions for Series 2 and Series 3 case studies we will use the findings from the surveys and initial case studies. In addition, we will review programs supported elsewhere in the Institute--such as the Multi-Unit School program of the Wisconsin R&D Center or the Strategies for Organizational Change program at the University of Oregon R&D Center--to determine their appropriateness for our program and as a basis for initiating design studies for alternative strategies.

School District Level. The surveys in the first year or two will be designed to determine the existing variation in function and effectiveness of school district research/planning/evaluation offices. We are interested in the resources allocated by school districts for these functions and how these resources have contributed to problem-solving behavior at a school district level.

Series 1 case studies will examine a small number of school districts identified as having elements of problem-solving capacity already in existence. For example, we might look for school districts that conduct organization development activities, those that have a multi-faceted research and evaluation office, or those that sponsor extensive development and training programs.

Our design of new programs to be tested and analyzed in the
Series 2 and 3 case studies will be influenced to a significant extent
by what we learn from the surveys and Series 1 case studies. In
addition, however, there are a number of ongoing NIE sponsored programs
that relate to change at the school district level. The following
are among the programs we will review in determining specific inter-
ventions to be developed and tested:

- Administering for Change (Research for Better Schools)

- Responsiveness of Public Schools (Oregon R&D Center)

- Evaluation Technologies Program (UCLA R&D Center)

- Educational Management Program (Far West Laboratory)

School/Community Level. As with the other three levels, the
initial surveys for the school/community level are intended to learn
from recent or existing programs. With regard to the school/community
level, where we are interested in the interaction of parents and non-
professionals with their schools, the following questions might be
explored in the surveys and analyses: Where have non-professionals been
involved in defining a community's educational goals and in monitoring
the performance of schools? What mechanisms have proven useful in
involving parents and community in schools? What are some successful
techniques for providing information about a school's performance to
parents? To what extent has media been used to promote debate in
communities about educational goals?

The initial case studies will examine a few settings in which non-professionals have had a significant role in stimulating a problem-solving orientation for their community's schools. Examples of the situations we have in mind are: communities where non-professionals have had important roles in the definition of educational goals; communities in which parents have been involved in an ongoing way in influencing the program/staff/organization/budget of their neighborhood school; and communities where information services have provided parents with support in affecting changes.

As with the other levels, the design of interventions for the Series 2 and 3 case studies will be influenced by several factors: findings from the surveys and initial case studies; the appropriateness of elements from other NIE-supported projects; and unanticipated developments in education generally. The purpose of our sequenced, deliberate strategy is to accommodate these various influences and to permit us to profit from what we learn at each preceding stage of the design. Among the NIE supported projects we will review as we design new interventions for the school/community level are:

- The School-Community Input Team as a Social Intervention (Palo Alto Unified School District)

- Reviewing Home-School Linkage (Far West Laboratory)

- National Sampling Survey of Community Control of Public Elementary and Secondary Schools (National Opinion Research Center)

- A Laboratory Investigation of the Goals of Secondary Education as Perceived by Educational Consumers (Humanistic Designs Corp.)

- Rural Education Program (Northwest Regional Laboratory)

SUMMARY

Overall, the strategy for the experimental program contains the following interrelated components, each building on the data and experience acquired by the previous elements:

- *Surveys* of the natural variation among existing institutional arrangements that have potential to stimulate and support problem-solving behavior. These will be organized along the four levels or contexts of change described earlier: teachers, schools, school districts, and school/communities.

- Intensive *case studies* of selected interventions that have potential to support problem-solving behavior at the four levels. Series 1 will study existing programs, Series 2 will combine existing programs and new interventions, and Series 3 will focus on additional interventions and deliberate attempts at replication.

- *Technical assistance to agencies* that wish to adapt and implement individual interventions developed by the program. Responsibility for providing this assistance will be part of the contracts to conduct the case studies and will also be assumed by the field sites being studied and by NIE program officers.

- *Assembly of successful interventions* from each of the four levels in a small number of school districts to study their interaction. The intent is to determine how the various components can be adapted in order both to complement each other and, in their interactions, to meet local conditions.

- Finally, *technical assistance to school districts* that want to build their problem-solving capacity by systematically implementing related, mutually-supportive interventions. This assistance would be based on the experience with the assembly districts, where the combination of elements had been tested and analyzed.

A series of *policy analyses* will be prepared at each stage of this
program to relate appropriate findings to policy options and the activities
of other Government agencies. These studies will be intended to acquaint
policy-makers at various Governmental levels with the implications of this
research for their respective areas of responsibility.

IX.   FIELD INITIATED STUDIES

The directed program described in the preceding chapters will reflect
a specific viewpoint about production, dissemination, and utilization of
scientific knowledge in education. We recognize, however, that there are
competing perspectives on these processes. Accordingly, we believe that
the overall program of the Institute should allow such perspectives to
be considered in light of the significance and scientific merit of proposals
which espouse them. In the process, it is possible that results of such
research may refine or modify the assumptions and emphases of the
directed program.

To accomplish this, we propose support of research on the processes
of educational change, rather than support of actual dissemination or
demonstration activities. We believe that stimulation of research in
this area will contribute badly needed fundamental and applied knowledge
about highly significant but poorly understood phenomena in education.

This area of inquiry could provide knowledge on the full range of
phenomena, performers, and settings involved in the improvement of educa-
tion through production of research results, systematic development of
alternative solutions to educational problems, dissemination of the results
of R&D throughout the education community, and the adoption and imple-
mentation of the results of research and development for improved education.
The scope should include, but not be limited to, studies of:

. The existing or potential education R&D system, including
institutional and organizational settings in which educa-
tion R&D is or might be performed; personnel for education
R&D; incentives and impediments to participation in educa-
tion R&D; and factors influencing the quality of education
R&D.

. Improved means of maintaining and providing access to the
documentary knowledge about education, including the
acquisition, processing, storage, retrieval, and
dissemination of documentary knowledge.

. The spread of the results of research and development through
the education system, including tracer studies of the spread
and adoption of specific innovations, applications of market
research techniques to educational change, and the effects
of differing dissemination strategies.

. The effects of alternative means of linking R&D and educa-
tional practice in efforts to improve the operation of
educational institutions.

. Innovative and problem-solving behavior in educational
practice settings, including studies of incentives and
predictors of educational change, organizational
behavior in education institutions, characteristics of
innovative educators and institutions, and the implemen-
tation of innovations in education institutions.

Together, the directed program and the field-initiated studies should,

over time, provide the basis for development of a coherent, integrated

Government policy for knowledge production and utilization in education.

This policy development will always be in process and should continue to

be a cooperative endeavor among all the individuals and organizations that

share a commitment to the improvement of American education.