The Research Functions of the NIE

Joseph Zubin

Biometrics Research Unit

New York State Department of Mental Hygiene

In order to specify the proper research functions of the NIE, we must first indicate what definition of education we are to adopt. The definition has ranged from education as the job of preparing the individual to enjoy life to the fullest, to education as that which goes on in institutions of learning and teaching. A middle ground escapist definition is to make education equivalent to what educators do.

Viewed from the widest angle available, education is an ongoing natural process characterizing man which occurs spontaneously throughout his life career. This natural educational process probably accounts for the major portion of variance in educational attainment while schooling accounts for only a minor portion. Nevertheless schooling is often a critical steerer of education since like a helmsman, steering a ship, it may inhibit as well as facilitate, and one of the major functions of benign schooling is to permit the natural educational process to continue unhampered. From the point of view of the research functions of the NIE, the naturally ongoing educational process is perhaps too global and too all encompassing to be manageable. Hence, it might be well to focus on a more limited aspect of the educational process as far as research is concerned.

The broadest definition would lead us to regard the educational process as concerned with influencing the development of the innate capacities of the human organism for the better or the worse. Perhaps a functional definition of education is to limit it to planned intervention in the developmental process of an individual during the course of his entire life with the purpose of optimizing his capacities. This goal of education would apply equally well to normals and to those who suffer from some abnormality interfering with development. In the latter case, optimizing their level of development despite their handicap, or compensatory and remedial training, would be the goal of education. Here, education and therapy may overlap considerably.

The function of research in education would be as follows: (1) to determine the nature of the developmental process in which intervention is
to take place. This is the basic research needed to permit optimization of functioning; (2) to determine the time sequences in which intervention is most propitious. This involves an understanding of the stages in development; (3) to experimentally determine how the planned intervention could be made most efficacious. This involves research into educational theory, practice, and administration; (4) to determine the type of intervention most suited. This would also involve research into evaluation of outcome.

In conducting research on the educational process we direct our investigation at discovering the variety of forces both internal and external which impinge on the individual throughout life, affecting his behavior in better or poorer adjustment. Educational research is to be distinguished from educational practice. In the latter we try to select those forces which hopefully work towards the better development and greater freeing of man's innate capacities. The purpose of educational research is to provide the basic knowledge for selecting the very best intervention methods for optimizing development as well as permitting natural development to go on uninhibited.

The influence which education is most concerned with is the learning theory model. The assumptions underlying this model are that all of man's behavior is most influenced by learning and that the laws of learning developed in psychological laboratories occupy the same relationship to education that the laws of physics occupy to engineering. There is a continual flow of new knowledge in basic behavior theory emanating from learning laboratories. These new findings should be translated into educational practice and the required research to make this translation is urgently needed. For example, the House-Zeaman finding on the role of the attention factor in learning in retardates certainly has implications for learning in normals also, and would be something that could be translated readily into educational practice. However, the transfer of learning principles to the classroom has not always proved salutary. What are the other forces that influence man's behavior and modify it?

In searching for the other factors that influence man's behavior from the moment of conception to his final breath, the following classes of influences or models can be postulated: (1) ecological, (2) developmental-
maturational, (3) hereditary, (4) internal environment, and (5) neurophysiological or brain function.

The ecological model refers to the variety of influences of the social-cultural-physical variety which impinge on the ecological niche that he occupies and shape his behavior. They can modify man's innate capacities for the better or for the worse. Capitalizing on the benign forces and minimizing the malignant forces is the goal of intervention according to this model. This model is largely in the hands of social scientists -- anthropologists, sociologists, economists, architects and others -- who view man's development as largely due to the field forces to which he is exposed. Many of the recent innovations in the educational field have arisen from this approach.

The developmental model postulates that the transition periods between the various maturational stages that man passes through are the critical points in which his behavior is modified towards better or poorer adjustment. It is in these transitional points that the presence or absence of proper support and nutrient environmental supplies may make for better or poorer development.

The hereditary model stipulates that behavior depends upon the unfolding of the genetic endowment a person is born with. While this is a generally accepted truism, the implications of this model are not always clear and quite recently work based on this model has split the research community into two contending camps -- the genetically oriented (Jensen and Hernstein) and the environmentally oriented. The simplistic assumptions underlying much of this controversy stem from the expectation that the relationship between heredity and environment is monotonic and holds universally for all traits, abilities and behaviors -- assumptions which should be tested for their tenability rather than adhered to blindly on faith.

The internal environment model stipulates that the internal metabolism and body fluids and biochemistry are the determiners of behavior and that the biochemical control of development can be utilized for improving the learning process through nutritional advances, drug intake etc.
The neurophysiological or brain function model stipulates that the way the brain processes incoming information is the basis for learning and that knowledge of brain function is essential for guiding proper development in both normal and abnormal individuals.

These models do not operate independently, and their interactions are often more important than their main effects.

They stipulate the basis for development of behavior in general and underlie any investigation of the alteration and maintenance of behavior. But development is more comprehensive than education. How can we draw a line of demarcation between the two? If we define the educational process as the modification of behavior by environmental input as opposed to internal maturation, we can separate educational from developmental research as follows:

Research which investigates how the planned manipulation of the environment brings about alterations in the behavior of an individual, with the view of increasing or improving the reception and transmission of information and the capacity to act upon it (i.e., the process of communication and the response to its reception), is to be regarded within the province of educational research. This would include the investigation of maturational processes with the view of accelerating or facilitating them (and sometimes slowing them down) in order to enhance their capacity to receive and transmit information and to act upon it. It would include investigations of physiological and anatomical deficits in order to enhance learning. It would include investigations of physiological, sensory, perceptual, psychomotor, and conceptual (cognitive) processes involved in the processing of incoming information and execution of responses to such incoming information. While the line between developmental and educational research is often difficult to draw, one might apply the following line of demarcation: If the investigation is limited to how the individual processes information and is not concerned with the enhancement of communication and improvement of adjustment to the environment, it would fall outside the bailiwick of educational research.

One should also draw the line between basic research and 'clinical' or service-directed research in education. As long as the research is
directed at helping a particular population and is not concerned with
generalizing to others, it is service-oriented research if it is research
at all. When the individual or individuals under investigation are not the
primary concern of the investigator, but instead he is concerned not so
much with helping them as in finding out the underlying processes involved,
regardless of whether it is going to benefit the individuals under examina-
tion — it is basic research.

When the process at hand is merely concerned with applying known pro-
cedures to the treatment of individuals, it is to be regarded as service
and not research.

The comparisons of service-centered research, basic research, and
service applications are not to be taken as indicating that innovative
ideas and breakthroughs come only from basic research. No one knows how
hypotheses arise, and Reichenbach's separation of the realm of discovery
from the realm of verification may be artificial. The innovative idea may
come from a lone teacher in some obscure school who innovates the Austrian
method for subtraction, or from some pediatrician who notes eye contact
between mother and neonate and its absence in deviant cases, or from an
innovator like Pitman who provides a new sound-related alphabet. However,
once a hunch is born, its verification must proceed along scientific lines
through experimental design methods for eliminating chance as an explana-
tion of the noted effect, or otherwise controlling irrelevant or alterna-
tive explanations. This is where basic research comes in. Another charac-
teristic is the necessity for a scientific model to be specified from
which the hypothesis for testing emanates and into which the observation
may be incorporated. If the results be negative to the hypothesis, a change
in the model follows to incorporate the new information.

If we adopt the more limited view of education as that which goes on
in institutions of learning and teaching, the problem of research in educa-
tion becomes limited to the process going on in these institutions and
their evaluation with regard to progress in school. Perhaps the Federal
Government might pragmatically limit itself to this level. But even on
this level, the various scientific models discussed earlier apply, and the
ecological, developmental, genetic, internal environment, and neurophysio-
logical approaches constitute a spectrum for educational research.
Another problem facing us is to decide whether education is a science or a technology. If it is a technology, then its function is to translate the basic findings of its underlying sciences into applied practice, just as the function of engineering is to adapt the findings of the natural sciences to its needs. On the other hand, if it is a science itself, what are its interconnections, if any, with psychology, sociology, anthropology, economics and social and natural science in general? Perhaps one way of integrating research in education with research in its adjacent sciences is to deal with problem-centered rather than with discipline centered research. God did not make the lines of demarcation between the disciplines — they are all man-made and man can transcend them. New combinations of sciences continually develop, e.g., biochemistry. I can readily see an educator combining forces with a physiological psychologist to solve problems associated with fatigue in the classroom. Similarly, I can readily see a consortium of educators and psycholinguists working on problems associated with the teaching of reading etc. Perhaps the future of the NIE research will develop not along disciplinary lines, but along problem-centered lines which will corral the interests of all the sciences from anthropology to zoology in the effort to create the best planned intervention in the developmental process of the individual for the purpose of optimizing his capacities.

While this problem-centered approach to research is perhaps the one most likely to bear fruit, there are several obstacles in its path. First is the fact that the various disciplines train their graduate students to dig deep into their own confines and rarely permit them to cross the borders into adjacent disciplines. The petty jealousies regarding territorial rights of the various disciplines often stand in the way of interdisciplinary development. Second is the fact that recognition and advancement in a given field is rarely given to the few rebels who transcend the discipline's boundaries. Consequently, only the rare independent gifted individuals ever enter the interdisciplinary area. These are indeed educational policy problems and perhaps the NIE might well turn its attention to supporting research into examining the nature of this problem and the options available for its solution. One option that seems apparent is
to encourage, with the help of interdisciplinary fellowships, students to participate for their field work in ongoing interdisciplinary projects in which they would rub shoulders with peers from other disciplines and actively interchange skills and concepts. Unfortunately such interdisciplinary projects are not often found within a given discipline. Research Institutes or Units are more often the place where such interdisciplinary activities thrive and it might be well for the NIE to fund or help support the activities of such Units as a place for developing interdisciplinary research in Education. An example of the relative merits of developing interdisciplinary research in the University vs. independent units is given in Zubin, J. Biometrics Research in the '70s. (Delivered at the Biometrics Research Retreat, January 19, 1971.)

It is clear that the collaboration of scientists from different disciplines is not easy to obtain, but those scientists who collaborate on problems important to education should become the primary focus of support in NIE research. In this manner, NIE research may set a new cross-disciplinary pattern for solving its problems.

One type of research that is occupying much of the current research effort in Education is that of policy research or operational research in which broad principles are tested in special projects to determine their efficacy. The criteria for judging efficacy are themselves in need of research but some of the obvious criteria such as cost-effectiveness in expenditures in relation to outcome as measured by standard tests or school progress are now the primary criteria in use. There are several hazards involved in applying such criteria which unfortunately are not always taken into consideration by the cost-effectiveness experts. These results often suffer from what has been called the ecological fallacy — the error of assuming that the correlations between means of groups also holds true for all the individuals constituting these groups, e.g., the fallacy of assuming that if the mean of one group is higher than that of another, that it follows that most of the members of the first group excel the members of the other* (see Zubin, J. Ecological vs. clinical fallacies

*By the same token, there is also a corresponding clinical fallacy in which the assumption is made that the correlations within a subgroup hold true for the entire population.
in personality research. Paper delivered at the Symposium on "Comple-
mentarity between the idiographic and nomothetic methods in clinical psy-
chology," Annual Convention of the American Psychological Association,
September 4, 1972, Honolulu, Hawaii.)

Thus, while no one can deny that certain methods of teaching read-
ing may be more economical in time and money, when the efficacy is measured
on a group basis, the wholesale application of the new method into new
situations must be weighed against the possible hazards it may create for
certain subgroups. Even when it applies equally well to all subgroups it
may still hold some hidden danger.

It may be a question of short term vs. long term effectiveness in
the population as a whole. While children suffering from certain handi-
caps must be provided the means of overcoming the handicap even if it
involves some personal sacrifice (e.g., teaching a hyperactive child to
become more passive by behavior modification and thus expose him to the
hazards of future passivity) such sacrifices are not to be tolerated in
the population as a whole. Thus, if certain teaching methods bring about
short term gains but long term losses such as decrease in self-initiative
or creativity, the price paid for the short term gain may be at too great
a cost and perhaps slower learning would be preferable. Admiral Rickover
has pointed out that "The Greeks at Thermopylae and at Salamis would not
have stood up to the Persians had they had cost-effectiveness people to
guide them." Hence, with all due respect to the economics of education,
we need to be careful not to interfere with the very process we are trying
to nourish by stealing short victories at the cost of eventual defeat.

Summary

If we define the educational process as planned intervention to
optimize the natural development of man in all his capacities, it behooves
us to investigate the natural development itself as well as its pitfalls so
that, the developmental progress can be enhanced to its fullest. Accepting
the assumption that education itself is more similar to engineering than
to a basic science, we must provide the interdisciplinary base from which
application to the technology of education can arise. The basic underlying
fields in addition to the humanistic tradition which underlies the approach to man, are the social, biological and physical sciences which are the mainsprings of man's behavior. In order to deal with the problems of education we have to eschew the disciplinary lines that now demarcate the disciplines and engage in cross-disciplinary research to answer the basic problem of education. It is proposed here that in order to develop the knowledge requisite for steering man's optimum development, we resort to scientific models that could guide our research in such development. Some of the models that are now extant are: (1) ecological, (2) developmental, (3) learning, (4) genetic (hereditary), (5) internal environment and (6) neurophysiological.

In dealing with much policy research one must be cautious about letting economic considerations become the final criterion for determining policy. Economic consideration may give short term advantages but long term defeats.