Research has helped to influence education principally through (a) the design of classroom materials, (b) conceptualizing the nature of the human learner, and (c) the solution of particular problems.

The relation between educational research and educational practice is a complex one. It is not a matter of a research worker producing solutions to problems and the teacher applying them. Indeed, this has rarely been the way in which psychological research has had impact on classroom practice. Let us look at some of the important ways in which research has influenced education.

The Design of Classroom Materials

The most obvious source of impact has been on the design of classroom materials. Thorndike’s word counts, and the subsequent development of methods of measuring the difficulty level of reading material, had important impact on the design of schoolbooks for over half a century. Few books for sale to schools today ever go to press without first being subjected to an analysis of reading difficulty. The design of dictionaries for children was also another spinoff of Thorndike’s research on word counts, the influence of which has been enormous.

A new and important influence on the design of materials for schools has been the work of Jean Piaget, whose model of the intellect has become a basis for the design of mathematics and science curricula. The British Nuffield Mathematics materials and the Nuffield Science materials are excellent examples of this, with manuals explaining to the teacher how each item in the materials is related to particular aspects of Piaget’s model of the intellect. Although the latter materials are commonly found in the classrooms of innovative teachers, they have not been widely used in America largely because few teachers are familiar with Piaget’s contribution to child development. However, the SCIS science program, also designed partly in terms of concepts formulated by Piaget, has had considerable use in American classrooms.

One can say, with some certainty, that many of the materials developed for American schools in the next decade, in science and mathematics, will bear the imprint of
The Nature of the Human Learner

A second way in which research has an impact on teaching is through providing a conceptualization of the nature of the human learner. All teaching, even the worst forms of teaching, is based on some conception of the nature of the learner. In this century, teachers' conceptions of learners have come to be progressively more influenced by the beliefs of behavioral scientists. Conceptions of the nature of the human learner have been derived from many sources in the past. The scholastics derived their conception of the learner from religion, viewing him or her as a soul that had to be saved through the acquisition of eternal truths. For example, Aquinas introduced teachers to a theory of determinism in behavior almost as rigid as that found among modern behaviorists. Much instruction was reduced to the catechism form which, like its modern counterpart the programmed text, called for 100 percent mastery of the content. In contrast, Montessori derived a view of the learner from the knowledge that physicians, biologists, and psychologists had acquired informally about child development, a fact which is hardly surprising in view of her own medical and scientific background. She was able to use such knowledge, together with her understanding of the hierarchical structure of cognitive growth, to develop her famous curriculum.

In the present century, there has been an increasing trend for teachers to adopt scientists' conceptions of the nature of the human learner. The Thorndike learner was a passive system, waiting to have connections established between stimuli and response. This simplistic model influenced the thinking of many teachers earlier in the century. Later this model became displaced by the operant model which shared many features with that of Thorndike. Teachers, who embraced such models, or who had been indoctrinated in them, rarely understood the assumptions on which they were based. Neither did they recognize that the models had been developed for the purposes of research and were gross overgeneralizations from data, and not
meticulous deductions from scientific experimentation. The fault, perhaps, was not with
the teachers, for the promoters of the models
themselves often presented the models as
though they represented the ultimate in
truth, rather than as convenient ways of look-
ing at learners for the purposes of research.

Many teachers during the past half cen-
tury could not embrace the simplistic models
of either connectionism or operant psy-
chology. Alternative models were available,
but none carried the hallmark of a distin-
guished scientist. The Progressive Education
Movement tied itself closely to the philosoph-
ical position of John Dewey and the model
of the human learner that this philosophy
implied. In contrast to connectionism, or
operant psychology, the learner was viewed
as an active searcher after truth and a system
that formulated hypotheses about the nature
of the environment, and then worked on
testing them. Such a conceptualization of
the nature of the learner lacked a scientific
basis at the time when it emerged as a posi-
tive influence on classroom practice during
the 1930's, but in the past decade it has
become more and more associated with the
research of Piaget, who uses this conceptuali-
zation of human learning as a part of the
framework within which he does his research.
Piaget himself has expressed his general
agreement with the viewpoint of Dewey, and
the scientific status of Piaget's research has
given his model of behavior enormous
prestige.

This latter type of model has been re-
ferred to as the humanistic model, a term
which has the doubtful distinction of having
no clear meaning. Nevertheless the model
includes fairly well defined attributes of child
behavior such as that intelligence is basically
inventive, that the child creates logic to solve
problems, that knowledge, though tied to
action, requires an internal representation
system, except at the most elementary level,
and so forth.

These conceptualizations of the human
learner are often as much philosophical as
they are scientific. Often they are just sets of
assumptions. For example, Skinner's as-
sumption that all behavior is controlled by
the environment is a philosophical position
and there is no way of conducting a program
of experimental studies to show that this
assumption is correct. Piaget's position is,
perhaps, a little nearer to being experi-
mentally verifiable. Teachers, like scientists,
need a set of simplifying ideas to guide their
work and the simplifying ideas of the scien-
tist, or the scientist turned philosopher, seem
to have a certain appropriateness for guiding
the work of the teacher. The danger comes
when either the teacher, or the scientist,
begins to believe that his or her assumptions
represent eternal truths. What the teacher
needs is a set of reasonable assumptions, but
teachers have to realize that what is a rea-
sonable set of assumptions for doing research
may not be a reasonable set of assumptions
for running a classroom. Also, the assump-
tions made in running a classroom have to
be acceptable to the culture at large and to
the parents. The kind of regimented class-
rooms that flow from the ideas of operant
psychologists are unlikely to be acceptable to
well-educated parents. Those who wish to
see the classroom as a preparation for living
in a democratic community may also see
such a classroom as antithetical to the
achievement of such a goal.

The Solution of Particular Problems

A third way in which scientific research
is considered by some to have potential for
influencing the classroom practice is through
providing the teacher with information that
has applicability to the solution of particular
problems that arise. The bureaucratic form
of this concept of research and development
in education is that the improvement of
education will come through compiling an
inventory of the problems that classroom
teachers encounter and then discovering,
through research, the solution to each. This
concept of educational research, and its
application, has long been promoted by fed-
eral agencies, including the U.S. Office of
Education and the National Institute of
Education.

This formula for research and develop-
ment has long been favored by practical
educators pressed with problems needing a practical and immediate solution. The failure of research workers to produce specific answers to specific problems has often resulted in the work of the researcher being dubbed as useless. Of course, researchers in some fields do sometimes come up with quite specific solutions to particular problems, but these are generally cases in which precisely the same problem recurs on innumerable occasions, in precisely the same form.

For example, in the medical field, a solution to the poliomyelitis problem could be found because the disease is caused by a small group of viruses that have produced precisely the same symptoms in millions of individuals. Teachers do not encounter a relatively few, well-defined, constantly recurring problems, but a vast range of problems. Even when the same problem seems to occur twice, the cause may be different on the two occasions. The model for undertaking and applying medical research is not a suitable model for undertaking educational research. Indeed, the model of research involved in solving the poliomyelitis problem is not the model used in relating most research to practical endeavors.

John Dewey long ago recognized that research could not provide a cookbook for solving problems in practical fields. The bridge designer uses Newtonian principles as a general guide to the solution of design problems, but the Newtonian principles do not provide very direct answers to the questions he or she may ask. In the same way, Piaget's description of the development of logical behavior in children can provide a very general framework for the development of curricula related to logical development, but only a very general framework. Piaget's findings have to be used in the context of the problems that children encounter, and the problems of children in a Midwest school may be very different from those that children encounter in Geneva, Switzerland.

Consider another example. Research on memory indicates that information is likely to be transferred from short-term memory to long-term memory if the receiver of the information expects to use it at a later date, but information which children in one locality expect to use later is not the information that children elsewhere expect to use later. Again, simple reinforcement may sometimes be applied effectively for improving learning, but the blind use of such procedures, on a routine basis, may be as ineffective as the blind application of any other piece of laboratory-derived knowledge. The real problems of the real world outside of the scientific laboratory have so many conditions influencing outcomes, that do not occur in the laboratory, that scientific findings must be cautiously used as only rough guides to action.

In my experience, teachers show considerable sense in deciding whether particular areas of scientific inquiry do or do not have implications for classroom use. Although educational practice has long been plagued by fads, the scientific knowledge that has slowly been assimilated, over the years, into classroom practice, has been that which has stood the test of time. A description of classrooms and teaching today shows practices that are vastly superior to those described by Joseph Mayer Rice in the 1890's. Most of the changes represent changes in our conception of the nature of the human learner, derived from a wide range of psychological and sociological studies, but there are also many changes in the materials used for instruction that are traceable to psychological research.

This slow and cautious assimilation of psychological knowledge, bypassing the fads of any particular decade, has been a force for the good. One hopes it will continue. Unfortunately, a new force evident on the horizon is the attempt by some commercial firms and individuals to merchandise, with evangelistic zeal, particular viewpoints and materials related to them. Teachers must become more aware of the fact that the merchandising of psychology may be a self-serving enterprise for those who do it, and not a dissemination of what will be recognized ultimately as truth.
