

*Industrialists must recognize that their—and the nation's—true interest lies in the solution of education's fundamental problems, not in the discovery of how to make a fast buck.*

## **R and D— in Industry and in Schools**

**LOYD L. TURNER**

**Assistant to the President, Fort Worth Division of General Dynamics; and President, Fort Worth Board of Education, Fort Worth, Texas**

RESEARCH and development have played a major role in American industry—particularly the aerospace industry with which I am associated—since its beginning. Research and development have played a very minor role in American education—particularly the public schools with which I am also associated—until quite recently.

The reason for this is obvious, although some professional educators may be reluctant to admit it. In order to keep up with or get ahead of the competition, in order to make a profit or avoid bankruptcy, companies with successful products and a steady increase in customers still maintain sizable research staffs who continually strive to improve these products and design new and better ones. Public schools, on the other hand, are not compelled to keep up with the competition in order to stay in business; they are practically assured of a steady growth

in customers; and there is no way for the public schools to go bankrupt.

Industry through the years has invested huge sums of money in research and development and has welcomed experimentation, innovation, and change. Public schools through the years have invested practically nothing in research and development—frequently, to be sure, because their budgets did not permit it—and for the most part, public schools have not welcomed experimentation, innovation, and change. They have generally submitted to the patterns established by security, tradition, and past experience, and they have rarely rocked the educational boat.

Public school administrators in general and superintendents in particular know that changes cause problems, even in the Great Society, and most of them would prefer to do things the way they have always done them or the way other administrators are doing them. This is so, in spite of the fact that edu-

cators, of all people, should realize that there is no security in conformity for the sake of conformity, and there is no lasting tranquility in the company of the herd.

### **Resistance to Change**

Let us go from the general to the specific. Several years ago—before the federal government jumped into education research with both feet and millions of dollars—the Fort Worth Board of Education put into its annual budget \$50,000 to be used for research and development, particularly in the curriculum area. At budget-making time the following year, the board learned that the superintendent and his staff had spent only a small fraction of the money, apparently thinking that the board would commend them for their frugality. Instead, the board chided them for missing the opportunity which the research and development money represented, and the board placed a similar amount of money for research and development in the following year's budget and instructed the superintendent and his staff to spend it for this purpose.

Our school administrators in Fort Worth were probably no less interested in research and development and no more opposed to change than the average school administrator, whoever and wherever he might be. I might add that these administrators have now set a goal of devoting one percent of the annual budget to research and development by 1978. They realize that in order to create an educational climate conducive to change, in order to break the shackles of tradition that stifle creativity and innovation, they must

include in the budget adequate funds for research and development.

(Before proceeding further, I would like to make clear that these are my views. They do not necessarily reflect the views of General Dynamics or the Fort Worth Board of Education.)

### **Funds for Research**

Industries in the United States supported research and development in 1965 to the tune of more than \$14 billion. The aerospace industry alone, counting both federal and company funds, invested more than \$5 billion in research and development. Figures for 1966 and 1967 are slightly higher, and *Business Week* predicted in its May 13 issue that by 1970 industry will be spending more than \$20 billion annually on research and development.

Federal expenditures for educational research in 1965 totaled only \$69.8 million. State expenditures for this purpose were \$11 million, and local school districts spent \$3 million on research.

These millions spent for educational research in 1965 represent a tremendous increase over what was spent five years earlier. Even so, these expenditures are a drop in the bucket compared to the billions spent by industry in 1965 for research and development. As a matter of fact, some individual corporations—notably International Business Machines—spent more for research and development in 1965 than the \$69.8 million spent by all federal agencies for educational research.

In the past two years, however, the amount of money being spent on research and development in education has increased appreciably, primarily because more federal funds are now

available for this purpose. In the past, most public school systems have not had the money and many have not had the inclination to do much research and development.

The federal government is now providing both the funds and the stimulus. The long-range results of this type of federal participation will probably be good for public education, regardless of how some other federally aided education projects may pan out.

### **Research and Change**

Why? Because research and development, long neglected in public education, are the best methods for promoting change. Research will move from the wings of education to stage center. Inventors, engineers, product testers, and disseminators will join the more conventional researchers. Centers of research and development will emerge on a scale beyond anything currently in existence, and I am not referring solely to the regional educational laboratories.

Some of the results of this educational research will be useful; some will not. The situation could hardly be otherwise, if one admits that occasionally federal grants are based more upon brochuremanship than upon any crying need in public education.

More than two-thirds of the total national research effort is supported by federal funds; and three-fourths of the nation's total research and development effort is done by industry. Until recently, however, industry had practically nothing to do with federally aided research in education.

Prior to the passage of the Elementary and Secondary Education Act of 1965, the United States Office of Edu-

cation contracted only with universities, colleges, and other non-profit institutions for research in education. After the act was passed, however, the Office of Education began contracting with industrial firms and other profit-making organizations for such research and development.

This romance between the Office of Education and big business may prove to be one of the most significant developments in modern education.

### **Warning Sounded**

Many people in and out of education are concerned, however, that the power of this federal "carrot" in the hands of the Office of Education—which can now contract directly with profit-making organizations for educational research and development—can largely determine which development programs will be undertaken in education.

Others fear that decisions which should be made by educators will be made by industrialists. The subcommittee of the Joint Economic Committee of the House and Senate, after its June 1966 hearing on technology in education, issued this warning:

It appears that the vital function of programming—preparation of content of education—is falling too frequently on the hardware manufacturers when it should be handled by educational experts. It would be tragic if control of curriculum and content of courses were to pass by default into the hands of large corporate producers of the hardware and software end of the business.

We should not lose sight of the fact that the funds for educational research are only a small portion of what the federal government is spending in the general area of education. During fiscal

1966, the United States Office of Education listed 67 different federal programs supporting educational efforts of one kind or another with a total funding of more than \$3 billion.

This burgeoning education market has attracted some of the major corporations and industrial organizations in the nation, particularly computer manufacturers.

Education has now learned what industry learned some time ago—a computer is no better than the information fed into it. (The acronym GIGO stems from this fact: “Garbage in, garbage out.”) Right now, electronic hardware for education is much further advanced than electronic software.

This deficiency in software, however, is going to be corrected in the years ahead, as one of the positive results of recent mergers between computer manufacturers and book publishers and the golden promises surrounding computer-assisted instruction.

### **Computer-Based Instruction**

A good example is the Radio Corporation of America, which merged last year with Random House, reflecting their “conviction that publishing and electronics are natural partners for the incredible expansion immediately ahead for every phase of education in our country.” Earlier this year RCA announced its full-scale entry into the field of computer-based instruction, with the formation of RCA Instructional Systems in Palo Alto, California. Working closely with a group of Stanford University educators, the center is developing new curriculum devices and combining computers, communications channels, and display terminals into a

system capable of teaching the student as an individual.

According to Robert W. Sarnoff, RCA president, this system will make possible rates of learning and retention far greater than any other teaching technique. “It avoids, moreover, the rigid system of learning by rote, substituting, instead, emphasis on the development of flexible skills that the modern student will need throughout a lifetime requirement of continuing education,” he said at the dedication ceremonies for the new center.

RCA is only one of many corporations and industrial organizations interested in the educational market.

### **Opportunities and Obligations**

This education-industry mix in the United States obviously affords opportunities; but, less obviously, it imposes obligations. Educators must recognize the complexity of the present and future educational task and must understand how the new technology can help them successfully meet it. Industrialists must recognize that their—and the nation’s—true interest lies in the solution of education’s fundamental problems, not in the discovery of how to make a fast buck in an expanding educational market.

Optimists believe that this blending of education, federal funds, research and development, and industry will be good for the nation. Pessimists believe that this blending—while it may jar education loose from some of its rutted practices—may also result in too much federal control of education.

The truth—and even the computers do not know it yet—probably lies somewhere in between. ◀§

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