The Technological and the Liberal in General Education

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THE programs described in this paper represent a set of related ideas for overcoming the ancient danger of the isolation of the classroom from the world. They share some common qualities which may be indicated by the title: "The Technological and the Liberal in General Education." [1] These programs have been developed in various parts of the country and contain ideas for innovation for the elementary, junior high, and senior high school levels. No one has yet brought them together in a unified way. The prospect remains for some urban area to take on that interesting challenge.

1

TECHNOLOGY FOR CHILDREN PROGRAM—*Elementary level, Trenton, New Jersey, suburban and inner city areas*

A basic feature of this program is its assumption that the elementary classroom should be transformed into a "responsive environment"—a place where children have a chance to manipulate, construct, and interact with a broad range of materials while learning. Its designers note that before coming to school, children explore their environment with all of their senses: auditory, tactile, visual, kinesthetic, olfactory, gustatory, etc. Compared to the varied set of interactions in the out-of-school environment, the classroom may be experienced as restrictive, adult-centered, dull, limited largely to verbal activities.

The program's rationale assigns to the school the task not only of establishing continuity with the child's earlier activities, but of extending experiences through contacts with realities in the larger society. Science-technology is seen as a major transformer of the quality of modern life. A critical task of modern education is to help the young gain insights and qualities of mind to enable them to live in the technological era.

Instead of visualizing technology as strange, remote, and vaguely menacing, the program attempts to help children see it as the product of man's thinking, and as an extension of his efforts to deal effectively with his material world. Technology's power can be used to debase life or for human good. The program rejects the notion that an adequate understanding of the rich complexity of the technological society can be attained primarily by descriptive chapters in books. The classroom is turned into a place where children can have direct experiences with materials, tools, techniques, and modes of thought represented in technology.

A deliberate effort has been made to avoid creation of specific structures for the

[1] Based on a paper, "The World as a Classroom," prepared for the St. Louis White House Conference on Education, Spring 1970.

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use of the materials. Teachers are encouraged to be flexible and imaginative in discovering ways to utilize the materials in connection with other studies in the elementary curriculum. Grants from the Ford Foundation have made it possible to provide $600 "classroom kits" of tools and materials for teachers who volunteer to work in this way.

Summer workshops are provided to help teachers gain confidence in moving in the new direction, and supervisory consultants are made available during the year. In the workshops, teachers gain experience with the kinds of materials and activities they will be employing in the classroom. Random examples include making paper, printing, use of simple jigsaw and other power-driven tools, experiments with electricity, refrigeration, exploration of the insides of clocks, cameras, telephones, crystal radio sets, and hydraulic brake systems.

I visited classes in which students were using some of these techniques in connection with units on map-making and transportation, in addition to employing them in science oriented projects. The program encourages an atmosphere of freedom in which individuals or small groups may develop special interest projects.

The out-of-school environment becomes a wellspring of information. During a unit on refrigeration one class visited a local refrigerator factory and watched the assembly-line process from beginning to end. It could be seen as an extension of their own simplified explorations in class.

Human relations learnings are intrinsic to classrooms which require children to cooperate in handling recalcitrant materials or tools. In this kind of situation teachers may be experienced as guides and helpers in a warm, supportive atmosphere. The good teachers learn the difficult discipline of restraining their impulses to intervene except when absolutely necessary.

This approach is not without problems. The right resources have to be provided and teachers need special training and sensitive supervision to overcome their insecurities. It is important to note that this program has been tried only with teachers who volunteered to enter it. Like a lot of other good ideas in education, it could be killed if expanded rapidly on a mass basis.

2
The American Industries Projects

The American Industries Projects were developed at The Ohio State University and Stout State University with special reference to the junior high school level. Essentially they involve a complete rethinking of industrial arts as general education. They stemmed from a realization that American students are ill-informed about the industrial system, and that traditional industrial arts programs with emphasis on a few hand-skill techniques, such as wood and metal working, are inadequately designed to remedy the situation.

Because of the complexity and diversity of modern industry a decision was made to create a conceptual structure that would reveal activities basic to all industries. The conceptual framework was developed with the collaboration of specialists in areas such as industrial design, engineering, personnel management, and psychology. The model calls attention to features and processes of industry, such as the use of energy and materials, production design, modes of construction, merchandising, cost accounting, research, and the organization of personnel.

Students study the conceptual analysis of industry and follow through with an industrial project conducted by themselves. In the Nova schools of Broward County, Florida, I saw an eighth-grade group at work on a project in which students manufactured and sold megaphones for use at school sports events.

They developed the engineering design for manufacturing the product with working drawings and prototype models. One committee took responsibility for the financial records, another worked on operation control problems including the use and training of personnel. Students procured the materials, used tools and power-driven machinery in an assembly-line type of production, and conducted inspections on the quality of the product. They worked out advertising and sales techniques. Students invested their own

money, sold in the school market, and took the losses or profits.

More students apply for admission to the courses than can be accommodated. A check with a number of suburban parents brought comments to the effect that they found their children spontaneously engaged in hours of talking and planning for the projects—"It gives them a chance to do something that they have control over."

At Nova these courses, as general education, are open to all students and serve a number of useful functions for guidance purposes. Teachers in related areas such as mathematics, science, social studies, and English are exploring possibilities for integrating their subjects with the industrial projects.

3

Programs of the Center for Technological Education—*San Francisco Bay area*

The Center for Technological Education of San Francisco State College gives guidance for some 40 interdisciplinary senior high school programs in the greater San Francisco Bay area.

These programs, begun in the early '60's, grew from an awareness that large numbers of students of average ability (IQ's 90-115) were bored by traditional schooling and were doing poorly or dropping out. While such students were leaving school, a growing need was developing for more and more persons with at least two years of education beyond the high school. Efforts to understand the situation led to several conclusions: (a) Students did not see the significance of subjects studied without relation to each other, yet the contemporary world of work requires persons who can use language, mathematics, science, and human relations skills in an integrated way; (b) Students were not motivated by classroom approaches limited to verbal exercises; they wanted to be active manipulators and doers in projects that would relate school work to community life.

A decision was made to design new curricula which would correlate several academic studies with experimental activities in lab-shop settings and in the community.

The Richmond Pre-Tech program is an example. In order to overcome the isolation of subjects, a team of teachers was formed—in this case from English, physics, mathematics, and the technological laboratory-shop. Instead of presenting teachers with a pre-established curriculum, they were brought together in two summer workshops to develop their own tentative plans of work. Central concepts from science or technology were identified and plans were made to relate these in ways designed to improve communications and mathematical skills. A distinctive feature was an insistence that the team have time for daily planning meetings so that projects could be designed and modified in process. A unit on heat, for example, was tentatively scheduled for three weeks but actually ran for eleven weeks. In the unit, apparatus was constructed in the tech-lab to conduct experiments; the study of heat in physics was related in mathematics to first degree equations; the English teacher helped students prepare written and oral reports.

Teaching teams are granted considerable autonomy and are encouraged to develop projects in depth with a stress on individual and group interests—rather than on cursory coverage of a long list of topics. It must be emphasized that the approach is one of general education rather than vocational education. The technological laboratory provides opportunities for students to *apply* theoretical knowledge. It is not craft-training centered. Special efforts are made to arrange for field trips to industrial laboratories, government experiment stations, or industrial plants. On some occasions students spend as much as a week on special work projects in one of these situations.

The Pre-Tech program happens to have an emphasis which points its students toward the middle-level technician training programs of the local community colleges. But many other kinds of programs using a similar rationale can and do exist. There is, for example, an interdisciplinary program involving social studies, math, and English at the San Lorenzo High School, and a program in Food Education and Service Technology in Oak-

land. In the Oakland program, science, math, and English are related to a home economics laboratory. An advisory committee with representatives from local businesses and unions has been established.

The San Francisco programs have concentrated on underachieving students of average ability. The rationale, however, could easily be adapted as a motivating device for students with college level potential. Imaginative educators might see possibilities for bringing together suburban and inner city students on common projects.

The programs I have described are distinctive in their effort to quicken the quality of liberal studies by relating schoolwork to the realities of a technological society. They are not vocational in the sense that they make no effort to train students for specific jobs. They differ from most work-study programs in that they are not designed primarily for early school-leavers. By stressing the integration of academic studies with tech-lab projects and field experiences, they strive to kindle interest in intellectual pursuits. At the same time they provide opportunities for active and manipulative activities and for multidimensional experiences with the processes of science and industry. They are as relevant for college-oriented students as for those who plan to enter the work force. □