

## Testing education

Standardized testing has traditionally been concerned with ranking individuals for purposes of comparing their knowledge of a subject. The College Entrance Examination Boards are primary examples. Test results are given in terms of percentile ranking of individual performance on the test. Such testing is not designed to measure the testee's extent of knowledge of the material, but rather his standing among peers.

In 1963 John Gardner, then president of the Carnegie Foundation, and Francis Keppel, U.S. Commissioner of Education, decided to explore the possibility of assessing the state of knowledge of the population in more absolute terms. The effort, they felt, would yield data on the effectiveness of the educational system by determining just how much people knew in such areas as science, art and social studies. The importance of such an assessment has recently been echoed by President Nixon in his call for measuring "how well the educational process is working."

The efforts of Gardner and Keppel, supported by the Carnegie and Ford Foundations, as well as with funds supplied more recently by the Office of Education, have resulted in the establishment of the National Assessment of Educational Progress Project. The project has three goals: to provide an index of what young people actually know, to measure changes in knowledge and skills over a period of time and to improve the quality of education in the United States.

Last week the results of the knowledge census were released for three categories: science, citizenship and writing. The nationally representative sample that was surveyed included 100,000 subjects aged 9, 13, 17 and 26 to 35. Typically, the results disclosed such information as that 98 percent of the 13-year-olds knew that a human baby came from its mother's body, but that only 29 percent of the 19-year-olds and 55 percent of the adults knew when ovulation occurs.

"The fundamental purpose of this initial survey was to provide a baseline so that in the assessment three years from now we can make meaningful measurements of gains in knowledge," says James Hazlett, administrative director of the National Assessment. "We also hope that the results provide some useful information to those people involved in developing curriculum changes."

Data were released for only 40 percent of the items. The remaining items will be re-tested for comparisons in the next cycle of testing. Unfortunately some of the data released is so sparse as

to make the validity of interpretations unreliable.

While 141 items were released on the "knowledge of the facts of science," for instance, only 14 items were available for "understanding the investigative nature of science" and 10 items for "attitudes toward science and scientists."

Such scant information is hardly a sound basis for evaluating educational progress of a nation or developing school curriculum. "The result is that released information for Objective III [the nature of science] is rather scant, and for Objective IV [attitudes toward science] is so meager as to be almost worthless," says Dr. Richard Merrill, president-elect of the National Science Teachers Association.

The objectives on which the tests are based are perhaps more interesting than the individual item results. In order to develop the test it was first necessary to draw up standards on what the American public should know or believe about science and citizenship. A panel of scholars, educators and laymen was responsible for drawing up the objectives. What has in effect been developed is a knowledge and attitude census that measures the objectives of a potential national curriculum.

## AUTO EMISSIONS

### Two-way attack

Nixon Administration statements have indicated a high awareness of the need for curbing automobile emissions, by weight the most common air pollutants in the United States.

Last week there were signs of action. The National Air Pollution Control Administration announced new and more efficient procedures for monitoring emissions. And an announcement by chairman Russell E. Train of the President's Council on Environmental Quality fulfilled the President's promise of last August that the Government would embark on a search for nonpolluting substitutes for the internal combustion engine.

Train's announcement came after a study by an ad hoc committee chosen by the Office of Science and Technology. According to Dr. Ernest S. Starkman of the University of California at Berkeley, a member of the committee and chairman of a new auto pollution advisory committee, the outlook is good that \$45 million to be spent by the National Air Pollution Control Administration over the next four years will turn up a viable alternative to internal combustion engines.

Train says that the three best possibilities are gas turbines, steam engines and a heat-engine-and-electric hybrid. But Dr. Starkman emphasized that no stone will be left unturned, that all pos-

For example, on the citizenship test Objective I is "Show Concern for the Welfare and Dignity of Others." One of the criterion attitudes for 13-year-olds is, "They respect those who differ from them in religion, national origin, race, social status, sex, clothing, physical or mental abilities, or interests." A series of test items, or exercises, were then developed to measure to what extent 13-year-olds do in fact meet this objective. Under this objective 83 percent of the 13-year-olds reported that they would be willing to let someone of another race live next door to them.

While the explicit purpose of the project is to assess knowledge and attitudes, there is also a communication and persuasion factor involved in asking specific questions, particularly those regarding attitudes (SN: 7/11, p. 31). A subtle but firm implication of asking citizenship questions on race and foreign relations indicates to 13-year-olds that there is a proper way to respond and believe.

This may be an unavoidable problem. "Anytime you are asking questions someone must think that it is important," says Dr. Frank Womer, staff director for the National Assessment in Ann Arbor, Mich. □

sibilities will be considered. NAPCA's principle chore will be the separation of the wheat from the chaff in the evaluation of competing contentions; research on the three major possibilities so far has been so limited that to say one or the other looks best is still very much a matter of opinion.

Dr. Robert U. Ayres of International Research and Technology Corp., a Washington, D.C., consulting firm, insists, for instance, that the steam engine is far and away the best possibility (SN: 9/20/69, p. 247): "The problem is to put together all of the existing information," he says. But he admits there are more specific problems. At present, water meets most of the criteria for a fluid to vaporize to propel either a turbine or a piston steam engine. But it does not meet them all, and a fluorocarbon with a high molecular weight that would also serve as a lubricant might be the answer. The trouble is that all presently available fluorocarbons break down into toxic substances at the temperatures demanded.

Heat transfer—between metals, liquids and gases—is another problem with steam engines, but Dr. Ayres believes progress in the basic subject of heat transfer over the past four years, when applied to steam engines, will solve the problems. Also still needed for steam engines are precise controls that