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In looking at science in today's high schools, one can come up with the following statistics. There are approximately four million students at each grade level between grades nine to 12. In biology classes we find 1.85 million students, in chemistry about 1.25 million and in physics only .25 million students. Over half of these students are enrolled in terminal or "slow-track" science courses, where they are neglected or forgotten, taught by the beginning teacher in a non-lab-oriented classroom.

Almost every high school has a science course where the so-called "slow-learners" have been placed. These courses may come under a variety of titles —*Applied Science, General Science, Everyday Science, Low Level Biology*— but the truth remains: each year over two million students go unmotivated in science.

What is the future of these students? It is in the world of "jobs." They are tomorrow's bus drivers, plumbers, salesmen, repairmen, mechanics, beauticians, secretaries, office workers, assembly line workers. As adults these students will be good American citizens. Perhaps they will not have a college degree (only seven percent of the population has a completed college education today), but they will become the backbone of the American labor force.

Because most science courses and teachers are college-oriented, secondary schools have not been reaching educationally uninvolved students. "Educationally uninvolved" students are simply those students who have "turned off" to school. They come in all colors, from all ethnic backgrounds and from all socio-economic levels. They have been called dumb—but records tell us they probably have at least average intelligence. Their problem is quite simple: they have been "tuned out" (educationally) for several years.

The educationally uninvolved student may have one or more of the following characteristics: (1) He may lack oral and written comprehension; (2) he may be two-four years behind in reading comprehension; (3) he is headed directly into a job instead of into college; (4) he may feel alienated; (5) he will be given materials that are not relevant to his life style; (6) he will be

put into classrooms with limited facilities and supplies; (7) he has a short attention span; (8) he resists books; (9) he could be a discipline problem; (10) he has learned to accept failure; and (11) he will probably exhibit a poor attendance pattern.

Why be concerned with the educationally uninvolved student in science? Because, besides a genuine concern for the youth of today, Bureau of Labor statistics predict that the next generation of workers will find 70 percent of all jobs technologically oriented, the typical worker in the next generation will probably change jobs 10 times, and, therefore, be retrained 10 times. The average student today will have the opportunity to vote in federal elections at least 20 times during his career—and many of his votes will reflect his attitude toward our technologically-oriented world.

In 1965, Harry K. Wong and Malvin Dolmatz began to develop a high school program that would make science exciting and relevant for the educationally uninvolved student. There are four basic objectives to the *Ideas and Investigations in Science* program which they developed. These objectives are: (1) to have students learn a set of major ideas and concepts; (2) to have students learn the ideas and concepts by involving them in inquiry-oriented activities; (3) to make the ideas and concepts relevant by including scientific problems with social implications; and (4) to provide lessons in which every student can experience continued success.

Let us consider each objective as it relates to the educationally uninvolved student. The first objective deals with a set of major ideas and concepts. The 10 major ideas chosen are Inquiry, Evolution, Genetics, Ecology, Homeostasis, Predicting, Matter, Energy, Interaction (of matter and energy) and Technology. The student learns about each idea by doing a series of investigations. Each investigation contains a group of related facts and experiences. From these, the student learns one concept in each investigation. Each concept learned builds on previous concepts. The concepts are sequentially articulated, so that a major idea emerges after the students work through a set of nine to 12 investigations.

The second objective is to involve the student, through inquiry, in his own learning. The students work in groups of two to four, and, with the teacher's help, discover one concept per investigation. These concepts are discovered by involving students in the major processes of science—observing, classifying, etc.

The third objective is the use of relevant material. Entire investigations and parts of investigations are devoted to scientific problems with social implications, such as employment, education, racial prejudice, fluoridation, nuclear testing, population explosion, pollution, space race, information explosion, smoking, venereal diseases, illegitimacy and drug abuse.

And the final objective is to have organization and material which students have a good chance of understanding, completing and succeeding in. Each

investigation has been designed to make it possible for every student to succeed.

The teacher who finds himself or herself conducting a science class of educationally uninvolved students may wish to keep several attitudes in mind. The first is Challenge—the challenge to give personal meaning and relevance to the material presented.

Second is Freedom—freedom for the student to make mistakes and explore. Third is Respect—the respect that one person can have for another whom he wishes to help. Respect implies a "can learn" attitude and a little love. Fourth is Warmth—warmth as results from commitment to helping, being accepting, calm and supportive. Fifth is Control—control that comes from being prepared, consistent and firm. The last is Success. A student comes to learn, and therefore it would seem that the teacher's focus should be upon accomplishment. What the teacher does has more significance than what he says.

An anonymous quote from Wm. W. Purkey's book, *Self-Concept and School Achievement,* states this idea beautifully:

> No printed word nor spoken plea
> can teach young minds what men should be,
> not all the books on all the shelves,
> but what the teachers are themselves.

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High school teachers will study such subjects as ecology, environmental assessment, the population explosion and the nation's power needs and its impact on the environment at 1972 summer institutes supported by the National Science Foundation.

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The institutes, to be conducted by 190 colleges and universities, usually last from six to eight weeks. A typical institute enrolls about 40 participants and includes laboratory or field work, lectures, discussion sessions and seminars.

Summer institutes offer instruction in mathematics, biology, chemistry, earth sciences, engineering science, physics, social sciences, general science and selected combinations of these subjects.

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