Robert E. Yager

Effects Upon Students of Today's Science Education

This author predicts the effects of today's science education upon students who have experienced it.

Most of the major curriculum developments in science that are currently active and national in scope have many features in common. These materials and their suggested use by teachers identify science curriculum and methodological trends immediately prior to the 1980 decade. An elaboration of some of the major features of these programs may be helpful in identifying major trends likely to affect student competencies in science for the 1980s.

The disciplines of science are becoming less discrete. There is little rationale for approaching biology as biology, chemistry as chemistry, physics as physics. Many new courses and course foci are emerging. Often, the course is not organized around basic discipline topics at all. In fact, the relationship of science to other areas of endeavor and thought is being reflected in many curriculum developments.

In contrast to the science of the 1960s and early 1970s, current science programs frequently include much applied science and technology. Rather than viewed as "nonscience," applications of science to real-life situations often become central to the study of science in the secondary school. Content that was formerly relegated to social studies, home economics, industrial arts, or omitted from the curriculum altogether is now central. Technology is frequently providing the bridge to a consideration of pure science.

More attention is being given to the objectives of science education in the secondary school. Traditionally, such objectives have aimed at the central concepts of science. For over 50 years, major groups, including those reporting in the Yearbook of the National Society for the Study of Education, have called for an emphasis on the processes used by scientists as well as the concepts they have produced and organized. Many now see the emphasis on content and process as an extremely limited view of the totality of science. The many dimensions of science, including its philosophy, history, interactions with society, creative features, applications, and relation to all human enterprises, are all recognized as equally viable curriculum concerns as are the concepts and processes central to previous views of the study of science.

The Concepts/Processes of Science

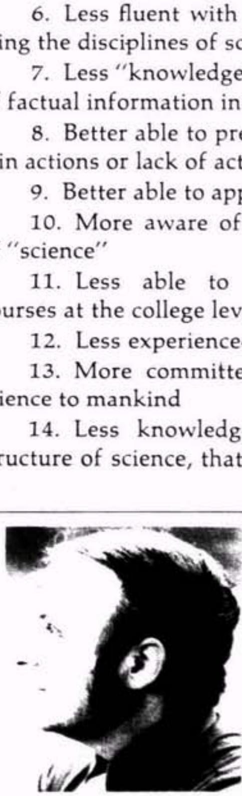
Perhaps an analogy concerning this enlarged view of science is helpful. To study music is to do more than to study the compositions musicians produce (the concepts of science). Further, studying music is more than practicing the techniques used by a musician (the processes of science). To know music is to appreciate it as a human creation. There is an important history of music; there are various instruments each designed tc accomplish something; there is a cultural setting for music; there are varying uses of music; there are many ways music affects people, that is, not all who are musically literate know a given quantity of compositions or are skilled at producing music. This is not to say that the study of musical composition (or the concepts and ideas of science) or the learning to sing or to play a musical instrument (the sciencing that occurs in a laboratory) or the study of musical history (history of science) or practice with music appreciation (interaction of science and culture) are not all important dimensions for concern and study.

Societal concerns of the late 1970s are societal imperatives—often central to our scientific/technological advances. The position of science in an educational setting reflects the new focus in science for the 1980s. A concern only for the concepts and processes of science is an inadequate concern.

Other common features for the science programs for the 1980s are concerned with approaches to instruction. Often courses as known in the past (for example, biology, chemistry, and physics) are disappearing—or at least representing only one dimension of the curriculum. Parts of courses are being developed as separate and independent units. Many of these units are shorter (for example, one to four weeks). Textbooks are becoming obsolete and thereby, poor indicators of course content. Provision is being made for student choice as to topic, approach, pace, and depth.

The changes in materials, course structure, teaching style, and definition of science literacy are likely to result in different student competencies as a result of their experiences with science in the secondary school. These competencies are likely to characterize the student as:

1. More aware of science and societal interaction
2. More aware of the meaning and limitations of science
3. More knowledgeable of technology and its impact
4. More action oriented
5. Less skilled in the laboratory *per se*
6. Less fluent with basic concepts characterizing the disciplines of science
7. Less "knowledgeable" in terms of quantity of factual information in basic science
8. Better able to predict consequences of certain actions or lack of action
9. Better able to apply scientific knowledge
10. More aware of the multiple dimensions of "science"
11. Less able to "by-pass" introductory courses at the college level in the basic sciences
12. Less experienced as a "junior" scientist
13. More committed to the importance of science to mankind
14. Less knowledgeable of the traditional structure of science, that is, its disciplines.



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