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## **Frontiers in Elementary Science Education**

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"Frontier" is generally construed to mean the position of the advance wave of exploration and settlement, whether it is referring to geographical areas, cosmic research, new political ideas, or merely innovations in thought and sentiment.

Most of us are seldom familiar with the entire frontier of any area, space, or idea. But generally we think of only that part of the peripheral

border of the subject with which we are concerned as being *the* frontier. Now, if one considers the frontiers of elementary science education carefully, he can recognize various frontiers.

One frontier of the entire discipline of science lies in the elementary grades as initial science instruction is pushed farther and farther down the academic scale toward the cradle. This frontier is quite different, to be sure, from its opposite or counterpart frontier on the side of rapidly expanding knowledge in the areas of space travel, nuclear science, or molecular biology. The importance of this first frontier cannot be minimized—for just as sure as the player must enter the game before he can score, so must the student enter the world of science on one side before he can emerge on the other to push back the frontiers of ignorance, superstitions, and inadequacies. The total body of scientific knowledge and technology can be likened to an endless river which separates the place of our birth from the opposite shores of undiscovered knowledge, wisdom and abundance. One has no other choice to reach the opposite shore except to learn to swim well in the river of knowledge and then to pursue a course which will bring him safely across into the land of unknown opportunity and challenge. It therefore seems expedient that a child should learn to swim in the river of scientific knowledge as soon as possible and be urged to set his compass on some challenging point of the opposite shore, this especially if he seems to possess the qualities of a good swimmer and the perseverance to reach his objective.

Some have assumed that the child is ready to learn to swim at the 9th grade level with his introduction to general science; others have thought the time was right in junior high. More recently it has been recognized that elementary school children have a natural and burning curiosity about the river of scientific knowledge and when denied proper leadership into the frontier are unnecessarily delayed in their crossing. Some may even become discouraged and never attempt the journey.

Every frontier needs its frontiersmen—dedicated to helping the uninitiated avoid the dangers, choosing the right routes to follow, and in general, aiding in the realization of maximum benefits from their labors. The elementary grade teachers have become the Daniel Boones and the Kit Carsons for the scientists of the next generation. They are stationed along the near banks of the river of scientific knowledge, but unlike the Boones and the Carsons, many of them have not yet learned to swim. Furthermore, some of these teachers are quite afraid to go near the water.

Most elementary teachers cannot teach science or the methods of science without first being instructed. Their only recourse is to teach *about* science or to avoid science altogether. One is almost as bad as the other, for they are missing the teachable moments when the pupils' interest, enthusiasm and desire to learn run high. It does not seem necessary for these elementary teachers to be accomplished scientists or students of science. In fact, rarely could it be expected of a teacher who has gone far in science to return to labor with elementary children. On the other hand, to teach most science concepts (even the elementary ones) requires of the teacher some previous experiences in science. These experiences need to be real and satisfying. They certainly should include problem solving which used scientifically acceptable techniques. If the teacher has learned to cultivate curiosity on the part of her students, if she knows how to teach them to observe, examine, investigate, and to draw sound conclusions, she is ready to take her place as a guide on the elementary science frontier.

The conquering of one frontier always seems to open new ones. Only a few short years ago, the National Science Foundation was reluctant to

admit that science should be a part of the elementary science curriculum. Gradually there has been an awakening to this need, however, and now there only seems to be the question of who would assume leadership in this undertaking—the National Science Foundation or the U. S. Office of Education. Already the SMSG studies in mathematics have been extended into the grades and soon we shall expect regular scope, sequence, and content studies to prepare new and challenging materials for elementary science (Atkin, 1961).

In the meantime, elementary teachers need to be preparing to serve as frontiersmen to guide our young students into science experiences as soon as they are mentally ready for them. Every school system and every individual teacher needs to adopt an active in-service program of self-improvement. It is not enough to require six hours of college credit (in anything) every two years. Such in-service programs, to be effective, must have legitimate motives and objectives as well as administrative support and encouragement. Time allowance for self-improvement in the teacher's daily schedule is a growing practice among some administrators. When dividends from these efforts become more apparent, the practice is sure to spread to other schools. Most administrators favor self-improvement among their teachers, but too many of them want it to be strictly on an over-load basis on the teacher's own time and at the teacher's expense. Too often, only frustration results from excessive over-loads and self-improvement pressures. Many industries have found it profitable to finance a continuing education program for their employees. Is it unreasonable to assume that school districts would receive rich dividends from investments to improve the abilities, techniques, enthusiasm, and morale of their teachers?

#### LITERATURE CITED

- Atkin, J. M. 1961. The University of Illinois Elementary School Science Project. *Elementary School Sci. Bull.*, Dec.: p. 3.
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