

False Versus

In education, we tend to characterize programs and projects in the language of opposites. We ask, is your project this or that, A or not-A, for X or against X. Often such dichotomies make good sense both logically—there really are only two positions—and conceptually—the two positions are meaningful and unambiguous. For instance, as to focusing primarily on the attainment of general science literacy *versus* focusing primarily on the development of scientific talent, Project 2061 is committed to the former.

But such characterizations can be misleading. More often than not, in complex matters such as education, the elements of seemingly opposite pairs are not actually mutually exclusive. To return to the example above, science literacy is the focus of Project 2061, yet the project strongly believes that a proper curriculum will provide for the interests, talents, and needs of students that go beyond the core of knowledge and skills that all students should acquire.

Content vs. Experience

Here is another example: emphasis on content *versus* emphasis on experience. Project 2061 believes that science literacy is best expressed in terms of the knowledge and skills that everyone should possess, seemingly putting the project in the content camp. Others believe that doing so will lead to dull, bookish teaching and foster rote learning. Surely that is a danger. But then “hands-on” is not risk free, either. Students can carry out interesting and enjoyable activities that lead nowhere conceptually. Instruction ought to be lively and engaging, to be sure, and it

ought to be designed to lead to important knowledge and skills.

Knowledge vs. Skills

And then there is the knowledge *versus* skills argument. This takes several forms. Some educators take the position that it is what a person knows that counts, others that given the right intellectual skills, it does not much matter what a person knows. Project 2061 sees that as a false dichotomy and takes the position—reflected in *Science for All Americans* and *Benchmarks for Science Literacy*—

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that neither is sufficient without the other, and hence both are needed. A person needs certain skills to be able to use knowledge effectively and knowledge to think productively.

An especially important case of the knowledge *vs.* skills issue has to do with inquiry. Should a curriculum be designed to promote an understanding of how scientific inquiry is conducted *or* should it prepare students to themselves carry out scientific investigations? Project 2061 strongly takes the former stand when it is dealing with the lasting outcomes of education for science literacy. But that is not the whole story. The project believes just as strongly that it is not easy to understand scientific inquiry without having the experience of carrying out investigations. The knowledge-skills dichotomy

disappears once the ends-means dichotomy is introduced.

Learning vs. Teaching

One last example: learning *vs.* teaching. As we noted in *Science for All Americans*, learning is not necessarily an outcome of teaching, to which we might well have added that some things can be learned without formal teaching. But it is also true that good teaching under the right circumstances can expedite learning enormously. Teaching is a great invention, but it is by definition utilitarian, serving the purpose of learning. In educational reform learning—an end—takes precedence over teaching—a means to an end—but is no substitute for it. *SFAA* and *Benchmarks* both concentrate on what is to be learned, with some commentary on teaching. But now Project 2061 is developing tools to enable schools to provide the kind of teaching that will result in student learning advocated in its previous publications.

There are many other either-or propositions that, even if not altogether false, are likely to be misleading. My list would include: facts *vs.* concepts; discipline-based *vs.* integrated; theory *vs.* applications; top-down *vs.* bottom-up; teacher preparation *vs.* curriculum reform; and others, not to mention ends *vs.* means. ■

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