A False Sense of "Discovery"

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A False Sense of ‘Discovery’

Within the past few years the terms “discovery” and “inquiry” have come into vogue in educational circles. These terms, and those of similar connotation, are found in science curriculum programs, magazine and journal articles, and papers presented at professional meetings. It has also become apparent that certain textbook publishers are extremely sensitive to the “in” terms; one finds that such words have been carefully inserted into the introduction or preface of some outdated science textbooks.

The widespread use of terms such as “discovery” and “inquiry” has given rise to some rather interesting results and their concomitant side effects. One predictable side effect has been the often amusing, but seldom rational, battle between the advocates of the “discovery” approach and their antagonists. One may well wonder which camp has made the largest number of unsupported claims—the score is probably about even.

One result of this emphasis upon “discovery” has been that many classroom teachers are saying, “I use a discovery (or inquiry, or problem-solving) approach in teaching science.” And these teachers are sincere in their desire to improve science education. Upon hearing such statements, however, a rather persistent question comes to mind: What is this teacher’s working definition of “discovery”? Or, in other words, what does this teacher do in his classroom to implement his “discovery” approach?

In order that a teacher build a working definition of “discovery,” he must decide which classroom techniques or procedures are compatible with his own personal interpretation of “discovery.” In the final analysis it is only the teacher’s interpretation that has any real meaning; it is his interpretation that is presented to the students.

Most teachers probably have some sort of working definition for “discovery,” but this definition cannot be obtained verbally with any degree of reliability. It is readily obtained by observing what a particular teacher does in his classroom: he will permit certain procedures and he will prohibit others.

Even a beginning “discovery” teacher is aware that certain class-
room procedures or activities are incompatible with the approach. Lecturing and cookbook experiments are obviously taboo; these procedures are quickly classified as “nondiscovery.”

But what of other classroom procedures? It is not uncommon to observe traditional classroom procedures being used by a teacher who claims to be “using the discovery approach.” This is particularly true in some of the new science curriculum programs: the materials say “discovery,” the teacher says “discovery,” and even the students say “discovery.” But watch the classroom in action: most of the old procedures are still there, the names only have been changed.

Consider the classroom procedures discussed below. In what ways are they compatible or incompatible with your definition of discovery?

Prejudiced Planning

“Preconceived judgment or opinion” is one definition of prejudice, and this is an apt description of the planning behind most “science units.” The teacher enters the classroom with a prepared lesson plan, and all students are required to start at the beginning of this plan and proceed to the end of this plan—ready or not! In addition, all students will perform the same, or similar, experiments; all students will arrive at the same answers; all students will memorize the same words; and all students will take the same “recall” tests.

Individual differences? Forget it! That’s only an overworked piece of jargon to which educators pay lip-service.

How does all this rigid, insensitive planning come about? A discussion of this question is far too lengthy to undertake here, but I would suggest that the sequencing and grade-level placement of most science subject matter is determined primarily by two factors:

1. Opinion—“I think the kids can do that.”

2. History—“Well, I had Electricity and Magnetism after Mechanics.”

Now, admittedly, some of the new science curriculum programs—notably Science—A Process Approach—have done some research and they are to be commended for their efforts. But one must examine the nature of the research. Are the children only tested for recall—either word recall or equipment-manipulation recall?

But let us return to your definition of “discovery.” The question that you should now answer is, “When this kind of planning is used in a science classroom, what can the students ‘discover’?” As you formulate your answer, you should remember that Prejudiced Planning is exemplified by the teacher who operates under two tenets: (1) “All students will start here” and (2) “All students will end there.”

What “discovery” do these boundary conditions permit?

Classroom Discussions

Imagine a scene in which an enthusiastic, excited, personable teacher is involved in a fast-moving classroom discussion. The questions and answers are delivered with ease and this causes a warm glow of appreciation to be felt for this teacher—his performance is flawless. (One wonders
what this "performance" does for the students.)

Many teachers admit to the impossibility of conducting a discussion with thirty people, but then these same teachers continue to perform this ritual day after day. It is strange indeed, but these teachers seem to gain a great deal of self-satisfaction from conducting a lively session of "Guess What I'm Thinking." The typical classroom discussion has one prime objective: to verbalize the "correct" words in the "correct" order.

What can a student "discover" in a classroom discussion?

**Summarizing Discussions**

Now imagine a classroom that is drawing to the close of a particular science unit. The teacher feels that it is his obligation to summarize and to tie everything together into a neat little package; that is, a neat little package for himself. Few seem to question just how logical and neat these packages are for the students.

Summarizing discussions amount to telling the students what they were supposed to have "discovered." For the majority of students in a classroom, the summary serves only one purpose: it provides the clues as to what words to memorize for the final exam.

A student may have learned a great deal in a particular science activity, but a teacher can quickly destroy any student interest, confidence, or pride of achievement by neatly summarizing the "important" facts. The student, in effect, has again been told, "What you think is unimportant; what you found is unimportant; you are incapable of learning for yourself; you must memorize my facts."

What can a student "discover" in a summarizing discussion?

**Recall Tests**

Now the science unit is over and the teacher presumes to "measure" what the students have learned. This measurement is performed by presenting the students with tests composed entirely of recall items. Many teachers are incensed when someone suggests that these instruments only test for word memory. But then again it can be hypothesized that many teachers actually believe that learning is word memory. Such an hypothesis is plausible when one observes what teachers do in the classroom.

John Holt, in his book *How Children Fail*, says, "The good student is the one who waits until after the final exam to forget." This definition is most appropriate. The recall test measures nothing but memorization ability; it is a mistake to attribute "concept testing" to these tests.

What can a student "discover" when he is required to parrot back a prescribed set of memorized words or formulas?

In the foregoing paragraphs we have considered some typical science classroom procedures which are employed in nearly every classroom in this country today. Those who would dispute this point have not been in very many classrooms lately.

The extent to which the above-named procedures are employed in a given classroom is a good indication as to the degree of "discovery" allowed in that classroom. I would sug-
gest that there is no "discovery" possible, even in a limited sense, when these procedures are used. On second thought, there is one exception: the students can "discover" which words to memorize for the test.

If one agrees that the above procedures inhibit "discovery," then it follows that a "discovery" or "inquiry" approach is nonexistent in this country today. What one does find is a large number of verbal advocates of "discovery" who are using highly traditional techniques in the classroom. The student, as is so often the case, is caught in the bewildering middle: on one hand his teacher will give him equipment and shout "Discover!" and then this same teacher will plan-discuss-summarize-test for "You didn't 'discover' my answers." Is it really so surprising that many teachers decide that the approach doesn't "work"?

The students fall for the "discovery" line only once. They quickly learn that what they do in science class is of little consequence; what they had better do to survive is to find out what words to memorize.

In like manner, arguments against a "discovery" approach must be examined closely. One often finds that the critic has never observed the approach, even in a limited sense. For those who have observed the approach it is not uncommon to find their criticisms based upon student performance on a recall test!

The plea here is for honesty. If teachers are going to say, "I use the discovery approach," then they should create a classroom situation that truly allows a student to discover some knowledge for himself. Lip-serv-

Study of Science Facilities

The National Science Teachers Association is embarking on a nationwide study of facilities for the teaching of science at the secondary school level. The study will cover in-school facilities—laboratories, classrooms, and special-purpose rooms, such as greenhouses and planetariums—and facilities outside the school, such as outdoor education centers that are used for science programs. The final report will include a variety of school situations and will serve as a guide to school systems and architects in building or remodeling facilities for science programs so that they will better fit both the modern science programs and the new learning techniques and materials.

The study is being funded by the National Science Foundation, Dr. Joseph D. Novak, professor and chairman, Division of Science Education at Cornell University, is the project director. He will be assisted by a task force of persons who will do the field work and by consultants from architectural, business, and educational groups.

The National Science Teachers Association, the nation's largest group of educators concerned with all areas of science teaching, is an affiliate of the American Association for the Advancement of Science and an associated organization of the National Education Association.