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Other Topics

Hunter Lesson Design: The Wrong One for Science Teaching

Hunter lesson design is not appropriate for science teaching—it relies heavily on teacher directive behaviors, and it wrongly implies that science is merely a collection of facts and rules.

The "Madeline Hunter Teacher Effectiveness Training Program" has been marketed to numerous school districts with claims of improved instruction, increased student achievement, and an "all-purpose lesson plan" appropriate for every lesson in all disciplines. However, we contend that Hunter's lesson design model is not consistent with many goals of science education, it is not appropriate for every lesson in science, and it contradicts important principles of science teaching. In fact, this model supports only the teaching of low-level facts that require only the recall of information and low-level skills such as titrating, handling microscopes, and cutting glass tubing.

The complete Hunter program involves a variety of topics, but this discussion will focus on lesson design because teachers, when asked about the Hunter program, usually talk about the "seven steps of a lesson" (Moore 1988, Wolfe 1987). Hunter and her colleagues claim this model was never intended to be strictly linear in nature or contain all seven components in every lesson; nevertheless, they do suggest teachers and administrators consider using these seven elements when teaching any lesson. Many schools require daily lesson plans in the seven-step format. Teachers *use* it this way, especially when they are being observed by an administrator or Hunter program facilitator (Garman and Hazi 1988).

Why do administrators and teachers believe effective teaching should result from the Hunter lesson plan? Freer and Dawson (1987) suggest that it provides a clear model and a common language for administrators and teachers, while Wolfe (1987) sees it as a generic lesson plan for overworked teachers. Common language in itself, however, does not make a model effective. We contend that exemplary science teaching strategies *do not follow* from the Hunter generic lesson design.

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Propositions Do Not Equal Procedures

To Hunter's credit, she clearly identifies the dilemma involved in any attempt to improve teaching:

> Propositions are easy to learn; artistic performance procedures are much more difficult to attain ... [The Hunter] model is deceptively simple in conceptualization, incredibly complex in application. There is a quantum leap from knowing propositions to creating artistic procedures. (Hunter 1985)

However, although she recognizes the problem, Hunter's model also fails in its attempt to translate propositions into procedures.

First, too many propositions in the Hunter scheme are *not* translated into procedures. The propositions described are often general and vague—they fail to delineate appropriate teaching behaviors and strategies. For example, Hunter (1985) writes, "Teaching decisions may be delegated to the learner," and Wolf (1987) states, "As teachers prepare to instruct, they need to consider many factors: the content, their students' previous knowledge. . . . "

But the Hunter literature and videotapes don't show us what delegating teaching decisions might look like in active science inquiry or what the teacher should consider about content to help students learn. Too often, teaching behaviors and strategies—the translation of propositions into the procedures that directly impact learning—appropriate for science instruction goals are simply not addressed.

Second, several Hunter propositions and a number of teaching behaviors and strategies for translating the propositions into procedures *contradict* many important goals of science education and many principles of effective science content instruction. Lawson and associates (1989) call Hunter's methods (and the methods of currently popular mastery learning/outcome-based education) "naive," and they go on to say that these methods "quickly degenerate into teaching of only the simplest, most useless facts."

Students, Not *Tabulae Rasae*

Thus, Hunter's teaching suggestions contrast sharply with research on effective science teaching. For example, her statements in *Mastery Teaching* (1982a) and in *Mastery Teaching Video Cassette Tapes* (1982b), provide glaring contrast to the science education literature:

> *Lesson Element—Anticipatory Set:* At the beginning of class, use an activity or statement that focuses student attention. The set provides a brief practice and/or develops a readiness for instruction that will follow.

Hunter suggests the teacher ask review questions. For example [emphasis is ours]:

> . . . call on a student who you think will give the right answer. [In this way] *correction* of unvoiced misunderstandings or erroneous answers can be accomplished without visibility or embarrassment . . . Ask the students to write something (e.g. definitions in their own words, the solution to a problem, a short summary of yesterday's, or this week's content) . . . Always, however, tell students the key ideas that they should have included so they have the opportunity to *immediately verify or correct their knowledge* (*Mastery Teaching*, pp. 27–28).

But students cannot "immediately verify or correct their knowledge," and are not just *tabulae rasae* on which the teacher need only write new knowledge and meaning (Osborne and Freyberg 1985, Piaget 1964). Students hold views of the world and meaning for words which significantly affect the outcome of instruction, or are influenced in unanticipated ways (Osborne and Freyberg 1985).

Although Hunter does suggest that teachers ask questions for diagnostic purposes, the methods she suggests (short answer and lower-level questions, thumbs up/down, and similar procedures) are very different from those suggested by research. According to Osborne and Freyberg (1985), for example, teachers looking for necessary beginning points for instruction must:

- Find what logical structures of thought the child is capable of, and match the logical demands of the curriculum to them (Shayer and Adey 1981);
- Find the alternative viewpoints possessed by the child, and provide material in such a way so as to encourage the child to reconsider or modify these viewpoints (Driver 1980);
- Find the meanings and concepts that the learner has generated from his or her background, attitudes, abilities and experiences, and determine ways in which the learner will generate new meanings and concepts (Wittrock 1974).

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What are science teachers to do with students' extensive ideas about the natural world? Hunter (1985) seems to be aware of Wittrock's generative theory of cognition, but what is observed in the Hunter literature and videotapes bears little resemblance to science educators' best use of "generative learning" when designing instructional strategies.

> *Lesson Element—Objective:* A time when the teacher informs the students what they will be able to do at the end of instruction (purpose) and how the lesson is relevant.

Hunter contends, "In most (not all) cases you will find it facilitating to tell students today's objective and the purpose or reason for that learning" (p. 29). This practice of informing the students what the expected learning is before instruction again implies *tabulae rasae*, unless one is teaching isolated facts and concepts or performance skills that follow invariable explicit steps. But Lawson and associates (1989) write:

> [Hunter] argues correctly that good instruction includes a few essential elements but she incorrectly concludes that these elements are things such as teaching one objective at a time and telling the students beforehand precisely what they are supposed to learn . . . Further, telling students precisely what they are supposed to learn robs the lesson of its inquiry nature and, therefore, eliminates curiosity, the most powerful source of motivation in science that we know. The Hunter approach also appears to directly contradict the notion that the child actively constructs his/her knowledge, which is a basic tenet of the learning cycle method (p. 87).

What Is Relevance?

Hunter attempts to make science relevant by saying things like "We're going to learn the classification system of plants so you will be able to correctly categorize each one in the final exam" (p. 30). And she does this in other areas besides science; regarding English instruction Hunter states, "Analyzing poems for meaning is important in itself, but even more so if it's going to help you on the final" (Tape 4). These examples demonstrate lack of relevance; they do not suggest that students have intrinsic motivation for learning.

Even more disturbing, the Hunter approach doesn't help teachers give a rationale for learning science. Students are often told, "You're going to need this some day," and that "some day" is test day. But the National Assessment of Educational Progress (1978) data reveal that only 22 percent of young adults believe what they studied in school science will be useful in the future (Yager and Penick 1984). Stressing learning just for a test reinforces poor attitudes about the usefulness of science.

Hunter emphasizes that teachers should be good at conveying information: "Information is the foundation of all learning. You can't think without it. Once you have that information, you can build concepts, generalizations . . . and proceed to do higher thinking" (Tape #5).

Lesson Element—Instructional Input (Providing Information): A time when the teacher provides information that is needed by the student to perform a skill or complete a process. Input may be facts, generalizations, steps in a process, or critical attributes.

Here is one of her suggestions for presenting information to students:

Energy comes from the sun. That energy is absorbed by plants and enables them to use elements from the soil to manufacture food. This process is called photosynthesis. Animals eat plants and, with oxygen from the air, are able to convert them to energy. This process is called cellular respiration. (*Mastery Teaching*)

Hunter then goes on to suggest, "Once students have perceived the basic relationships inherent in photosynthesis and respiration, they are able to add more complex information."

This "basic information" consists of several extremely difficult concepts, each requiring student-generated understanding. An ability to simply regurgitate this information is not, in our view, indicative of learning. Too often "understanding" is assumed to be commensurate with pronunciation of terminology. Students who have been exposed to this same "basic information" have later been observed to think plants somehow mechanically "make their own food" in much the same way as one "makes" a salad or hamburger (Osborne and Freyberg 1985). Thus, when facts are presented as unconnected to students' prior knowledge, they, too, lose their relevance to further learning.

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The Lecture Routine

Hunter acknowledges that this generic lesson model is more suited to lecture (1982b), and this is demonstrated throughout her videotapes. She rationalizes the emphasis on lecturing with statements such as, "You see lots of it, most teachers lecture, so let's make them more effective lecturers" (Hunter 1982a).

Most teachers do lecture a great deal (Yager 1981; Yager and Stodghill 1979; Stake and Easley 1978; Goodlad 1982, 1984; Weiss 1978), but most educators lament this problem—they don't try to train teachers to lecture better and then call it effective teaching.

A multitude of research studies suggest that directive teacher behaviors and strategies are detrimental to children. For example, Flanders (1951) and Cogan (1956) claim that directive teacher behaviors produce anxieties in students and reduce the learning of new concepts. Shymansky and Matthews (1974) found that the more directive the teacher behaviors (such as evaluating students' ideas, telling students what to do and how to do it), the less productive and involved the students were in science. Shymansky and Penick's (1981) study showed that teacher-structured classrooms resulted in teacher dependency, less creative problem solving, and more disruptive behavior. Brophy (1981) indicated that direct, teacher oriented, instruction is effective only when basic skill mastery is the primary goal.

Teacher as Model

Lesson Element—Modeling the Information: When the students see examples of an acceptable finished product or process. Critical elements of the example must be labeled.

Hunter suggests that the teacher, when helping students work toward an acceptable finished product, should identify the critical attributes, label the similarities, and present an example and exceptions. In addition, when helping students work toward an acceptable process, Hunter also suggests success will be greater if the teacher will "show the students exactly what they're supposed to do" (Tape 7).

These may be helpful strategies, but only when the goal of instruction is knowledge or imitation (the lowest level of Bloom's Taxonomy). In addition, modeling information for a class of students presupposes that students possess the exact same levels of cognitive development, when in reality any group of students possesses a wide range of cognitive development and abilities. Imagine a doctor who walks into a waiting room with patients of every ailment imaginable

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and prescribes aspirin to everyone. The doctor would be seen as incompetent, yet the Hunter model prescribes treatment en masse. While we do not deny the value of modeling in facilitating certain student goals, the examples of modeling provided in the Hunter literature and videotapes are largely inappropriate.

Proponents of the Hunter lesson design may charge that we have misrepresented lesson elements *Instructional Input* and *Modeling of Information*. They will maintain that student exploration, experimentation, and discovery may constitute the input and modeling for a lesson. What the Hunter lesson design is in theory, however, is irrelevant to how it is portrayed in the Hunter literature and videotapes and how it is perceived by administrators, teachers, and especially students. Moreover, those who suggest that better examples would rectify this problem miss the critical argument that although exemplary teaching may be reconstructed to fit the Hunter lesson design after the fact, the lesson design does not lead to exemplary science teaching. In this respect the Hunter lesson design is much like astrology: all experiences can be reconstructed to fit a horoscope, but the horoscope doesn't accurately predict or facilitate the experiences.

Anybody In There?

Lesson Element - Checking for Understanding: When the teacher checks for students' possession of essential information and skills necessary to achieve the instructional objective.

Hunter suggests that teachers should avoid dysfunctional questioning methods (*Okay?*, *You all understand?*, *Any questions?*), but she then goes on to suggest methods that are only slightly less dysfunctional (calling on the more able students to get correct answers, choral responses, and similar methods). In Tape 9, the science example shows a teacher asking a student to list the lab procedure sequence that he had just explained to the class. This element would more accurately be labeled "a check for memory."

The examples of questioning provided in her literature and videotapes suggest that Hunter's interpretation of good questioning invariably involves recall of information. But these checks may or may not coincide with students' true understanding of the material. Inadequate checks for understanding often result in unexpected outcomes such as those described in Osborne and Freyberg's (1985) *Learning in Science*.

An Emphasis on Content Acquisition

Lesson Element—Guided Practice: Students' first attempts with learning are guided by the teacher so they are accurate and successful. The teacher circulates to see that instruction has taken.

Lesson Element—Independent Practice: Students perform the skill or process without major errors and are ready to develop fluency by practicing without the availability of the teacher.

The two elements above deal simply with performance skills, procedures, and rules—a very small component of scientific literacy. Clearly, the premise of Hunter's model is that learning is the acquisition of information. One facilitator of the Hunter model states that the lesson design is "most effective when students are engaged at the lower level of Bloom's Taxonomy—specifically at the knowledge and comprehension levels, when the teacher's objective is to teach performance skills or mastery of a body of knowledge" (Ceroni 1987). But again, this is a very small component of scientific literacy; it falls far short of "learning" in science as defined by Phillips (1986):

> Learning is not acquiring knowledge. The essence of intelligence is the mental structures used to relate, interpret, synthesize, classify, order, predict, and make inferences and hypotheses about the data or facts.

Furthermore, these student-developed thinking abilities (sometimes called "process skills") cannot be acquired vicariously (Novak and Gowin 1984, Osborne and Wittrock 1983, Phillips 1986, Piaget 1964).

Content acquisition is only one goal among many noble goals in science education. Traditionally, content acquisition has been emphasized at the expense of other student goals (Harms 1978). Unfortunately, the Hunter model conveys this same kind of tunnel vision.

Follow the Leader

The role of the teacher in the Hunter model is essentially that of organizer and presenter of information, whereas the role of the student consists mainly of passively following directions and regurgitating information. In Goodlad's (1984) and Cunningham's (1971) observations of classrooms, these roles, although typical, were seen as indicative of the crisis in education.

The general view of the Hunter teaching model as "research-based" seems tenuous at best (Gibboney 1987). Conspicuously missing in this model is attention to:

- Use of wait-time (Rowe 1969, 1974a, and 1974b);
- Appropriate/inappropriate use of praise (Brophy 1981, Deci 1975, Treffinger 1978, Rowe 1974a and 1974b, Lewin 1935);
- Evaluation (Treffinger 1978, Marchall 1960);
- Effective diagnostic strategies (Piaget 1964, Phillips 1986, Osborne and Freyberg 1985, Novak and Gowin 1984);
- Questioning and responding strategies (McGlathery 1978);
- Facilitating creativity (Flanders 1960, Payne 1958, Torrance 1963 and 1965, Torrance and Meyers 1970, MacKinnon 1960, Treffinger 1978);
- Constructivism: How students construct their own knowledge and what teaching strategies foster this (Osborne and Freyberg 1985).

Finally, there is no existing research showing that students learn more or faster as a result of having been instructed via the Hunter lesson design (Slavin 1989a and 1989b). The popularity of the Hunter model, as Wolf (1987) and Freer and Dawson (1987) suggest, seems to comes from its generic nature and common language—not from empirical evidence.

Not the Answer for Science

Hunter's emphasis on student acquisition of information distorts the nature of science by making science appear to be merely an enormous body of facts and rules about the natural world. Many scientists and science educators well versed in the history and philosophy of science have criticized this overemphasis on information acquisition in school science (Einstein 1936/1954, Szent-Gyorgy 1964, Feynman 1966, Klopfer 1969, Rachelson 1977).

Instructional strategies designed to facilitate authentic science inquiry simply do not follow from the Hunter lesson design regardless of the number of elements left out or how the elements are arranged. Active science inquiry is too complex to set down a predetermined step-by-step procedure (Einstein 1933/1960, Feyerabend 1975, Margetson 1982, Hodson 1988).

The use of teacher directive models and behaviors in teaching science has been of great concern to science educators (Penick and Yager 1986), precisely because of the issues we have raised here. Although educators may find Hunter's suggestion easy to use, the potential damage of her approach lies in the diversion of energy, resources, and attention away from critical problems and issues in science education when they implement her model. Indiscriminate use and promotion of the Hunter model will only serve to exacerbate the problems that currently plague science education.□

One facilitator of the Hunter model states that the lesson design is "most effective when students are engaged at the lower level of Bloom's Taxonomy."

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