Hunter Lesson Design Helps Achieve the Goals of Science Instruction

Berg and Clough reached erroneous conclusions about the Hunter lesson design by pulling sentences out of context to support their point of view.

On reading Berg and Clough's critique of the Hunter lesson design, I was surprised to read the quotes Berg and Clough—scientists—had taken *out of context* from one book, one article, a few "selected" videotapes to fabricate from these meager data a completely erroneous conclusion. It is as if a scientist observed a worm that had been run over by a car and concluded that whenever a worm crawled on a road, the flatness of the road caused the worm to acquire that same property. Such "scientific" thinking is incomprehensible.

Even though Berg and Clough quote me in describing my model as "deceptively simple in conceptualization, incredibly complex in application," they make the most unsophisticated and incorrect interpretations. In addition, they focus only on "Lesson Design," an element of the model that lists features one must consider (not necessarily do!) in planning any type of lesson. Lesson design is *not* our teacher decision-making model of instruction.

A Few Questions

To support their assertion that "They [elements of lesson design] contradict what researchers recommend for effective science teaching," Berg and Clough used none of my definitions of these elements—they used their own interpretations. In defending those elements of lesson design, I would like to ask them a few questions. Do researchers recommend:

- ... that science classes begin with students' minds on friends, games, television, or other nonrelated interests? That there should be no attempt to focus students on the content of the lesson? (*Anticipatory set*).
- ... that teachers have *no* learning outcome for students' efforts and activities? That they merely hope students will learn *something*? (*Objective*).
- ... that there be *no* source of information? (*Input*).
- ... that there be *no* modeling so students can observe manipulation of only one variable at a time, how to seek and assess data that would support or impeach a conclusion, how to develop a hypothesis from observation of relationships in data or from past experience, as well as how to develop and test competing hypotheses? That students "discover" how to use scientific instruments, prepare a slide, practice safety precautions that should be observed in a science laboratory? (*Modeling*).
- ... that there be *no* checking to make sure students know what they are about before they start (safely) to work? (*Checking for understanding*).
- ... that students be "turned loose" in an unknown and challenging situation without assurance that what they are doing is safe and relevant to scientific inquiry? (*Guided/monitored practice*).
- ... that students should *not* apply their skills in inquiring, observing, hypothesizing, experimenting to support or refute a hypothesis, and drawing conclusions to new or different situations? (*Independent practice*).

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Berg and Clough's allegations that "the Hunter lesson design plan is not appropriate to most goals in science education" fly in the face of research, the experiences of expert science teachers, and our own lab school work in developing, field-testing, and demonstrating contemporary science programs.

Lesson Design in Science

Further, Berg and Clough maintain that our lesson design fails to address "procedures appropriate for science goals." They also assert "this model is teaching the simplest, most useless facts." So, let's look at *brief* examples of elements in a science lesson that would qualify for a Hunter lesson design and consider whether they would disapprove of them.

Anticipatory set and objective: *Let's review the procedure in making slides because today you'll be making*

your own slides to be used in developing a hypothesis to explain —— and support your conclusions.

This "directive teaching" technique focuses students on the challenge and serves to verify or correct previous learning that is essential to today's science activities. It is much more than "low-level recall of useless facts."

Berg and Clough completely misunderstand the rationale, in *reviewing* material, for calling on students who will give an accurate answer. Do they wish students' incorrect answers to be made visible, with resultant humiliation plus possible pollution of other students' understanding, or would they prefer (as I would) that inaccurate memories be corrected with no visibility and consequent loss of dignity? Berg and Clough apparently do not realize that the example they cited constituted a *review* of what already had been learned, not discovery of new learning.

Objective: *Today your group will work with magnets to see how many generalizations you can develop and support.* Is this specifying "precisely what they are supposed to learn" or "robbing the lesson of inquiry" or "eliminating curiosity"?

Input: *Remember what you've learned about modifying only one variable at a time, observing results carefully, and checking whether or not the data support your hypothesis. Your information today will be derived from your own observations while you experiment with these materials.* Is this a "teacher-dominated lesson"? Input can come from observation, experimentation, computers, films, or books, not just from teachers.

Modeling: *Observe what I do, and be ready to state whether my conclusions are valid or invalid, and why.* Is this blind imitation?

Checking for understanding: *Look at your data to determine and be ready to state which could be used either to support or refute your hypothesis.*" Is this "low-level thinking"?

Guided/monitored practice: *I'll be circulating among your lab groups. Signal me if you have questions or need assistance.* Is this "rote repetition"?

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Independent practice: *Identify a question that you have about ——. Then design and conduct an experiment (by yourself/with your group) that would answer your question.* Is this "low-level thinking"?

To a careful reader, these examples demonstrate clearly how the elements of instruction allow amply for higher-level thinking, building on student interests, and activating students' prior knowledge.

Selective Extrapolation

Berg and Clough contend that the Hunter lesson design prescribes roles of teacher and learner that not only do not facilitate learning but that are inconsistent with many goals for science education. Had they read carefully, they would have found theory translated into practice. Their claims that "conspicuously missing in the model are wait time, appropriate use of praise, evaluation, diagnostic strategies" are not true.

Berg and Clough also conclude that my model emphasized content acquisition at the expense of other student goais. Instead they could have quoted my statements in *Mastery Teaching*,

> All students have potential for creative thinking. In many, that potential has been scientifically extinguished by their 'majoring' in recalling THE right answer rather than using information as the launching pad for more complex thinking.

or:

> Information and skills become useful when they can be applied to a new, not previously encountered situation. Generalizations can be used to solve new problems. Previous experience can be used to predict outcomes, estimate answers, extrapolate from data, and/or avoid errors. It is important that students have experience in applying whatever they learn to new problems or situations (Hunter 1982).

I reiterate this throughout the book. Why couldn't Berg and Clough find it?

Interestingly, Berg and Clough chide *Mastery Teaching* because "critical problems and issues go unaddressed." They contend that "the Hunter literature and videotapes don't show us what delegating learning decisions might look like in active science inquiry." Why don't *they* "address" and "describe" them? Probably because they realize that in a 15-minute tape created to show theory and practice, it is not possible to do more than present psychological generalizations and show vignettes from many different disciplines so the viewer may sense the ubiquity of those generalizations in all content areas. The series was not produced to show exemplary curriculums in science or in any other discipline. A curriculum specialist in language arts, dance, German, or philosophy could level the same criticism.

Berg and Clough assert that "too many [of my] propositions . . . are not translated into procedures." Although they quote from the introduction to *Mastery Teaching*, they evidently overlooked the statement on the same page, "In no way have we included all the techniques which make teachers more effective."

Had Berg and Clough carefully examined other chapters of that book or even sampled my 12 other books and over 300 journal articles, they might have found innumerable translations. It is of "scientific" interest that they present none of their "recommended teaching strategies" to show how they are in conflict with lesson design. The truth is they aren't.

To support their arguments, Berg and Clough quote old research data incompletely reported by Slavin (1989). In the Napa study they cite

(Hunter 1986), researchers reported statistically significant academic gains while using the Hunter model. Gains dropped when the teachers stopped. They also cite Mandeville and Rivers' article in *Educational Leadership* (1988) as evidence against the Hunter model, but those authors subsequently stated that theirs was not a valid Hunter model (1989). Although Slavin (1989) reported West Orange results after one year, the results after four years show significant gains in four of the six areas tested (Sousa and Donnavon 1990). Scientists should keep up with current findings.

Here is an example of Berg and Clough's selective extrapolation: they quote part of my *Mastery Teaching* statement, that

> It is seldom that what we teach has no reference to students' lives, but frequently they do not make the connection. Consequently, in most (not all) cases you will find it facilitating to tell students today's objectives and *the purposes or reason for that learning*. Should you wish either the objective or its relevance to be discovered or to be a surprise, that is fine (p. 29).

Why don't they support this excerpt with Berg's own revelation in the National Assessment of Educational Progress (1978) that "only 22 percent of young adults believe what they studied in school science will be useful in the future"? Instead, they pull out only the middle sentence in an attempt to support their contention that I believe that students should be taught "precisely what they will learn."

Out of the eight learning objectives I listed, Berg and Clough selected, "We're going to learn the classification system of plants so you'll be able to categorize each one correctly on the final exam." They ignored objectives such as "Today, we'll learn about calorie intake so you can regulate your weight while eating foods you can enjoy" or "After today, you'll be able to determine when conclusions are valid and when they're not. That's a skill you'll use throughout your life." Scientists shouldn't generalize from one instance.

In the chapter, "Providing Information Effectively," I state,

> A well-designed lecture can be adjusted to learners' needs in terms of examples used, pacing, vocabulary, and idea density. A lecture also can be modified on the basis of signals given during the lecture by students, indicating their confusion, lack of interest, or need for the relief afforded by humor. . . Because so much teaching is done by lecture, *this* chapter will focus on that method of delivering information.

Never have I "acknowledged that this generic lesson model is more suited to lecture," as Berg and Clough state. This is another example of their practice of using part of a sentence out of context to draw a conclusion.

A Most Unscientific Approach

Obviously, Berg and Clough had already drawn their conclusions before they examined my work, so they pulled sentences and video segments out of context to support their point of view, ignoring any non-supporting data. This is a most *un*scientific approach. One could create the same effect by quoting selected excerpts from the Bible, like: "Judas went forth and hanged himself," to conclude that "God said, 'Go thou and do likewise.' "□

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