

Are You Doing Inquiry Along These Lines?

THE USE OF CONCEPT MAPS TO REPRESENT UNIQUE THOUGHT PROCESSES: TOWARD MORE MEANINGFUL LEARNING

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"Are You Doing Inquiry Along These Lines?" describes proposed or current scholarly work around which networks of researchers might be formed. Those interested in specific research paradigms, problems or questions, inquiry approaches, or other related aspects of curriculum and/or supervision may use this Journal as a contact point for communicating informally. Anyone wishing to suggest a focus for such a network should prepare a brief sketch of the particular research interest and submit it, along with the name and address of the contact person, to the editors for consideration.

In assessing their students, most teachers rely heavily (and often solely) on *products* such as responses to tests and assignments. Few broaden their nets to include in their assessments other components such as practical activities, including laboratory performance, participation in discussions, and creative exercises.¹ Thus, the more readily accessible (but often more superficial) aspects of education are the basis of teacher assessment. The thought processes that lead to the products, however, generally remain private to the learner. Teachers have insufficient class time even to discuss these processes with each student in a class of 30. Choosing one from the four given alternatives (or distractors) in a multiple-choice test item identifies the product chosen but not *how* or *why* the student selected a particular response. (But it is illuminative to the teacher if, in multiple-choice items, space is provided for students to indicate how or why they selected their particular responses.)

Exploring students' thought processes provides stark evidence of the uniqueness of thinking processes and the individuality of thought patterns. Teachers can readily obtain this evidence using what are variously known as

¹David Cohen and M. E. Harrison, *Curriculum Action Project: A Report of Curriculum Decision Making in Australian Secondary Schools* (Sydney: Macquarie University, 1982).

"concept maps," "conceptual schema," and "cognitive maps," an approach developed by Novak.²

For example, I recently gave a group of 36 students the following word list: *ants, cats, snails, monkeys, buildings, plastic, rocks, bananas, tacks*. Students were asked to create four pairs of words and to tell why they paired them. In a group of 12 students, every possible pairing resulted. For example, *ants* was grouped with *cats, snails,* and *monkeys* (as each is a group of living things), *buildings* (which ants inhabit), *plastic* (since ants can be studied in plastic containers), *rocks* (under which ants can live), *bananas* (which attract ants), and *tacks* (since both ants and tacks can be small, discrete, and grayish, and both contain the letters *a, t,* and *s*). After pooling all the students' pairings, the students were surprised (indeed, amazed) that such diverse thought patterns existed within so small a group on such a simple task. The students were also surprised by the flexibility and divergence of thinking of the individuals within the group.

This exercise on grouping items into pairs provided a quick and simple introduction to how backgrounds of knowledge and experience influence how individuals think, connect, organize, and link the seemingly same information differently. This linkage is the basis of the concept map. Like a road map, the concept map illustrates the interrelationships and links between its component parts.

I then showed the students several examples of concept maps in which the subordinate components were grouped together to provide an overview of interrelated ideas and concepts. These components illustrated various ways of graphically representing a common set of terminology and concepts. Concepts and their interrelationships can be grouped in hierarchies, flowcharts, or in a variety of shapes and patterns. These patterns have been illustrated as circular and triangular diagrams, pyramids, spiders, burrs, and webs.³ Presenting such a variety of examples helped to flex student minds to the range of graphical and logical options open to them. The simplified approach described above helped students to explore the meanings of terms as introduced in the area known at Macquarie University as "Curriculum Studies."

The students were asked individually to list from six to ten terms related to their understanding of what curriculum and curriculum studies were about. After five to ten minutes, they were asked to share and pool their words with another student. A little later, they formed groups of fours, again sharing and pooling their lists. At this stage, a list of selected introductory key words from the curriculum studies field was fed to the students to enlarge their conceptual

²Joseph D. Novak, "Meaningful Reception Learning as a Basis for Rational Thinking," in *The Psychology of Teaching for Thinking and Creativity* (Association for the Education of Teachers in Science Yearbook), edited by Anton E. Lawson (ERIC document reproduction service No. ED 184 894, 1980), pp. 191-224.

³Sarath Chandran, "Concept Maps," *Australian Science Teachers Journal* 30 (March 1985) 56-60.

horizons. These key words were to be juggled with the students' own consolidated lists' into interrelated groupings. This list of curriculum key words was derived partly from the recently published *International Encyclopedia of Education*⁴ and included such words as *adoption, balance, change, components, consultant, content, contract, school-based decision making, definitions, development, development centers, diffusion, evaluation models, history, implementation, integration, knowledge, movements, organization, pacing, policies, politics, reform, research, resources, theory, and validation.*

From other readings done by the students, more terms were added. These terms included *processes, philosophical bases, reality, people-centered model, theory, intentions, realities, context, participation, hidden curriculum, centralization, curriculum elements, control, learning experiences, consensus, power, interaction, devolution, values, situational analysis, frames, communication, objectives, people, autonomy, summative evaluation, reflective evaluation, formative evaluation, leadership, evaluation of learning outcomes, and community.*

The student subgroups were then asked to develop from their words (which included curriculum concepts and ideas) a concept map to illustrate their emerging understanding of the curriculum field. The students engaged in deep discussions as they attempted to pull together the curriculum concepts and their interrelationships.

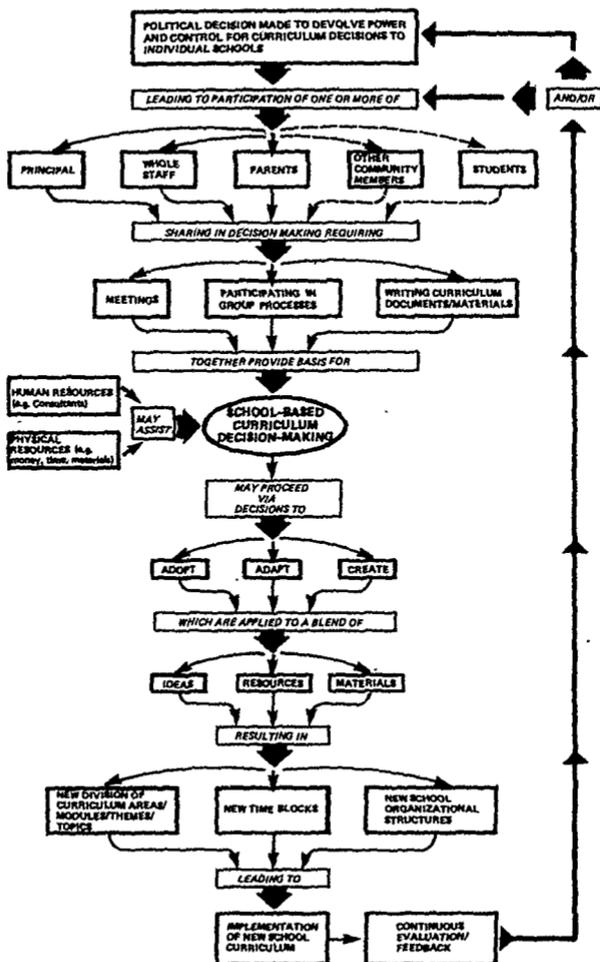
The students were asked to designate the relationships between groups or pairs of concepts by labeling the connecting lines or arrows between them. Some commonly used labels for lines in concept maps included *consists of, part of, symbol for, member of, example of, equivalent to, are usually, may assist, some are, subset of, common name for, works by, alternative to, involved in, leading to, composed of, product of, using, imparted to, resulting in, expressed in, so that, maybe, requires, affected by, contained in, and symbols for.*

One example of a concept map developed for an aspect of curriculum studies is illustrated in Figure 1. This figure represented my thinking at the time. As such, it was a unique piece of thinking, a portrayal of my current perceptions or misperceptions of the scope of the interrelationships of school-based curriculum decision-making concepts. Some may prefer to label it a "model" in that it is a representation intended to portray a reality by linking concepts.

Certainly, the figure forces us to grapple with ideas and to explore perceptions deeply. It is a method of clarifying perceptions (and overcoming misperceptions). The method provides stark evidence that even "experts" may perceive concepts differently. Those developing a concept map create their own unique set of meanings. Concept maps cannot be assessed as

⁴Torsten Husen and T. Neville Postlewaite, eds., *The International Encyclopedia of Education. Research and Studies*, Volume 2C (Oxford: Pergamon, 1985), pp. 1135-1275.

Figure 1. A Concept Map of One Person on One Day Applied to School-Based Curriculum Decision Making



"correct" or "wrong," since there is no single "correct" way to express thought patterns. However, a generally acceptable set of links may develop between concepts in a field.

The resulting representation is a slippery product, like quicksand. As we step into it, it changes. Yet this change emphasizes the importance of the thought processes, reminding us that the elements of an area of knowledge are interactive and continuous.

In my class, groups of students revealed and shared their perceptions of curriculum studies, enlightening me about their learner/consumer viewpoints. I also discovered some of the concepts needed to close the gaps in the formulation of their "structures of knowledge." It was a great lesson in the understanding of learning for students and teachers alike.

Applied near the start of a new course, the technique can give a teacher a feeling for where students are. The concept map is a nonthreatening and informal pretest. Yet it is much more informative and illuminating than any pretest. Reapplied at various stages and at the end of the course, the concept map approach influences teaching more than any testing approach that I have come across and provides better two-way communication than formative and summative evaluation.

So I recommend the use of concept maps to encourage students to demonstrate that they have effectively assimilated and organized areas of study in a meaningful way. The alternative too often exists: facts as series of isolated, unrelated, discontinuous, and disjointed bits of information as a "basket of facts" to be memorized to pass exams and then promptly forgotten. Integrating the ideas within a concept map helps to promote more meaningful learning.

Those doing inquiry on the use of concept maps may wish to join a network on this topic. Please indicate your interest by writing to me.

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