# Evaluating Computer Courseware

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Appropriate use of technology and its assimilation in the classroom are important; but to find out how well computers and software assist in teaching and learning, we need to subject them to the same criteria used for evaluating any other aspect of the curriculum.

Since computer courseware is part of the school curriculum, appraising it should be a natural part of curriculum evaluation. Yet where educational innovations are concerned—microcomputers being the most recent—we are easily seduced by promises for success. Thus, in our attempt to evaluate the promise, our thoughts turn more to surface-level, technological issues rather than to deeper meanings that we have known for some time to constitute the basic questions of curriculum and instruction.

Consider the following often-asked questions about computers and courseware: How many computers should we use? Where should they be located? Do they make appropriate use of sound and voice simulation? Does the software provide appropriate feedback and reinforcement? What are optimal ratios of student versus program control? These kinds of questions raise important issues under the general category of *technology*. Perhaps the most important technological question is, "What does the technology do that cannot be done as efficiently and effectively with other kinds of learning materials (teachers, peers, paper and pencil, books, and so forth)?" Fortunately, there is no dearth of evaluative criteria for courseware technology (Edwards, 1984; Marshall, 1984; Merrill, 1983; Hively, 1983; and Van Buskirk, 1983).[1]

But there are two other categories of questions that transcend the particulars of any given technology: *curriculum* and *assimilation*. Assimilation is the process by which schools innovate; in this case, the ways in which a new technology becomes part of the daily life of teachers and students. Unfortunately, the track record of districts and schools in the assimilation of technology is not good. To prevent computers from meeting the same fate as educational TV, teaching machines, and the like, evaluators need to ask: How has the learning environment been modified to receive and constructively exploit the full potential of computer courseware? Obviously, from an evaluative standpoint, it would be foolish to hold any particular piece of courseware accountable for the larger issue of assimilation. However, since the viability of computer courseware rests upon the adequate resolution of this issue, it deserves special mention in any evaluation framework.[2]

I turn now to the main evaluative thrust of this article, the curriculum.

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## Curriculum Commonplaces

A comprehensive view of curriculum and any aspect of it (including computer courseware) requires explicit consideration of all relevant elements of the teaching-learning experience.

**"Perhaps the most important technological question is, 'What does the technology do that cannot be done as efficiently and effectively with other kinds of learning materials?' "**

The fact that content is part of but not the whole of curriculum was implicit in Tyler's (1947) well-known rationale. Since then, various attempts have been made to sort out the facets of curriculum as a multidimensional construct. One that has seen a good deal of theoretical and practical development is Goodlad's (1979) notion of curricular *commonplaces*. This idea has enjoyed considerable success both in framing curriculum inquiry (Goodlad, Klein, and Tye, 1979) and in generating relevant data for the study and assessment of schooling (Klein, Tye, and Wright, 1979; Sirotnik and Oakes, 1981).

Curriculum facets that can be seen as commonplace to all organizations of teaching and learning experiences include the following:

1. *Goals/Objectives*—statements of intended teaching and learning specific enough to convey at least the relevant content and expected behaviors.

2. *Content*—substantive strands and topics comprising the "stuff" of teaching and learning.

3. *Strategies*—instructional methods or processes designed to promote teaching and learning (use of open-ended questions, group discussions, lecture, deductive/inductive approaches, and so on).

4. *Activities*—events, tasks, and so forth designed to engage teachers and learners (reading, writing, listening, practicing, role playing/simulating, and so on).

5. *People*—human resources available to facilitate teaching and learning (teachers, aides, student peers, and so on).

6. *Materials*—physical resources designed to facilitate teaching and learning (pencils, paper, books, learning kits, manipulatives, calculators, computers, television, and so on).

7. *Grouping*—ways in which human resources are organized for teaching and learning (total class, individual seat work, cooperative learning groups, and so on).

8. *Time*—allocation and use of time in teaching and learning.

9. *Space*—ways in which classroom areas are organized for teaching and learning.

10. *Assessment*—determining, collecting, and interpreting information for describing and judging the effectiveness of the teaching-learning process and for facilitating decision making and actions toward improving that process.

## Educational Values and Beliefs

These commonplaces alone do not provide an adequate framework for making curricular judgments. While they suggest appropriate types of descriptive information, they lack the bases for evaluation. They answer "what is?" questions, but do not automatically address "why and what ought to be?" questions. The bases for evaluation are found, instead, in *educational values and beliefs* which permeate all curriculum inquiry. It is simply a question of making them explicit and striving for a working consensus among those concerned about why they are important.[5]

The following educational values and beliefs appear in most formal curriculum documents at state and local levels. Most are implicit in Tyler's (1947) discussion of the sources and criteria for, and the organization and evaluation of, learning experiences. Many are implicit in Goodlad, Klein, and Tye's (1979) dimension of "qualitative factors," which serve as evaluative screens for curriculum commonplaces. And most have emerged as evaluative criteria for work produced by the Curriculum, Computers and Collaboration Project of the Laboratory in School and Community Education.

Consider, then, the following list of key words, which represent a constellation of educational values and beliefs:

1. *Equity*—equal access to the curriculum (content, teaching practices, time, and so on) regardless of race, sex, religion, or any correlates thereof, such as socioeconomic status.

2. *Experience*—building upon concrete, real-life events, feelings, and

meanings in the empirical world of teachers and students.

3. *Critical thinking/problem solving*—going beyond the necessary facts and comprehension levels of cognitive processes, questioning knowledge, and using higher order processes such as analyzing, synthesizing, proving, applying, abstracting, and evaluating.

4. *Discovery/creativity*—freedom to explore knowledge, think divergently, invent, imagine, and so forth.

5. *Proactivity*—deliberate involvement of students in their own learning such that they become active, nonpassive, and nonreactive decision makers.

6. *Integration*—treating knowledge "ecologically," not as discrete, unrelated bits of information, but as parts contributing to a whole.

7. *Variety*—deliberate use of different instructional activities, materials, grouping techniques, and so forth, in contrast to an over-reliance on only one teaching-learning configuration (such as, teacher lecturing to the total class).

8. *Individual variability*—recognizing individual differences in ability, learning styles, attitudes, and interests as assets rather than liabilities and adjusting/adapting/modifying curricular elements to accommodate these differences.

9. *Socialization*—humanizing knowledge through exploring why and how it is *not* independent of its sociocultural and political context.

10. *Personalization*—humanizing knowledge through exploring meanings, sentiments, interests, and future aspirations.

A convenient way to map curriculum evaluation is to form a matrix of questions that naturally emerges by crossing an educational values and beliefs list with the list of curriculum commonplaces (Figure 1). Each cell represents the obvious set of questions that are generated by the interaction of the value/belief represented in a given row and the curriculum commonplace of a given column. For example, dealing effectively with "individual variability" (row eight of the matrix) requires asking questions like: Do the topics, activities, and teaching strategies accommodate the different learning styles and abilities of the students? Are appropriate material and human resources available and used for accommodating these differences? Are students taught en masse, at the same time, and in the same place, or are allowances made for individual differences (using small groups, variable pacing, learning centers)? Is testing primarily summative for uniform grading or formative for diagnosing and facilitating individual learning progress?

**Figure 1. An Evaluative Matrix for Describing and Judging Curriculum.**

| Educational Values and Beliefs | Curriculum Commonplaces: Goals and Objectives | Content | Strategies | Activities | People | Materials | Grouping | Time | Space | Assessment |
|---|---|---|---|---|---|---|---|---|---|---|
| Equity | | | | | | | | | | |
| Experience | | | | | | | | | | |
| Critical Thinking/ Problem Solving | | | | | | | | | | |
| Discovery/ Creativity | | | | | | | | | | |
| Proactivity | | | | | | | | | | |
| Integration | | | | | | | | | | |
| Variety | | | | | | | | | | |
| Individual Variability | | | | | | | | | | |
| Socialization | | | | | | | | | | |
| Personalization | | | | | | | | | | |

## Curriculum Meets Technology

The point of imposing this kind of comprehensive, evaluative screen on a computer courseware program should be obvious. Courseware does not exist independently of curriculum. It contains and should address all curriculum commonplaces. As consumers, we must resist the temptation to be sold by the flashy novelty of a technological invention and demand some understanding and judgment regarding how the invention fits into the desired curricular scheme of things.

The values and beliefs in Figure 1 lead to such questions as:

- Is the courseware biased toward certain student subgroups?
- Can the courseware tap into real-life student experiences?
- Does the courseware address higher level cognitive skills and processes?
- Does the courseware encourage discovery learning, exploring of concepts, and inventing new concepts?
- Is the courseware an integral part of the larger curriculum?
- Does the courseware accommodate individual differences in ability, learning styles, and so forth?

**"Checklist-type evaluations of courseware stripped of their instructional context are insufficient to guide selection."**

- How does the courseware mesh with the role of teachers, peers, resource materials (pencil, paper, manipulatives), learning center activities, and so on?
- Does the courseware treat the learner as a passive recipient of knowledge or as an actively engaged learner and decision maker?

These and similarly generated questions must be addressed when evaluating courseware or any significant aspect of curriculum in order to avoid simplistic appraisals; for instance: "Oh, that's just a drill-and-practice worksheet or textbook simulator" or "Look how wonderfully this program simulates human intelligence." It is almost as though the labels "drill-and-practice" and "artificial intelligence" carry self-evident properties of "bad" and "good." Clearly, however, drill-and-practice courseware and programs such as LOGO can be useful depending on how they address the issues and questions suggested by a matrix such as that in Figure 1.

I am *not* suggesting that any particular piece of courseware be held accountable in and of itself for each and every cell of a values/beliefs-by-commonplace matrix. Rather, because curriculum must be held accountable in this way, so must educational software. In other words, checklist-type evaluations of courseware stripped of their instructional context are insufficient to guide selection. Certainly the information collected by checklists is useful, but particularly as it is brought to bear upon, and revised in accordance with, the intended classroom curriculum. Ultimately, thoughtful consideration of the tough questions of curriculum inquiry must be imposed on courseware as it is *used* in the specific educational setting.□

[1]See also guides published by the California Library Media Consortium for Classroom Evaluation of Microcomputer Courseware, The Computing Teacher, Educational Products and Information Exchange, and MicroSIFT (Computer Technology Program, Northwest Regional Educational Laboratory.)

[2]Many readings currently exist in the area of school innovation and change generally, and the assimilation of technology specifically. See, for example, Oettinger (1969); Sarason (1971); Goodlad (1975); Heckman, Oakes, and Sirotnik (1983); Mayer (1983); and Oakes and Schneider (1984).

[3]The process, of course, is not so simple. The basis for achieving a "working consensus" has been a matter of considerable philosophical debate in the arena of epistemology; that is, what constitutes knowledge and the means whereby it is obtained. The position advocated here is multi-paradigmatic. It embraces both quantitative (traditional research using experimental and correlational designs and statistical analyses) and qualitative (naturalistic research using ethnographic, case study, and observational techniques and interpretation) methodologies, *so long as a critical perspective is maintained*. By this I mean a rigorous and sustained dialogue that addresses such questions as: What goes on in the name of curriculum? How did it come to be that way? Whose interests are being served by the way it is organized? Is this the way we want it to be? We have used the term *critical inquiry* to describe this multi-paradigmatic perspective. The interested reader is referred to Sirotnik and Oakes (1983).

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