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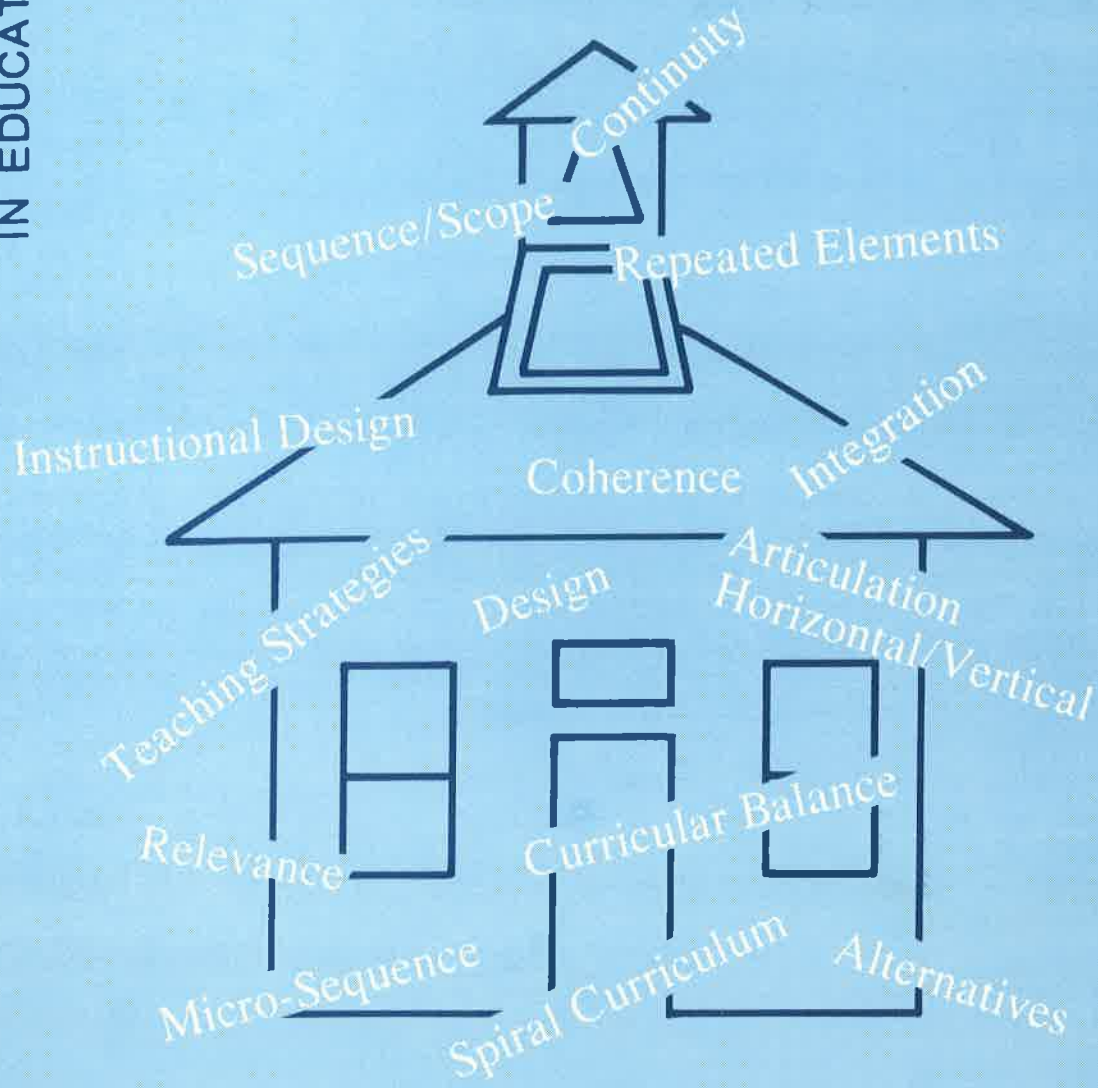

Coordinating the School's Curriculum

Curricular Perspectives/Strategies

Subject Areas

Design and Development

Issue Editors: Robert C. Morris & Donald J. Reyes

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Editors' Note

by Robert C. Morris and Donald J. Reyes

Thirty some odd years ago Hollis Caswell wrote:

> Assertions that schools are not teaching the Three R's are being made. Schools have been accused of extreme practices in following the interests of children and of indoctrination...It seems to be widely agreed among educators that a sound curriculum requires provision of much meaningful experiences for children which utilizes the abilities these fields represent (Caswell, H. (1952, Feb.) NEA Journal, 93–95).

The results of this emphasis on achievement and understanding would be, Caswell felt, that"many systems, individual teachers, school staffs, and committees" would develop curriculums that would provide a **desirable emphasis** and **coordination** for increased student understanding and achievement. A late 1980's perspective on educational reform still advocates these ideals. Numerous protagonists of the reform movement believe that what must be changed is the basic purpose and pattern of curriculum. The redesigning, rethinking and where needed the restructuring of our schools' curriculums are therefore becoming the focal point for a discontented public.

The central theme of this issue of Thresholds deals with the identification, assessment, and tactics available to educators as they develop and articulate curriculums. Editors Morris and Reyes propose this issue as a guide, or tool for practitioners in the field. By considering those **generic** curricular activities in the context of special problems associated with individual subject areas, it is hoped that this issue can be of assistance for K–12 teachers struggling with curriculum coordination.

Additionally significant is that this issue of Thresholds continues the extensive efforts of curriculum workers everywhere, as they attempt to develop a comprehensive concept of curriculum. Scientific developments in the field of curriculum must be melded into a meaningful whole in the context of humanistic endeavors. A major goal of curriculum remains striving toward providing knowledge, understanding, attitudes, and sophisticated human skills that can help human–kind guide scientific and materialistic developments as wisely as possible. This issue attempts to pursue the means available for us to accomplish this goal in curriculum.

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Challenges to Curriculum Development in the Eighties

by Peter F. Oliva

Curriculum workers today face a number of severe problems in their efforts to provide a relevant and balanced curriculum for children of the 80's and beyond. Some of these problems are quite new; others are old, but in some cases intensified by current educational and social conditions. Responding to these difficult problems is a constant challenge to those who are charged with planning, implementing, and evaluating the curriculum. Seeking to cope with these problems are the many administrators, supervisors, and teachers at both the school and district levels who are engaged in the enormously difficult but vital task of curriculum development. Among the more serious problems which curriculum workers are currently encountering are the following:

A. Superimposed curricula. Whereas numerous educators, for example, John Goodlad, perceive the school as the local of control in education, more and more states have moved to mandated curricula, some of which specify in minute detail instructional objectives which must be accomplished in each subject at each grade level in every school of the state.

At one time we looked askance when told with some exaggeration, of course, that the Minister of Education of France could tell exactly where any teacher and class were in any subject in any school in the country at any given day or hour. We are rapidly approaching this degree of control which seemed so unacceptable to us a few years ago.

Either in place of or in addition to the state's directives the school districts have followed the lead of the state in superimposing detailed district–wide curricula on all schools of the district. Perhaps more defensible than state–specified curriculum, yet still restrictive of school initiative, many districts have standardized the curriculum every bit as much, or more so, than the state, thereby reducing school–based decision making. To implement their mandated curricula, districts have been engaging in a practice known as curriculum alignment in which objectives, activities, and tests are carefully spelled out for teachers for every marking period in every grade. The purposes are to improve student achievement, i.e., raise test scores and to make instruction as teacher– foolproof as possible.

B. Overemphasis on testing. Never before in the history of American education has so much emphasis been placed on assessment of student achievement. Excessive testing is an overreaction to the accountability movement. Teachers all over the country are literally teaching with an eye to local, state, and national tests. In this stress on testing American education again is imitating practice found in foreign educational systems.

State assessment is a natural outgrowth of state–mandated curricula. States are requiring either criterion–referenced or norm–referenced tests in various disciplines to such an extent that some students are subjected to a major state–required test every year of their school lives. We now find tests for exiting kindergarten; tests for promotion to fourth grade; and, of course, minimal competency tests for graduation from high school. The curriculum therefore, centers around the tests. Teachers' success is judged on the percentage of students who pass the mandated and college entrance tests. Indeed, administrators' success is also judged on how well students fare on the ubiquitous tests.

In order to make sure that their students pass the state–required tests, school districts have developed their own local assessment program. Thus, at the end of every marking period students undergo the district tests to demonstrate mastery of instructional objectives of that marking period. Though emphasis on testing centers on the 3 R's, mandated curricular objectives, alignment of curricula, and assessment have spilled over into other disciplines.

C. Overemphasis on subject matter. Mastery of subject matter has resurrected itself as the major, and sometimes it seems only, goal of education. Decades of progressive thought about educating the child in mind, body, and spirit are blithely ignored even though verbalized in most schools' statements of philosophy of education.

The affective goals of education–attitudes and values–are but minor appendages in many classrooms to preparation for the criterion–referenced and norm–referenced tests of subject matter. If the teacher is going to be judged on student test scores, he/she is not going to spend time on affective learnings which are not subject to testing. Forget citizenship, self–actualization, and moral and spiritual values. There is no time for nonmeasurable learnings. Besides, they are not the province of the school anyway, it is often said.

Even the psychomotor domain has come onto hard times with de–emphasis on vocational education and, as a sign of the times, tighter restrictions on athletics. One saving grace of the emphasis on cognitive learnings is the renewed focus on the development of thinking skills as well as knowledge of subject matter.

D. Conflicting proposals for reform. Curriculum workers have al-

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ways encountered proposals for schools, e.g., open schools vs. self–contained classrooms vs. nongraded schools. Proposals for change normally make the life of the curriculum worker more interesting. However, the sheer volume of proposals for reform in recent years have overwhelmed many practitioners. Concern for improving education in the United States—by parents, educators, students, and legislators—has resulted in study after study of all levels of education, but especially the high school. Though well–intended, the studies create as many problems as they seek to solve. To which groups or individuals should curriculum workers pay heed? The evaluation of proposals for reform consumes considerable time of conscientious curriculum developers.

E. The search for simple solutions. Though not a new problem, a plethora of packaged programs is available for almost any educational problem. Discipline? We can find several programs aimed at curbing student misbehavior. Lesson planning? Reading? Math? (Whatever happened to chisenbop?)

Teachers regularly attend inservice programs desperately seeking the solution to a particular problem. On the current scene many school systems are urging their teachers to follow a particular model of instruction, a step–by–step didactic approach which all teachers are expected to follow. The search for a single model of instruction which would prove suitable for all teachers of all students at all levels in all disciplines has proved futile. No universal model of instruction can apply under all conditions with all kinds of teachers and all kinds of students. Teachers must demonstrate a repertoire of models.

The foregoing five problems present challenges to those working to make the curriculum meaningful for American children as they approach the 21st century. The cumulative effect of the practices discussed above has been to limit the content, narrow the role of the teacher, and restrict the responsibility of the individual school.

The curriculum developer has the same responsibility he/she has always had, but it is more intense now, weighing carefully all the proposals for reform and selecting, when permitted the choice, those which make the most sense for his/her particular school system. The task today is more complex than ever.

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Alternative Curriculum Designs

by William H. Schubert

Curriculum design deals with two interrelated matters: (1) sets of questions or topics that serve as an outline or model for the way we think about curriculum; and (2) configurations of content to be taught and its several subdivisions. Rather than separate these two dimensions in this brief article, they are treated together. The message, however, is that persons engaged in curriculum design (from administrators to writers of curriculum materials to supervisors and teachers) should realize that the configuration of subjects and the master schedule for a school are only a part of curriculum design. The guiding force of design resides in the minds, the perspectives and conceptualizations, of those who teach and those who develop policy for the what, how, and why of teaching. The questions one asks when one engages in curriculum construction and the topics one considers when one observes or participates in a curriculum and attempts to analyze it are extraordinarily important factors in the design of curriculum. In a deep sense these images are more defensibly entitled to the label 'design' than the product of design found in curriculum guides and similar documents.

With the above orientation to design in mind, alternatives will be discussed below. Some of the alternatives deal more with topics to be considered when thinking about and planning design and some deal more with the actual substance of curriculum areas to be offered. This apparent inconsistency, however, is merely a reflection of the character of the curriculum design literature and the different emphases found in it. Readers are encouraged to ask themselves which of the design positions are most closely aligned with the ones that govern their professional work and which make the most sense to them in light of their experience and perceptions of what they should do.

Tyler's Rational Design

By far, the most widespread set of topics to guide curriculum design over the past 40 years is derived from work by Ralph W. Tyler. Tyler's small book Basic Principles of Curriculum and Instruction (Tyler, 1949), contains what is often referred to as the Tyler Rationale. In it, Tyler says that those who wish to design or analyze curriculum need to address four major questions:

1. What educational purposes should the school seek to attain?

2. How can learning experiences be selected which are likely to be useful in attaining these objectives?

3. How can learning experiences be organized for effective instruction

4. How can the effectiveness of learning experiences be evaluated?

The centrality of purposes here is obvious, and Tyler recommends that they be developed with careful attention to philosophical and psychological 'screens.' This means that the four questions represent topics that must be considered for the justification of defensible curriculum. Substance to be taught must first be defended by clear conceptions of the underlying philosophical assumptions, and second, it must be defended by carefully characterized notions of the nature of learners and how learning takes place. Justification of curricular substance must also be subjected to the careful scrutiny of three sources: subject matter specialists, studies of contemporary life outside of school, and studies of learners themselves. It is important that all three of these sources (subject matter, society, and learners) be kept in balance throughout all aspects of design.

The basic topics of the Tyler Rationale are widespread among the artifacts of curriculum. Teacher's editions to textbooks, lesson plan forms, curriculum guides, methods textbooks, and evaluation checklists are but a few of the many places that one can find purposes, learning experiences or content, organization, and evaluation (or reasonable facsimiles of these categories). Moreover, the topics of Tyler's rationale have spread throughout the world and are widely used in schools of many cultures. Subsequent scholars, too numerous to recount here, have built variations on the Tyler model of curriculum design. Some have made it more behavioristic than its intent, some have made it a step–wise recipe, and others argue that it is a generic guide to be used alongside other approaches.

Walker's Naturalistic Design

In the late 1960s and early 1970s, Decker Walker conducted a naturalistic investigation of decision–making deliberations of curriculum committees (Walker, 1971), and determined that the phases of their work was not described best by the Tyler Rationale. He argued that curriculum design proceeds through three phases which he calls platform, deliberation, and design. In brief, platform consists of the constellation of beliefs, theories, aims, images, procedures, group politics, and hidden agendas that participants bring to curriculum planning meetings. At the meetings, participants engage in processes of deliberation to identify relevant information, clarify means and ends, discuss alternatives, weigh consequences, and make choices. In the reality of

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institutional life, time limits exist, and when it is time to implement, a design (however complete or incomplete) emerges in practice. Of course, deliberation can continue and refinement of implicit and explicit components of the curriculum can be continued during practice. A central point, here, is that design is more political than rational.

Walker (1974) also pointed to the need to tailor curriculum analysis to particular situations. Therefore, instead of allowing our perception of curriculum to be guided by a mind–set that looks for purposes, learning experiences, organization, and evaluation, he suggested the following alternative questions:

1. What are the significant features of a given curriculum?

2. What are the personal and social consequences of a given curriculum feature?

3. What accounts for stability and change in curriculum features?

4. What accounts for people's judgments of the merit or worth of various curriculum features?

5. What sorts of curriculum features ought to be included in a curriculum intended for a given purpose in a given situation?

These questions enable the curriculum designer to enter an educational situation without the baggage of preconceived categories of analysis. At the same time, a curriculum designer who does this may miss the insight derived from looking through time–honored lenses, such as those summarized in Tyler's rational.

Schwab's Practical Design

Joseph Schwab (1969) had marked influence on Walker when he called for practical curriculum inquiry; such inquiry derives problems from a particular state of affairs, investigates through long–term interaction with those situations, seeks to clarify meaning and direction, and provides more defensible decision and action. In order to do this well, Schwab (1971) indicates that a broad grounding in many theoretical and research perspectives is necessary, and that curriculum designers must learn the eclectic arts of matching knowledge to situations, tailoring and adapting it to situations, and inventing personal knowledge through experience in educational situations. For Schwab (1973), this experiential and situational perspective on design realizes that curriculum, as the impact of school on student outlooks, is the result of a dynamic interaction among four commonplaces: teachers, learners, subject matter, and milieu or environment. Each of these commonplaces affects the others and their impact on the outlook of students. Thus, if one seeks to understand and monitor curriculum–in–practice, an appropriate design might be to construct a four by four matrix that depicts the resultant sixteen interactions among the four curricular commonplaces. Schwab (1983) further suggests the development of a curriculum group or committee in each school, the purpose of which is to inquire about the commonplaces, their influence upon one another, their affect on student perspectives, and the way they might be modified for the improvement of student growth.

Dewey's Progressive Design

John Dewey's (1902, 1916, 1938) position on curriculum is a precursor to Schwab's practical inquiry. Aspects of Dewey's view point more deeply to the need for fundamental curriculum design as a function of the daily life of teachers and students. Dewey's notion of curriculum design is not principally that which is planned outside the classroom and delivered to it for implementation. Rather, it begins through the practical inquiry of teachers who build on the genuine interests and concerns of their students. Such teachers do not merely find out about student interests for the purpose of using them to motivate students to learn pre–determined subject matter. Instead, Dewey argues that teachers engage students in deeper consideration of their idiosyncratic problems. When they discuss them together, students become aware of the fact that their own problems are not so idiosyncratic after all. Indeed, they are shared at a level of common human problems, or what Robert Ulich has called "the great events and mysteries of life: birth, death, love, tradition, society and the crowd, success and failure, salvation, and anxiety" (Ulich, 1955). Democratic learning, then, can proceed as students and teachers derive ways to gain increased meaning and direction for themselves as they pursue the mysteries inside the problems, concerns, and interests most prominent in their lives. Dewey often referred to this progressive organization of the curriculum as a movement from 'the psychological' to 'the logical.' By this he meant that 'the psychological' indicated the interests and concerns of learners, and 'the logical' had to do with knowledge in the academic disciplines. The great task of teachers as curriculum designers, then, is to move students from momentary interest or caprice, to consideration of the deeper mysteries revealed by their momentary concern, through democratic deliberation that demonstrates the value of the disciplines to shed light on the significant aspects of life itself.

Berman's Process Design

Dewey's image of curriculum design focused on a product that never existed in any final sense. The process of teacher–student dialogue was, in fact, the product. Product–to–be–delivered in the form of subject matter areas was anti–Deweyan. Indeed, Dewey (1931) pointed to the artificial division of subjects as the greatest source of educational confusion. Preoccupation with the subject curriculum, he claimed, drew attention away from concerns of life that are not separated by subject matter boundaries.

Given the broad state of acceptance of the subject–focused curriculum, it is difficult to expect most teachers to be able to pursue Dewey's progressive design in its pure form. Therefore, Louise Berman (1968) developed a process orientation to curriculum. In this approach, the curriculum is designed around important life processes (perceiving, communicating, loving, knowing, decision making, patterning, creating, and valuing), which are correlated with the traditional subject areas. She shows that each of the subject areas can relate to the above processes, and the processes to one another. The processes, like Ulich's great mysteries, tap closely into

students' everyday interests and concerns and push them to deeper levels of growth through consideration of meaning and direction in their lives. Thus, Berman provides a bridge between the separate subject design and Dewey's progressive design which eschews the subject areas as a starting point.

Egan's Story Design

For decades, the dominant mode of curriculum organization at the elementary school level has been the expanding horizons curriculum. In this design, it is taken for granted that students learn best when they begin with that which is closest to them. This conventional wisdom has been challenged by Kieran Egan (1979, 1984, 1986). While all educators and most students know the sequence common to social studies and reading textbooks (from family, to neighborhood, to community, to state, to nation, to world, to universe), Egan argues that children are interested in fantasy, which is far removed from their everyday environment. He points out the need to move from fantasy back to reality. Drawing from sources in literature, archaeology, and philosophy, Egan posits stages of development that are quite different from Piaget's movement from the concrete to the symbolic and abstract. Egan suggests stages of mythic, romantic, philosophic, and ironic. Moreover, he emphasizes that curriculum developers should heed the magnificent history of stories as influences on persons' attention and outlook, and suggests the adoption of the story form for curriculum design and teaching. In stories, for instance, listeners or readers are presented with problems and conflicts, they are moved through a crescendo of events toward a climax and resolution of the problems. The great, natural human interest in stories should, therefore, be tapped in the process of teaching and learning.

Apple's Critical Design

During the past two decades, Michael W. Apple has done an immense amount to raise the consciousness of persons involved in curriculum to focus on issues of equity associated with social class, race, and gender (Apple, 1979, 1982, 1986). He argues that those concerned with curriculum design must become more aware of the hidden curriculum wrought by the ideology implicit in economic, political, and cultural forces in any society. For instance, in the realm of social class, Anyon's (1980) research indicates that working and lower class students are taught to follow rules, middle class students are taught to give 'right' answers, professional class students are taught to 'be creative,' and executive class students are taught to manipulate the system. Thus, without consciously trying to provide these results, ideological forces embedded in society structure schooling in ways that perpetuate the values that keep dominant groups in power. Attention to such matters is called critical because it derives from the Frankfurt School of critical theory which has had marked impact on continental European social theorists and more recently has spread throughout the world.

Apple, Henry Giroux (1983, 1988) and others do not offer a design alternative in the same sense as the other alternatives discussed here. Rather, they draw attention to certain kinds of questions that might otherwise remain unasked. I have discussed examples of such questions elsewhere, and summarize them below:

1. How is knowledge reproduced by schools?

2. What are the sources of knowledge that students acquire in schools?

3. How do students and teachers resist or contest that which is conveyed through lived experience in schools?

4. What do students and teachers realize from their school experiences?

5. Whose interests are served by outlooks and skills fostered by schooling?

6. When served, do these interests move more in the direction of emancipation, equity, and social justice, or do they move in the opposite direction?

7. How can students be empowered to attain greater liberation, equity, and social justice through schooling (Schubert, 1986)?

Through such questions, curriculum design can be critiqued in ways that are often overlooked by those who live in a society.

Conclusion

Seven alternative perspectives on curriculum design have been presented, as illustrated through the work of Tyler, Walker, Schwab, Dewey, Berman, Egan, Apple and others. A question that arises for the practitioner and theorist alike is "Are these positions mutually exclusive or are they able to be combined in eclectic fashion?" In other words, does participation in one of the alternatives rule out use of the others, or might all of them help to illuminate different parts of curriculum design?

My own position on the matters, as elaborated elsewhere (Schubert, 1980, 1986), is that each perspective has merit. Each can enrich the unending process of reflection that must guide curriculum design, but none provides the definitive recipe. Situations and individuals differ greatly and have different needs at different times. Thus, as William Van Til (1974) advocates, the 'quest for relevance' must be continuous. We must ask anew in each circumstance, "What knowledge and experiences are most worthwhile?" This question, in turn, invokes questions about what it means to grow as a human being and what a good and just society is. These are among the most fundamental issues faced by human beings, and because of this, curriculum design is one of the most complex and fulfilling lines of inquiry possible. This is the case at every level of the process, especially that of teacher and student reflection.

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The Curriculum Matrix—Further Thoughts

by Arthur W. Foshay

As a field of study, research, and action, the curriculum is difficult to deal with, because it seems to include everything there is. It has defied definition from its beginnings early in this century. Anything can be included, and has, from classroom climate to discipline to subject matter. For this reason, some universities have chosen to drop it, or to merge it with other aspects of education.

This won't do. No matter what difficulties the field presents, it remains at the very center of what educators seek to do. To ignore it would be analogous to ignoring patient care in medicine, or justice in law, or putting out fires in fire fighting. However, the field of curriculum making remains in disarray. As a professed member of this field, I have been disturbed by this fact ever since I entered it.

Two years ago, I finally got round to reading Thomas Kuhn's (1970) The Structure of Scientific Revolutions, which I should have read much earlier. In it, I found his statement that any field can be considered as a matrix, within which the cells require specification. Once so structured, systematic inquiry becomes possible, for the various cells can be seen in relation to each other. That helped. Could the curriculum field be constructed as matrix? I tried it; the first results were published as the Kappa Delta Pi Lecture in the summer, 1987 issue of The Educational Forum (Foshay, 1987). Let me explain briefly the nature of the idea, and then proceed to offer some further thoughts about it.

As I see it, the curriculum field has three main dimensions: purpose, substance, and practice. These can become the three dimensions of a matrix. In the making of a curriculum, one begins with some kind of intent, or purpose, tries to offer the substance required to achieve the purpose, and then decides on how the substance may be offered to meet the purpose—to carry on practice that allows specified students to encounter the substance profitably.

I constructed a cube with these three dimensions. Purpose was one face of the cube, substance another, and practice a third. What remained was to indicate Kuhn's 'specifications' on each of the three faces of the cube. I did so. The specifications represent my own knowledge and beliefs about the purposes of education, the substance that ought to be provided, and the educational practice that is required. Since it was apparent that people differ about the purposes of education, and that they also differ about what substance is therefore required, these two faces of the cube, or matrix, may be 'specified' in different ways. The nature of educational practice, however, is much less negotiable.

These are the specifications as I developed them. As the general purpose of education, I took Dewey's concept of self–realization. It had seemed to me for a long time that a complete realization of the self required full development of the six principal dimensions of human experience. In descending order of our knowledge about them, they are these: the intellectual, the emotional, the social, the physical, the aesthetic, and the transcendent, or spiritual. I have tried to explain what I think these terms mean, elsewhere. For the substance of the curriculum, I took the usual school subjects, considered as domains, since they are the way knowledge is organized, and must be considered as givens. To the school subjects, I added some elements of school experience often emphasized by students of the curriculum, but which are usually overlooked. These specifications come to a total of ten: mathematics, science, history (or social studies), language and literature, writing and composition, foreign language, the arts, vocational and technical subjects, the co–curricular activities, and the school culture (i.e., the expectations, customs, and value systems projected by the institution). I discerned nine elements of educational practice, which I offer as questions after Laswell's formulation of the communications field: who shall encounter what, why, how, when, in what circumstances, under what governance, at what cost, and how and by whom shall the encounter be evaluated?

All these elements interact. The question 'who,' for example implies some substances and not others. Not everyone studies everything. Some purposes, to be achieved, require a reconception of the substance. For example, in an effort to test the matrix, I looked into mathematics as a source of the transcendent dimension of human experience (for the matrix implies that all the purposes should be served if possible by all the substances). I found that some mathematicians had preceded me (though no mathematics educators, as far as I could see) and that it was necessary to reconceive the basic nature of the field (though not its details) if this purpose was to be served. The number of interactions in the matrix as I have constructed it here is enormous, since theoretically all the cells interact. The number, theoretically, would be 145,000. No wonder the curriculum field is difficult to explain!

Nevertheless, the matrix suggests boundaries for the field. Using the matrix, it becomes easier to distinguish curriculum from school administration, from educational policy, from the school as an administrator of social justice, and from other aspects of the educational enterprise. While all of these bear implications for the curriculum, none of them is of itself a substitute for attention to the nature and interaction of purpose, substance, and practice.

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The principal value of the matrix, I think, is to help us locate any particular curricular interest we have in the context of the field as a whole. It is because we often do not do so that the curriculum in a school is driven out of balance by immediate interests or crises, such as the current concern over mathematics achievement, or the interest a decade ago in creating a supportive classroom climate.

I have found the matrix useful in leading me and some others in reconsidering what we do. I have mentioned what it led me to think about mathematics. More recently, when I considered transcendence in the arts, I was forced to face a teaching failure of my own, years ago when I presided over an elementary school art class. A third grade teacher I know used the six purposes indicated in the matrix to design a lesson on the weather. Her children took three weeks to do what had previously taken three days, and they wanted more. She taught fewer topics that semester, but she taught this one much more deeply.

What are my further thoughts about the matrix? Here are several.

First, a thought about the matrix itself. As presented, it suggests a quality of rigidity and firmness in the curriculum field that is not true to the field. The curriculum constantly changes. It is dynamic and responsive to cultural, scientific, social, and psychological developments. It is much more like a partly understood cosmos than it is like a cube. It is an organic whole, constantly transforming itself within its three main dimensions. It is not static, as the cube implies. I am searching for a less misleading way of representing it graphically.

Second, I found it necessary to find another term to replace 'spiritual' in the matrix as I originally published it, because of the confusion of that term with religious doctrines. I settled on the word 'transcendent' because it lay at the heart of the spiritual dimension of human experience as described by many theologians and by the psychologists Maslow and Bloom. The transcendent experience is much easier to describe, and for one to recognize in one's self.

Third, it seemed obvious to me that the current emphasis on thinking as the objective of the curriculum is part of the great educational synecdoche— taking a part to be the whole, as when one takes grammar to be composition, or calculation to be mathematics, or map reading to be geography. The curriculum deals with the whole human being, not only with the intellect.

Fourth, what about morality and 'character'? It seems to me that these are necessary aspects of the social nature of human beings, and are thus within the set of purposes contained in the matrix as it stands.

Fifth, what about the old question of the integration of school subjects— the breaking down of barriers between the various domains of knowledge necessary for practical action? This, it seemed to me, is mainly a matter of practice, not of substance. I have arbitrarily taken substance to include the formal domains of knowledge, though, as I have indicated some of them may require reconceptualization to fit the purposes I have included in the matrix. I have meant to include in practice the applications, combinations, and 'adjunct' data we need in order to use the substance. In solving practical problems, we draw on any knowledge available to us, including unrefined personal experience. This includes the organized ways of knowing that have been developed for us; we put such knowledge in the context of actual problems that often go beyond what is organized. One uses organized knowledge in the service of practical necessities. But you can't use it if you don't know it. These distinctions are essential, I think.

Sixth, what about the school as a social institution, serving social needs and contributing to the solution of social problems? Is this not in conflict with the emphasis in the matrix on personal development—self–realization? I think not, if we will acknowledge that the social development of the individual is to be taken in its fullest sense. Clearly, we must not sacrifice one of these for the other. People ought not to be either wholly self–directed nor wholly other–directed. Everyone is both a private and a social person. I see no conflict here.

Well, that is where my thinking has taken me so far. Remembering that the purpose of the curriculum matrix is to provide a way for us to think of the field as a whole, and to locate our immediate curriculum concerns in the whole context, the matrix seems to me to offer a way of doing this work that avoids much of the confusion that plagues the field.

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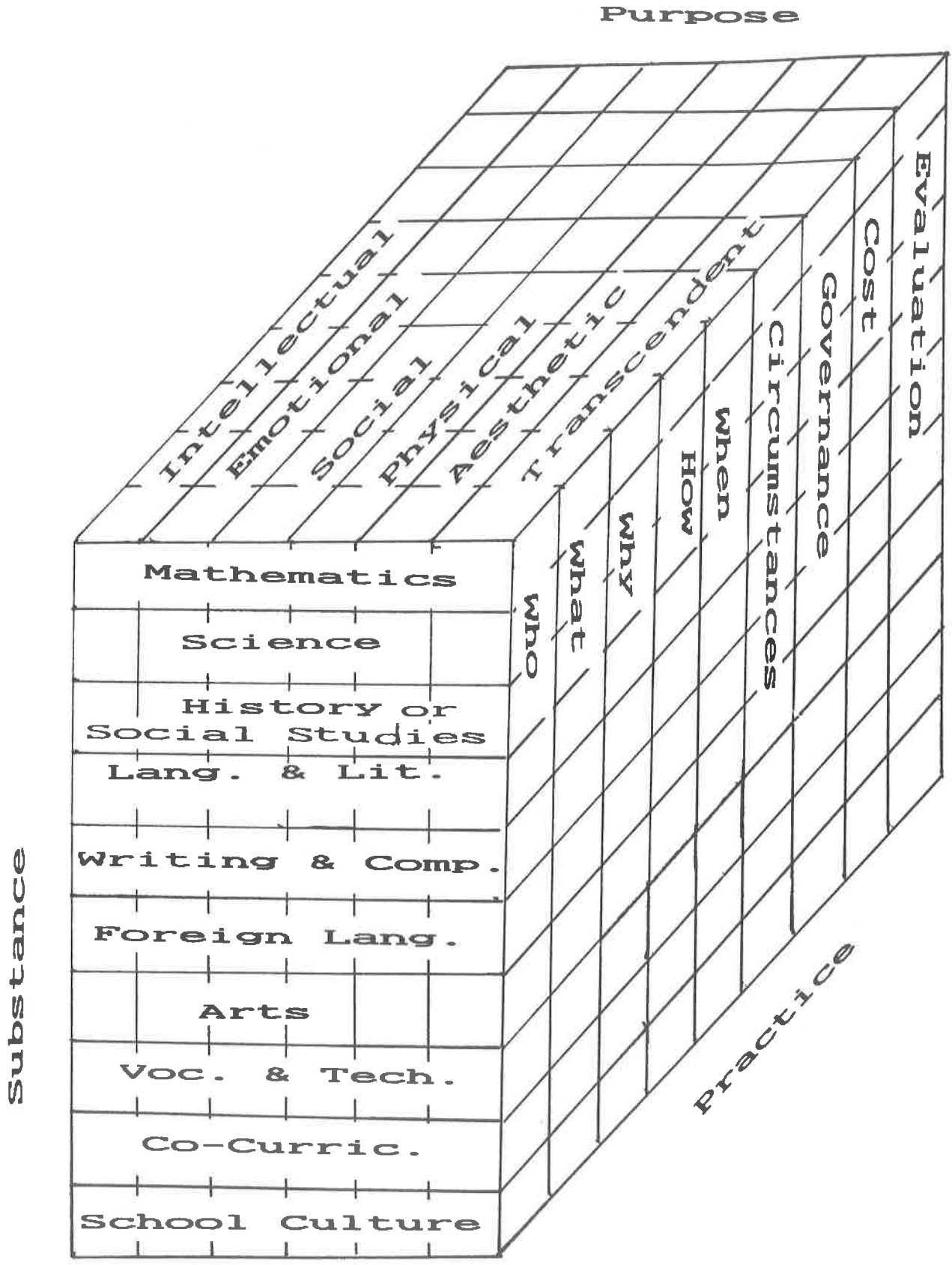

The Curriculum Matrix

Implications of Research on Curriculum Development*

by Kenneth T. Henson

This discussion of strategies is abstracted from the author's book, Methods and Strategies for Teaching in Secondary and Middle Schools, Longman, 1988.

There is a vast difference between the effects that research **has** on curriculum development and effects that research **should** have on curriculum development. Much of this difference can be traced to teachers who in recent years are playing an increasing role in curriculum development. Oliva (1988) explains this trend.

Unfortunately, according to Egbert (1984), "Teachers ignore research and overestimate the value of personal experience." This is true of both their teaching and their planning. Effectiveness research has shown that a major factor that distinguishes more effective teachers is that less effective teachers ignore the research that identifies the most essential content whereas more effective teachers take the time to search out the most salient information in their disciplines (Como, 1981). Less effective teachers tend to try to deal with more content (Morine & Vallance, 1975).

To determine how teachers should use research, we must first investigate the reasons why teachers so often choose to ignore research. According to Calderhead (1981), beginning teachers lack the ability to simplify and make sense of classroom events.

The failure of teachers to use research is not limited to their teaching practices. This shortcoming spills over into their curriculum planning. For example, since the middle of the century, Ralph Tyler has stressed the importance of using the Ends–Means model for developing curricula. That is, teachers and other curriculum developers should begin their planning by first deciding what they want to achieve and then select their content and activities accordingly. Yet, despite emphasis that teacher education places on the 'ends–means' approach, there is now much evidence that teachers begin their planning by determining the content to be covered and then select learning activities (Shavelson & Stern, 1981). One study found that teachers spend most of their planning time with content, a moderate amount of time selecting strategies, and the smallest amount of time on objectives (Peterson, Marx, & Clark, 1978). Furthermore, Clark and Peterson (1986) have concluded that even when teachers modify their teaching approaches, they seldom consider the lesson objectives.

Figure 1. Oliva's interlocking models

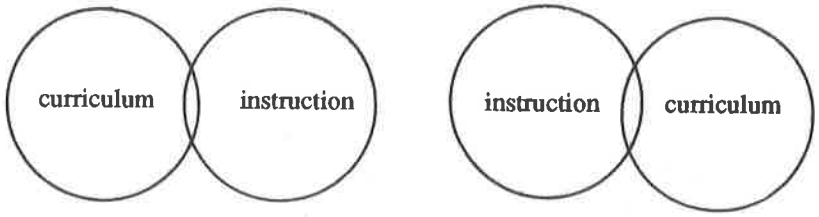

Figure 2. Oliva's sub–set models

*This discussion of strategies is abstracted from the author's book *Methods and Strategies for Teaching in Secondary and Middle Schools*, Longman, 1988.

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Unlike the empirical education studies of the past, the upsurge in educational research in recent years has been classroom studies. The effectiveness research of the 1980s has been tied to student achievement. Put simply, teachers can easily apply the findings in these studies in their classrooms and by doing so increase the level of attainment of their students. But teachers are not rushing to take advantage of these studies. In fact, teachers tend to stick with the same old approaches and use them again and again. Walter (1984) explains, "Once teachers begin lessons for groups of students, they are very reluctant to change those lessons, even when things are going poorly."

A Need for Strategies

Robert Zais (1976) presents curriculum and instruction on opposite ends of the same continuum.

Oliva (1984) uses the interlocking models in Figure 1 and 2 to show the relationship between curriculum and instruction. All of these models reflect a common quality; curriculum and instruction are inextricably linked together.

Teachers need a repertoire of instructional strategies. This provides them with a range of alternatives to consider when an activity proves unsuccessful (Walter, 1984). The remainder of this article will chronicle the research on several teaching methods, giving the strengths and weaknesses for each and explaining the teacher's role when using each method. Included will be the lecture, inquiry, simulation games, and case study.

The Lecture

The lecture is an extremely effective way to introduce a unit or build a frame of reference. It is also excellent for clarifying potentially confusing information. For introducing a lot of information in a short time, no other method is as effective as the lecture.

But the lecture has limitations. It is usually a poor motivator. It does a very poor job of promoting creativity, or helping students develop responsibility, and it is not a good approach for helping students learn to synthesize, internalize, or express themselves. Compared to educational games, the lecture is only equally as effective for immediate cognitive gain, and it is significantly less effective for retention over a period of three weeks or longer (Lucas et al., 1975).

Planning Lectures

Why are some lecturers good, some bad? Why are some teachers stimulating and others are so boring? How can teachers make lectures more interesting and informative?

Most successful lectures are relatively short. Few people can concentrate for extended periods of time, so even the best lecturers should limit their lectures to short time periods, occasionally changing to activities that involve students.

Like planning for other methods, planning lectures should begin with identifying the objectives of the lesson. When used either before or after a lecture, instructional objectives affect students' reactions to the lecture. Instructional objectives introduced at the beginning of the lecture tend to increase intentional learning (that is, learning that the teacher seeks to stimulate); instructional objectives used after the lesson affect the incidental learning. To ensure that students will learn the most important concepts in a lesson, the teacher should always introduce the objectives before the lecture. In this way, the objectives become **advance organizers**, giving learners a basis for new concepts (Little, 1985).

Structure

Most lectures can be vastly improved and simplified by 1) organizing the content into only a few major concepts, 2) ordering the concepts in a logical or natural sequence, 3) limiting the lecture to 10 or 15 minutes, 4) providing tasks that require all students to use the concepts, and 5) summarizing the major concepts. English teachers often outline the major concepts in a story and put them in a definite sequence; history teachers may use events and dates. Identification and ordering of concepts is equally important in all other classes.

Titus (1974) presented the following list of steps for preparing a good lecture:

1. Organization is vital.
2. Stick to a limited number of concepts.
3. Limit time.
4. Use humor.
5. Avoid tangents.
6. Watch your language.
7. Listen to yourself.

Vocabulary

Titus' concern for language in the list above is especially warranted. Too many lectures are loaded with jargon, technical vocabulary, or other unfamiliar language that confuses the learners.

Inquiry Learning

Advantages of Inquiry Learning

An obvious advantage of inquiry learning is the high degree of involvement of all students. In true inquiry learning, the student must be involved from the very beginning, even in setting up the problems.

The nature of inquiry enhances the development of creative potentials. True inquiry learning provides freedom and encouragement in using the imagination, and the learner is responsible for determining what information to gather and then determining how important it is. These are essential conditions for creative thinking to occur. The relative retention rate of inquiry learning (as opposed to lecture, for example) is extremely high. The highly personal experience involved in inquiry adds meaning to the learning. As Abraham Maslow (1973) explained, true learning is very personal; the most valuable learning always involves our emotions.

Disadvantages of Inquiry Learning

Like all other teaching strategies, inquiry learning has its share of disadvantages. It is a slow process for covering material. Teachers who feel obligated to cover certain amounts of content (for example, to get through a textbook) may find the process very inefficient. A more critical disadvantage of inquiry learning is that it requires that

its teachers have unique expertise that most do not have without special training. Today's teachers need more training in inquiry activity.

Planning Inquiry Lessons

Because inquiry learning is by nature a flexible process, the teacher may want to set the stage in different ways. By heterogeneous subgrouping within a classroom, a teacher can capitalize on unique personalities, interests, and skills so that each individual's potential can be used to contribute to the task at hand. In inquiry learning lessons, the major role of the teacher is that of a catalyst. Teachers must give students the freedom to investigate, develop their own ideas, and to discover ways to explain what they observe. Even the questions and problems that are formed are the students', not the teacher's. The teacher passively provides direction by selecting objects, activities, events, problems or questions. Teachers are often tempted to give information before it is necessary, but they must resist this temptation and avoid making negative nonverbal communications, such as grimacing.

It is important that students be encouraged to form hypotheses and test them on their own initiative. Students who participate in inquiry must not be afraid to make mistakes. The teacher must encourage each student to make bold conjectures and then to test them. Any hypothesis that seems at all probable to the student should be pursued.

Inquiry is a cooperative process, not a competitive one. Even the teacher who becomes involved with inquiry soon becomes student–oriented rather than subject–oriented. The independence and separate responsibility of the student, coupled with the opportunity to pursue learning for the joy of it, produces a high level of motivation. For this reason, the retention rate of inquiry learning is superior to most other teaching strategies and offsets the disadvantages of being slow in content coverage.

Simulation Games

The most popular type of game used in educational settings is the simulation game, which offers players the opportunity to experience a variety of roles that are common in life. By definition, a simulation game must imitate some reality and give players the opportunity to compete in a real–life role, yet it is important that the emphasis on competition be kept in perspective. Winning is not the major object of a simulation game. Above all, the game should be fun.

But this does not imply that games are effective only for developing social skills. On the contrary, a good simulation–type game can provide a sound and interesting learning experience. The following list are advantages for using simulation games:

1. Involve the student actively.
2. Create a high degree of interest and enthusiasm.
3. Make abstract concepts meaningful for students.
4. Provide immediate feedback to students.
5. Allow students to experiment with concepts and new skills without feeling the need to be correct at all times.
6. Give students the opportunity to evaluate their mistakes.
7. Allow students to practice communication skills.

Hostrop (1972) found that American history students who used a simulation on the impeachment proceedings of Andrew Johnson learned far more effectively than had they listened to a lecture. Simulation games enable students to interact at their own levels and to learn how to compete and cooperate with others. Learning itself can be increased during simulations when students work in small groups, when they are permitted to evaluate their own mistakes, and when the vocabulary level is kept simple.

Simulations can make the abstract material in a textbook more real and vivid. Here are some of the advantages of developing your own simulation:

1. You're able to pick the precise subject matter.
2. You know best the ability level of your students.
3. Time constraints are not a problem.
4. You are there to change or alter it if necessary as the game proceeds.

Planning Simulation Lessons

The success of any simulation depends upon its design and implementation. To help teachers design their own simulation games, the following are suggested:

1. Identify your objectives.
2. Decide on a problem or simulation.
3. Define the scope of the simulation.
4. Construct the rules.
5. Identify the participants' goals.
6. Write rules and teacher instructions.
7. Design any additional parts.
8. Develop a debriefing.

The designer of simulation games should consider the management requirements of the teaching situation and the ability of the students. Simulation games are valid only if they teach the desired ideas, values, and facts. When students help develop the game, their level of involvement in playing the game and their attitude toward the game are improved. Four general rules for directing a simulation game:

1. Say no more than the few words necessary.
2. Run the simulation, not the students.
3. Run the game, don't teach.
4. Do not tell the students how to behave.

Remember that good classroom management and rapport with students are necessary for good gaming. Finally, it is suggested that anyone who is adapting a game for classroom use should keep the rules simple, keep the game shorter than one class period, and attain a balance between risk, chance, skill, and knowledge in determining victory.

The Case Study

Much recent research supports the use of case studies in teaching. According to Doyle (1985), "[teachers must have] experience and an opportunity to reflect on the meaning of the experience." Koehler (1985) says that teacher education students need much more clinical feedback than they are receiving.

In other words, students need opportunities "to develop usable cognitive structures for classroom management" (Doyle, 1985). One instructional

method that offers much promise for that purpose is the case study method. In many other professions, the case study method has proven effective in tying theory into practice and in fully involving students in what they are studying (Kowalski, 1988).

The Case Study Method

A case is a description of a decision or problem, normally written from the perspective of the decision maker involved. The case writer must report the relevant facts of the situation at the time that the decision is being made.

The use of the case study method is based on the belief that the purpose of education is to prepare students to cope effectively with a myriad of situations that they may face in their future. In acknowledging the ever changing state of our world, the emphasis here is not on preparing a person to know, but rather on preparing the person to think and act judiciously. As Dewing stated in 1954, "Human thinking and the new human experience are indissolubly bound together...If we teach people to deal with the new experience, we teach them to think. In fact, power to deal with the new and power to think are pragmatically the same." To have students memorize these principles would not prepare them to perform the tasks and to react to future experiences. If students could examine common teaching experiences and discover these principles through using them, then they could learn to recognize and use the theoretical base that undergirds the experiences and thus learn to react intelligently to similar future experiences (Henson, 1988).

The distinguishing characteristic which makes the case system of teaching, in the hands of a competent teacher, an instrument of great power is the fact that it arouses the interest of the student through its realistic flavor and then makes him, under the guidance of the teacher, an active rather than a passive participant in the instruction.

In teaching, principles should be derived from facts, and content should be pursued from the concrete to the abstract. Secondly, the important principles must be discovered by the students, the distinguishing features of the method being its ability to motivate and actively involve the student.

Teaching by the case study method must involve class discussion of possibilities, probabilities, and expedients. Students must be taught how to separate the pertinent facts from the less significant ones, all to be purposefully contained in the program. The students must draw their own understandings, many of which the teachers themselves will not have anticipated (Biddle & Anderson, 1986). The more contrasting or seemingly contrasting situations that can be brought forth before the class for analysis, the greater, of course, will be the assurance with which the generalized conclusions can be stated. In addition, each case should be followed by questions, especially questions that cause students to compare, contrast, and draw conclusions, and questions about the significance, generalizability and limitations (that is, under what conditions the generalizations would not hold) of the case. This is why effective use of the case study method requires an effective teacher. Careful selecting and sequencing of the material included in the case, as well as of the follow– up questions, can facilitate the desired systematic, step–by–step moving from the concrete to the abstract.

Preparing to Use the Case Study Method

There is no single correct approach to using case studies that can be prescribed. On the contrary, teachers should carefully design varying approaches. Christensen (1987) explains it:

> A case analysis offers opportunities for systematic inquiry and rigorous reasoning about the substantive issues in the statement. A teaching plan evidences the instructors' creativity in the process of planning for the discussion, in the use of supplementary readings and exercises, and his or her understanding of what is known and what remains to be discovered about the substantive issues raised by the case. Equally important is the teacher's attitude toward his or her teaching responsibilities. A teacher who views the classroom as a laboratory gains both knowledge and insight...Opportunities for experimentation abound. A teacher may use different opening and closure procedures in two sections of the same course or explore different combinations of readings and cases, and various patterns of questioning and responding. So often, effective teachers are clinical researchers of the classroom scene.

The teacher must lead students to 1) compare and contrast information, 2) sift out the significant facts, 3) draw generalizations, and 4) test these generalizations under varying conditions. Zappia (1986) adds two steps: 5) to develop alternative solutions, and 6) to select the best alternative based on established criteria. The object is to teach students to judge. What teachers should seek is not what is best in the sense of the ideal, but what is best in the sense of practical judgment. The essence of teaching is not items of knowledge as discrete measurable techniques, but judgment, which is itself a form of knowledge. Tempered by growing practical understanding, that judgment emerges as wisdom (Sockett, 1987).

The case study method is ideal for discovering principles and generalizations. Since the method requires the student to discover principles, teachers must first learn proper methods of using inquiry learning. When using inquiry, the main role of the teacher is that of a catalyst to encourage students to make and test their own hypotheses, since "case studies provide an open invitation to generalize" (Biddle & Anderson, 1986).

Finally, the teacher can use the case study method to cross–examine the students. Teachers should mix and sequence these approaches so that their students will be exposed to the benefits of all of them, while simultaneously learning to enjoy a variety of activities in their daily classes.

A recent variation for using the case method is the development of case study computer simulations. According to Zappia (1986), "Many computer simulation games are designed so that

they provide all the positive elements of the case method but games have an added dimension...they permit the students to see the actual consequences of their decisions."

When using the case study, all decisions should be based on involving the students in positive ways. As Ahmadian (1986) explains, "The key to capturing potential (that must be tapped) is to cause students to become deeply involved, both emotionally and intellectually, in the analysis and resolution of cases. It has been found that case analysis and resolution must be supported by textual material and instruction guidance." Used in such a way, the case method becomes a tool that can help teachers bring meaning to their lessons.

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Teaching Mathematical Problem Solving: The Challenge of the 90s

by Peter Kloosterman

The 1960s were the era of the –new math.' The 1970s saw the –back to the basics' movement. In the 1980s, the trend in school mathematics curricula has been –problem solving.' Open any school mathematics text published in the last five years and you will find the word problem solving on almost every page. Is problem solving the fad of the 80s that will wither away in a few years or is it an innovation that is here to stay?

To adequately consider the potential impact of problem solving, we must first agree on what is meant by the term. A few weeks ago, I was looking at a recent second grade textbook and found a page labeled –Problem Solving: Subtraction.' On the page were ten story problems to be solved. As I looked at the page, I quickly realized (as would most second–grade students) that there was no real need to even read the problems. To get the correct answer, one simply needed to subtract the smaller number from the larger. In a fifth grade book I found a set of exercises designed to get students to look for extraneous information in a problem. This was, I thought, an excellent idea. After speaking with a few students in the class using the text, however, I found that the only time they ever needed to worry about extraneous information was on the pages which were labeled –too much or too little information.' Were these examples of what problem solving **should** be? I think not. According to standards for mathematics curriculum that are currently being developed by the National Council of Teachers of Mathematics:

> A problem–solving emphasis furnishes a context for the meaningful learning of concepts and skills and fosters the **development of students' higher–level thinking processes** (boldface added). Further, the Standards emphasize the importance of establishing an inquiry oriented, problem–solving classroom environment for all mathematic instruction...Students should be able to...justify their thinking and their solution processes, perhaps empirically, by using representational models, or analytically, by using known facts, properties, and generalizations (Thompson & Rathmell, 1988).

In the above examples, students could solve the problems posed with little thought. The means of solution for those problems were obvious. **True problem solving involves finding methods of solution for problems for which the path to a solution is not obvious.**

National assessment of educational progress results clearly indicate that students nationwide are very poor at solving non–routine mathematical problems (Brown, Carpenter, Kouba, Lindquist, Silver, & Swafford, 1988; Kouba, Brown, Carpenter, Lindquist, Silver & Swafford, 1988). It would be easy to throw up our hands, say we can't teach problem solving, and let it fade away like the new math. Students, however, need to be able to use mathematics to solve non–routine quantitative problems. Those going to college will find that figuring out how to attack a mathematics problem is the hardest part of most college mathematics courses. Students going directly from high school into the work force will find that calculators and computers are used for virtually all calculations. The individuals who advance in their professions, whether college trained or not, will be the ones who know how to overcome unforeseen obstacles to completing a task.

Problem Solving and Mathematics Textbooks

The textbook examples I noted earlier may have given the impression that textbooks are of little value for teaching true problem solving. This is not actually the case. While textbooks could be much better, they have, in general, improved considerably since problem solving became a focus ten years ago. Relatively straightforward one–step and two–step word problems are more common in textbooks now than they were in the 60s and 70s (Nibblelink, Stockdale, Hoover, & Mangru, 1987). National assessment results indicate students are actually quite good at one–step word problems like the ones in textbooks (Kouba et al., 1988) showing that what we teach, students learn! Most mathematics textbooks now include at least some non– routine problems. For example, this problem is from an eighth–grade text.

> On a rafting trip, Mrs. Spence sat behind Rob O'Neill, Mr. Rodrigo sat behind his son Mark, and Mark sat in front of Rob O'Neill. In what order, front to back, were these four people seated on the raft?

While the problem is easy to solve, it is unique in that there is more than one solution. For years, we have given students the impression that math problems have one and only one correct solution. Problems such as this show that it is important to consider whether or not more than one solution is appropriate. Such problems can be used to promote the

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problem–solving skill of group discussion and defense of alternative solutions to a problem.

While the amount of problem solving has increased in mathematics texts in recent years, the increase is small in comparison to the volume of materials now accompanying most mathematics textbooks. A friend of mine recently joked that she needed a pickup truck to take her sixth–grade supplemental materials home for the weekend. Her statement was close to the truth! What this means for teaching problem solving is that teachers have to be careful to use supplemental activities that promote conceptual understanding and critical thinking. Most texts have so many remedial supplements that a class could go a full school year with only drill type activities. While drill activities are effective for practice of skills, they usually require little thinking and thus are not effective for building problem–solving expertise.

Finding good problem–solving activities in textbooks and supplements is not a difficult task. In some cases, the –starred' items at the end of each section consist of non–routine problems. Sometimes there are the enrichment or application activities that require critical thinking. for a few topics, the regular exercises are sufficiently challenging.

Regardless of where I find them, every day I try to have at least one or two thought provoking problem or activities. Other teachers I know devote one class period each week to problem solving oriented activities. This organizational scheme seems to work just as well. When doing problem solving, I have the students work alone or in small groups on problems and then we discuss them as a class. On some days, each group gets a different problem in which case group members only have to justify their solution to me. It takes a while for students to get used to working together in groups but I find they usually enjoy it and it keeps them involved once they know I expect them to work rather than socialize when they are in a group. For individuals interested in some practical suggestions on getting students to work in groups, I recommend an article called "Groups of four, solving the management problem" (Burns, 1981).

If you are like me, you probably find there just are not enough challenging problems in your textbook and supplements to keep students excited about problem solving on a day–to–day basis. Several publishers are now offering supplemental problem–solving materials which have an excellent variety of problems along with suggestions for teaching them. One of my favorites is the Addison–Wesley Problem–Solving Experiences in Mathematics series for grades 1–8. These supplemental booklets contain one– and two– step word problems along with non–routine –process' problems. A third grade process problem is:

> Susie, Myrna, Sylvia, and Felcia exchanged Valentine's Day cards. How many valentine cards were exchanged?

A seventh–grade example is:

> Graceann had to number the 396 pages of her art notebook. How many digits would she have to write?

For both of these problems, the answer is not obvious, yet a solution is within the reach of the students the problems are intended for, particularly if they work together with their classmates and are guided toward the solution by their teachers. A teacher assigning these problems is provided with a page of suggestions for helping students arrive at a solution. Every problem has suggestions for helping students understand what is being asked for followed by suggestions for possible solution paths. All suggestions are focused toward aiding the students in discovering an answer rather than just telling them how to do the problem. After explanation of a possible solution to the problem, the teacher is provided with the numbers of other problems in the book for which a similar method of solution would be appropriate. The book suggests making an organized list to solve the number of digits problem and refers the teacher to the following problem which also could be solved by making an organized list.

> Jennie's wardrobe is made up of 2 pairs of slacks (brown and gray), 3 blouses (pink, pale blue, and flowered) and 2 sweaters (white and light green). How many different outfits does she have?

I would encourage teachers to try and make up their own related problems as well. For example, does the following question have the same answer as the valentine problem?

> Tom, Jose, Alex, and James were playing chess. Each played the other one time. How many chess games were played?

Careful solution of this problem will show that the answer is exactly half the total for the valentine problem. Why is the answer different? Is there some way to check the answers to the two problems? (A good way to check the answers would be to have students act out the two problems, taking the parts of the students in them. Counting valentines exchanged and chess games played will teach students an alternative strategy for solving the problems and make them believe the answer they have arrived at is valid.

When students appear to really understand how to do a process problem, I like to have them work on a somewhat more difficult extension of the problem. For example, the extension suggested for the valentine problem in the Problem–Solving experiences booklet is

> Suppose 5 girls exchanged cards instead of 4. How many cards were exchanged?

Students who understood the first problem should be able to solve this one. If they have trouble, the teacher can go back to easier problems such as having only 3 students exchange cards.

In brief, mathematics textbooks provide a good start to teaching problem solving. Problems which can be solved in one or two steps are important to teach from first grade through high school. Such problems give students needed confidence and practice at solving routine word problems. Being able to solve routine word problems however, is not enough. Students need exposure to problems where the answers cannot easily be resolved to one or two steps. Problems of this type can be found in most texts if you look for them. In addition, many publishers are now starting to provide supplementary materials that have worthwhile problem solving activities. As these materials are

often designed to be used with any textbook series, a teacher can use the materials of any publisher.

Teaching Problem Solving through Questioning

As noted, problem solving has clearly been the key to reforms in the mathematics curriculum over the last decade. Revising textbooks is an essential part of curriculum reform but it is not enough. Teachers must adjust the way they teach to match the needs of the curriculum. In mathematics, this is often difficult given the tradition in mathematics of –teaching the steps' needed to solve a problem. Many students have become comfortable with mathematics activities where all they have to do is follow a few rules to get a solution. I have always had students saying to me –I don't care that I understand the problem, just tell me how to get the answer." Such attitudes are not conducive to getting students to be good problem solvers. If students are to be good problem solvers, they need to be more concerned with understanding the processes that can be used to solve problems than with the answers to specific problems. They will not develop this type of attitude from textbooks. Rather, this type of thinking must be developed by the teacher. Teaching with good questions is an excellent way to do this.

Questioning should be part of almost every mathematics activity undertaken. Rather than explaining new ideas to students, try to get them to figure them out from knowledge they already possess. A student who understands how to add two three–digit numbers should not have to be taught to add four and five digit numbers. Asking the student what he or she thinks is the proper procedure will usually yield a correct response. For one–step word problems, making a student defend his or her choice of the operation to be used helps to get students thinking about more than being the first one to get an answer. For process problems, questions help to get students to think about what they know that will help them solve the problem. A teacher should always expect students to defend their solutions and to state whether other solutions to a problem are possible. When I have students working in groups, I expect every member of the group to be able to answer questions about how a problem was solved. If one student in the group cannot answer such questions, I hold the entire group responsible as a means of encouraging them to share ideas and solutions with each other.

Teaching Problem Solving with Computers

The introduction of computers and calculators has dramatically changed the type of mathematics children need to learn. Extensive paper and pencil computational skills are no longer necessary (Impact of Computing, 1985). In addition to changing what students are expected to learn in mathematics, computers have the potential for changing how they learn it. At the present time, computers are used in mathematics classrooms predominantly for drill on already mastered skills. While there is nothing wrong with using computers for drill and practice, there is nothing particularly unique or inventive about using computers for this purpose.

Like supplemental problem solving texts, some publishers are now making software available to help students learn problem solving, although quality of the software varies considerably with the publisher. In some cases, the software only offers additional practice on one– and two–step word problems. In other cases, there are some rather unique, thought provoking ideas. A teacher with an interest in promoting problem solving will have to treat software from text publishers like other supplemental materials from text publishers, in that some pieces can be useful while many others can be avoided.

Although textbook publishers offer some problem–solving software, much of the best problem–solving software is being produced by commercial software companies. In many cases, this is not software designed to help students solve word problems. Instead, the software is useful for promoting problem solving in the sense that any activity which forces students to do creative, quantitative thinking is a problem–solving activity.

Computers have the potential to change the way we explain mathematical concepts far beyond computation. I recall that when teaching high school math, it would take me an entire class period to graph $y = \sin s$, $y = 2 \sin x$, and $y = 4 \sin x$ to get students to think about the effect of a coefficient on a sine wave. For lower grade levels, a number of simple graphing packages are available which allow students to explore the properties of lines and plane figures. Such software may not help students in solving word problems, but it certainly can be used to promote the idea of mathematics as a field where inquiry rather than memorization is the key to success.

Other types of software are also available to teach problem solving in the general sense. At the elementary level, Gertrude's Secrets and Gertrude's Puzzles by The Learning Company encourage children to look for patterns with sets of shapes. The King's Rule by Sunburst Communications requires students to find number patterns from sets of examples. Students are allowed as many sets of examples as they wish before they try to guess the rule used to generate the examples. The simple rules are appropriate for upper elementary grades while the more complex rules are intended for high school aged students. A final example of software that promotes problem–solving thinking is Graphing Equations from Conduit Software. Included on the disk is a game in which students try to write equations for lines or curves that, when plotted, intercept randomly placed points on the computer screen. The scoring system for the game is set up so that curved lines which can intercept several points result in a much higher score than straight lines which can intercept at most two points. Thus when playing the game, students are challenged to consider a variety of different equations rather than settle for an easy to find but low scoring move.

In brief, curricular reform can be driven by a number of forces including the invention of new tools to teach content. Computer software is now available to help students solve word problems. More importantly, computers can provide activities which, by their very nature, will help students become better problem solvers. Programs such

as the Geometric Supposer and The Kind's Rule require creative thought on the part of the students. A function plotter allows students to explore the properties of graphs much more easily than was possible before. With these tools, achieving curricular reform in mathematics is a much more reasonable task.

Problem Solving in Mathematics: The Prospects

There is no question but that problem solving has been the focus of curriculum innovation in mathematics for the 1980s. The question is whether problem solving curricula will continue to evolve and improve or will fade into history as did the new math and the back to basics movements. To me, the key to answering this question lies in whether educators and the public really believe that problem solving is important. If we are unconcerned enough to think that the way we've taught math in the past is good enough for the future, problem solving approaches to teaching mathematics will fade away. There is no question that it is easier to present all of school mathematics as step–by–step procedures than it is to present it from a problem–solving point of view. It will take effort to improve instruction in mathematics. We have to be committed to improvement and believe that students need to be taught to be critical thinkers or problem solving will be a slogan rather than a real change.

The most encouraging news for implementing a problem solving mathematics curriculum is that we have a variety of materials for teaching problem–solving skills. Textbooks are improving although teachers often have to weed through substantial amounts of problems and activities to find those which really promote critical thought on the part of students. Supplemental materials for teaching problem solving are getting better and easier to come by every day. Questioning students is an excellent way to get them to see mathematics as a discipline where inquiry rather than memorization is the key to success. Computers, in addition to being a major cause of mathematics curriculum reform, can be used to teach mathematics in exciting new ways. We can transform the way we teach mathematics in the United States to the point where teachers and students alike see problem solving rather than computation and memorization as the key to mathematics. It will take time. It will take commitment. It can be done.

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Making the Pieces Fit in Reading Education: Problems and Solutions

by David M. Brown

To get maximum performance from a high–powered engine, all the parts must fit together well. If not, we know that the engine may be inefficient at best, or it may not run at all. Reading education is much like a high– powered engine. It is composed of many different parts that must interact harmoniously to produce the desired performance in students. For the past few decades, most reading programs have run smoothly. However, since adopting the goal of producing higher achievement in all students, educators have come to realize that some parts of reading education programs do not mesh as well as they should. To address this situation, several problems are identified below, and solutions are proposed for each one.

Kindergarten Reading Programs

Problems:

Although great strides have been made in reading education recently, some kindergarten teachers are still not providing the types of beginning– reading instruction that their students need. During the past few years, many educators have debated (Pikulski, 1978) whether to present formal reading instruction in kindergarten or to postpone it and teach only reading readiness skills. Some educators believe that formal reading instruction should be presented in kindergarten because many children appear to be ready for reading before they enter first grade (Durkin, 1974– 1975). Other educators argue that it is not desirable to provide formal reading instruction in kindergarten because many children are not conceptually ready to understand reading (Roberts, 1976). Unfortunately, some educators perceive the debate as being an either/or issue. Consequently, some kindergarten teachers provide formal reading instruction to all of their students, whether they can profit from it or not. Other kindergarten teachers present only reading readiness training in their classes, even though some of their students may be ready for formal reading. This poses problems for many students, for the reading instruction they receive in kindergarten sometimes fails to meet their needs. The situation also causes problems for first–grade teachers who, a year later, must work with students whose reading needs were not met.

Solutions:

The problems described above can be solved by employing an approach designed to meet the individual needs of students. Many authorities (Otto, Rude, & Spiegel, 1979; Durkin, 1987) recommended that formal reading instruction be provided when children appear ready, willing, and able to benefit from it. Therefore, kindergarten students who appear ready should receive formal reading instruction with the expectation that they will learn to read. However, teaching every kindergarten student to read should not be the goal of kindergarten teachers. Kindergartens must not become 'academic bootcamps' (Anderson et al., 1985). Instead, the goal should be to teach all students as much about reading as they can learn comfortably. Those ready for formal reading instruction should receive it, and those who are not ready should be taught reading readiness skills. This means, then, that some students will probably learn to read in kindergarten, and others may not be reading at the end of the school year. Kindergarten teachers must expect this type of performance from their students, for individual differences must be accepted and respected.

When the approach recommended above is employed, it is easier for first–grade teachers to implement effective reading programs. First–grade teachers can rest assured that their new students received, in kindergarten, the types of reading instruction they needed to develop as beginning readers. Consequently, first–grade teachers know that: 1) formal reading instruction was provided in kindergarten to those students who appeared to be ready for it, 2) some of their new students will already be reading when they begin first grade, and 3) those students who were not ready for reading in kindergarten were taught reading readiness skills, and they may not be reading when they begin first grade. Knowing what form of instruction students have received and whether or not they have profited from it enables first–grade teachers to meet the reading needs of their students and to assist them in developing comfortably as young readers.

First–Grade Reading Programs

Problems:

For many students, the foundation for failure in reading is created in the first grade. This failure is caused by requiring all youngsters to enter first grade when they are six years old and expecting them to learn to read quickly and easily. The problem is that "some students may not be ready for reading until well into first grade—or perhaps not even until second grade" (Otto, Rude, & Spiegel, 1979). Consequently, learning to read is extremely difficult for them, and some are often doomed to

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failure from the beginning. This situation initially creates major problems for many first graders and their teachers. Later, the problems are perpetuated, because a steady diet of failure during the first year usually causes students to perform poorly in later grades. Therefore, requiring some students to begin first grade when they are not ready for formal reading instruction creates short– and long–term problems.

Solutions:

Some viable solutions are available to solve the problems created by enrolling students in first grade before they can profit from formal reading instruction. Two approaches are described below.

First, some youngsters should be allowed to spend a second year in kindergarten instead of being placed in first grade when they are not ready for reading. During the second year of kindergarten, they can gain more exposure to reading readiness skills and receive formal reading instruction if and when they become ready for it. They can also expand and improve their knowledge bases with the additional training they receive. Spending a second year in kindergarten may also provide more time for them to mature. Although failing to attain adequate physical and mental maturity does not usually serve as the sole cause for a child's lack of success in first grade, many authorities (Otto, Rude, & Spiegel, 1979) acknowledge its importance as a contributing factor.

Second, 'readiness first grades,' which are provided in some school districts, can be beneficial for students who have completed one year of kindergarten, yet they are still not ready for regular first–grade programs. Such students should be allowed to spend another year working with reading readiness skills and beginning–reading activities. Also, providing an intermediate step between kindergarten and first grade can provide teachers with additional time to determine "what aspects of reading (students are) ready for" (Knight, 1983). In a readiness first–grade class, the curriculum is regular first grade. Readiness first–grade classes provide students who are not quite ready for reading at the beginning of the school year with a chance to ease into it without experiencing the trauma of entering a regular first–grade class where the pace of instruction is much faster and expectations for success in learning to read are much greater.

Secondary Reading Programs

Problems:

The quality of secondary reading programs, like elementary programs, ranges significantly. Some are well organized and operate quite effectively. Others, however, do little to aid students with learning in high school. Secondary programs of poor quality tend to fall short in three areas.

First, these programs do not provide additional developmental reading instruction beyond the sixth grade. Instead, the reading instruction provided in grades 7–12 usually possesses a remedial flavor, i.e., teachers are charged with the responsibility of identifying students' reading deficiencies and providing instruction to eliminate them (Shepherd, 1982). Little or no attempt is made to continue teaching the reading skills students study in the elementary grades. As a result, students reading below grade level when entering the seventh grade do not get the kinds of reading instruction they need to help them develop as good readers. Under these conditions, students do not receive enough beneficial reading instruction after completing grade six. Such a situation is often devastating to students, for it insures that they will do poorly in high school.

Second, the secondary teachers who teach reading usually have not been trained as reading teachers. Quite often, English teachers (Roe, Stoodt, & Burns, 1987) are assigned classes of students who have been identified as poor readers, and the teachers are told that they must provide remedial reading instruction in an attempt to help students improve their reading skills. Since the teachers have not been trained to teach reading, they are usually not capable of doing a good job with the assignment. Consequently, students do not receive the caliber of reading instruction they need.

Third, even when secondary teachers are capable of teaching reading, they often discover that the reading materials available to them are inadequate. Because many of their students are reading below seventh–grade level, the teachers need more reading materials addressing the interest of teenagers, but still possessing elementary–level readability (Dupuis & Askov, 1982). Such materials are not readily available sometimes; however, many publishers provide reading materials for use with secondary–level students.

Solutions:

To solve the first problem identified above, developmental reading instruction should be provided in grades 7–12 (Singer, 1976). The reading instruction provided in elementary school must be extended into the high school grades. Therefore, students reading below grade level when they enter the seventh grade should continue to receive developmental reading instruction at their present reading levels. For example, students entering seventh grade and reading at the fourth–grade level should continue to receive some reading instruction at that level. Providing instruction at levels where students can read enables them to continue to develop and improve as readers.

Three approaches are suggested for dealing successfully with the second problem. First, all secondary–level preservice teachers should be required to take at least one reading course as part of their undergraduate teacher education training. Many states maintain such a requirement presently (Farrell & Cirrincione, 1984); however, some do not, and their teachers often fill the ranks of the unprepared and ineffective. Second, more training related to teaching reading should be provided to secondary teachers each year in inservice sessions (Roe, Stoodt, & Burns, 1987; Vacca & Vacca, 1986). Requiring secondary teachers to periodically attend inservice sessions addressing the teaching of reading insures that they will continue to improve their knowledge and expertise as teachers of reading. Third, as-

signing elementary level teachers, as reading specialists, to teach reading to students in high school represents another way well–trained teachers can be made available to provide effective reading instruction. Employing a departmental approach, some elementary–level teachers could be assigned as full–time reading teachers in grades 7–12, teaching reading each day to students who are reading below the seventh grade level.

To obtain adequate reading materials for the secondary level reading classes described above, two solutions are presented. First, most textbook publishers provide basal text materials designed for grades K–8. Some of these materials can and should be used to teach reading to the students described above. For instance, using 5th–8th grade basal texts with high school students reading below their grade levels can solve many problems for students and their teachers. The students can continue to read from materials that match their instructional reading levels and are designed specifically for developmental reading programs that enable them to study the skills they need. As the students' reading abilities improve, their teachers will experience less difficulty in teaching them from content textbooks. Also, when using basal texts to teach reading, teachers have good, solid reading materials readily available. Second, high school–level reading teachers, supervisors, and librarians (Roe, Stoodt, & Burns, 1987) should work together to identify and acquire additional supplemental reading materials (Cheek, 1983) appropriate for use with secondary students reading below their assigned grade levels.

Summary

To make reading education programs more efficient and insure greater success for all students, solutions were proposed to problems associated with teaching reading at each of three levels. Kindergarten teachers must provide the types of reading instruction that students need. To do this, an approach designed to meet individual needs should be used, providing formal reading instruction for some students and addressing reading readiness skills for others. First–grade reading programs must be more flexible in meeting the needs of students who may not be ready for reading. Allowing some students to spend a second year in kindergarten can provide educational benefits, and 'readiness first grades' can also be rewarding for some children. Secondary reading programs must be improved by providing developmental reading instruction in high school, insuring that secondary teachers of reading are well trained, and securing better reading materials for secondary students and their teachers. If the changes recommended above are made, some additional parts of reading education programs will fit together well. As the teaching of reading is improved at the three levels, success in school will become a reality for more students.

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Articulation in the Sciences

by Robert J. Miller and Betty J. Stoess

Like other areas, science seems to suffer from articulation problems. Many classroom teachers are aware of these problems and express concern. Recent interviews produced responses such as "We don't have time!" and "It would help to know what will be expected of my students when they go on to middle school next year." But lack of time and lack of information are only two of the articulation problems in the sciences.

Science as a curriculum area may suffer more from articulation problems than some of the other areas. Mathematics and language arts, for example, have elements which must follow sequentially. In science, the only common strand appears to be science process skills. Unfortunately, this commonality seems to be often ignored. A cursory examination of science textbook series provides evidence that this is the case. Science is frequently presented as a fragmented series of interest areas which may or may not be conceptually oriented. It is unfortunate that science teachers, textbook authors, publishers and curriculum specialists do not build science curricula around science process skills. With a little help, changes can be made.

The Kentucky Department of Education, with the cooperation of committees of classroom teachers, developed skills continua for all content areas. The Science Skills Continuum identifies ten process skills and provides illustrative examples for grades K–8. It can serve as a model of essential learning in science and as a framework for grade to grade articulation of those learnings. Making science process skills the cornerstone of the elementary science program can do much to eliminate the common practice of teaching whatever is in the grade level textbook without awareness of how or if the activity contributes to the total instructional goal.

Articulation problems exist at the middle and high school levels as well. One type of problem exists because there is no real argument on the proper placement of certain content. After many years there is still concern over the placement of physics—before or after chemistry—and of earth science. While an integrated approach to teaching science might eliminate such concerns, attempts at integrating science have not been very successful. Other problems in articulation exist because there is little communication between teachers of science at the various levels. Teachers generally are not well informed about student learnings or science programs at the previous school or at succeeding levels. While there may be a prevailing assumption that teachers from various levels communicate, few opportunities exist for such communication. Textbooks tend to be selected by one organizational level (elementary, middle, high) without consultation with other levels. In–service opportunities may not provide for cross–level interaction. Topics and activities may be included at the middle school level and repeated at the high school level, not necessarily as a part of an overarching plan. For articulation to occur, we must insure that communication between responsible practitioners occurs and we must make articulation a curriculum goal.

Communication, commitment and leadership are all important ingredients in the articulation equation. Present practices aimed at enhancing vertical articulation usually focus on communication between professional educators. Educators are busy people and articulation may suffer unless it is made a priority. Leadership must maintain a focus on this priority.

Articulation in the sciences is best when a combination of the following are employed:

1. Every school should have a science coordinator or science chairperson. There must be an interested leader who can identify articulation problems and propose solutions within a curriculum area of a school.
2. Active involvement of the science supervisor or consultant is a necessary ingredient for articulation between schools.
3. Curriculum guides developed by teacher groups in school systems can communicate instructional sequence and expectations.
4. Curriculum guides developed at the state level should be used to give direction to local educator groups. Guides developed at the state level can serve as models for concise and clear goal directed statements free from specific biases found in guides designed from a single set of materials.
5. Local, state, regional, and national science teacher organizations can enhance articulation communications through the use of different media.
6. Textbook evaluation and selection can be a site for addressing articulation concerns.

Suggested practices to enhance vertical articulation in the sciences which are not widespread include the following:

1. Diagnostic testing by teachers to accumulate articulation data in the classroom should be more widespread.
2. Alliances between schooling units or levels can be a powerful tool for change. Alliances can involve schools within a district or within a region. Alliances could extend beyond the K–12 grade levels and logically include colleges and universities as do those recently formed in our state. Alliances

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are formed for the expressed purpose of encouraging communication on common problems and group efforts toward solutions to identified problems.

3. Formation of local science teacher organizations would enhance articulation by the increased communication inherent when professionals with similar interests gather together. Articulation as well as many other concerns such as science fairs, materials funding, materials distribution, and testing could become the focus of group effort rather than the difficult task of many individuals working alone.

Science education could also profit from greater horizontal articulation. Like most other curriculum areas, science tends to be taught during 'science time.' Sciencing done by practicing scientists is rarely, if ever, in a non–integrated format. Thus, the nature of sciencing in itself would be a good argument for greater horizontal articulation with other curriculum areas. There are other reasons to work toward greater horizontal articulation. In the elementary school, teachers sometimes express frustration with stresses associated in covering all the curriculum areas for the length of time the state mandates. With greater integration of science with other subjects, there might be less stress and correspondingly less frustration.

One goal of the middle school curriculum is to allow students an opportunity to explore curriculum areas in greater breadth. Students have an opportunity to explore options and to begin to look at possible career choices. For the science–oriented student, greater articulation between areas might result in greater knowledge of cross–disciplinary career choices such as medical illustration, environmental science, forensic science and others. Further, students could be led to see the value of non– science learnings. All people need good communication skills, for example, and all have some leisure time to use wisely or not so wisely. For the student not interested in a science career, greater cross disciplinary studies are equally important. Understanding the impact of science and technology on modern society is crucial to the future lives of all. Ample opportunities exist for treating topics common to science, social studies, mathematics, economics and other curriculum areas. Neither science nor the study of science exists in a vacuum. The middle school is an ideal spot to begin breaking down some barriers.

In the secondary school, reduction of redundant learning could be an outcome of more horizontal articulation of science with other subjects. A good example of subjects overlapping is science and mathematics. Much of the applied mathematics could be taught in science lessons. An additional benefit to this approach would probably be better cognition of mathematics by the student. Another example at the secondary level is that of science and social studies. Problem solving and inquiry are methods commonly used in modern programs for both subjects. Many of the social problems of the present and the future have a scientific or technological base. Articulation between the two subject areas will probably increase out of necessity as we move into the 21st Century.

For secondary students proceeding on to college, greater horizontal articulation could enhance a greater appreciation of liberal arts education which typifies the first two years at most colleges or universities. It doesn't take long in talking to the typical college student to find out this appreciation is not at a high level. If there was more horizontal articulation in science at the high school level, then maybe the science major in college would be more appreciative of the social sciences and humanities.

Most current practices for horizontal articulation of the sciences involve integrated lessons in the elementary school, team teaching in the middle school, and a core curriculum in the secondary school. None of the foregoing seem to be used extensively throughout the country.

Horizontal articulation could be enhanced by increasing use of the following practices:

1. Greater utilization of integrated science courses in teacher preparation programs.

2. More teacher and administrator inservice programs on horizontal articulation

3. A relaxing of strict state mandates on teaching fragmented subject areas in the elementary school. Many teachers and administrators take state guidelines stated in minutes per week and translate them into minutes mandated per day.

4. A greater movement toward integrated lesson preparation in methods courses during the teacher education program.

5. Less reliance on the science textbook as the main instructional tool.

6. Provisions for more time for teachers to interact with other teachers.

Summation

Articulation problems in science, both vertical and horizontal, are a reality. Interviewing teachers and school administrators who are honest in their assessment, provide the data to support the above conclusion. Procedures and methods to alleviate the problem are being used in some locations. Additional techniques in identifying and confronting science articulation problems would seem to be worth the effort for reasons delineated above. The main ingredient for progress in achieving better articulation in the sciences is the degree of awareness and commitment of leaders and groups they lead. Much needs to be and can be accomplished in the sciences.

Scope and Sequence in the Social Studies: Some Decisions

by Donald J. Reyes

> The scope and sequence is the infrastructure of the curriculum. It is also the connecting link between the theoretical foundation of the curriculum and the applied instructional materials used in the classroom (Dynneson & Gross, 1986).

Dynneson and Gross' observation points to the importance of scope and sequence decisions in curriculum development. Choices about the selection and organization of 'culture content' decide to a large extent the character and quality of an educational program. Even though teachers will always be individualistic in their applications of scope and sequence decisions, a program's 'infrastructure' is central to a strong curriculum in any discipline.

Curriculum developers in the social studies will make scope and sequence decisions on two levels—on the macro level, which usually affects the topics to be studied over the entire program, and on the micro level, which focuses on the content elements and objectives to be learned and their relationship to each other.

Global scope and sequence decisions. At the macro level, there is no doubt that the dominant scope and sequence organization, at least through the elementary level, is expanding environments. One measure of its domination is its consistent use in elementary textbook series. Silver, Burdett and Ginn is typical in this regard. The theme is carried through the 7th grade returning to American history in the 8th grade. Holt (1986) follows the expanding environment structure as well. Me, People, Neighborhoods, Communities, Regions, America and Its Neighbors, and the World are titles of Holt's elementary books. Scott, Foresman (1988), Harcourt Brace Jovanovich (1988) and McGraw–Hill (1986) also follow this format. Indeed it would be difficult to find a publisher that varies from the expanding environment organization for their elementary social studies program. For high school, publishers revert to a discipline approach combining geography, history, political science economics and sociology.

The expanding environment scope and sequence has been around since the 1930s and received support by the National Council of Social Studies (NCSS) Task Force on Scope and Sequence, which reported in 1983. The Task Force report was published in Social Education in 1984, and included a scope and sequence for illustrative purposes. While the conceptualization was not intended as a model or ideal, Shaver rightly observed that, "it will be cited as an NCSS position statement on scope and sequence" (1984), and indeed, it probably has.

The NCSS illustrative scope and sequence begins with the self and 'expands' the student's environment through the family, the neighborhood, the community, the region, the nation and out through the world at large. Grades 8 and 11 focus on American history, grade 10 world history, economic systems at grade 9 and, finally, electives at grade 12 (1984).

There is by no means a full support given to the idea of using the expanding environments notion to make scope and sequence decisions at the macro level. In the same issue of Social Education which contained the illustrative scope and sequence, there were presented some criticisms as well. Some reactors were concerned about the statement's conservative tone, its overwhelming emphasis on citizenship as its goal, its lack of attention to developmental needs of students and its lack of specificity in relating its particulars to a solid rationale.

Some alternatives. Partly in response to criticisms, the NCSS provided opportunities for alternative views to be presented. Some were published in the November/December 1986 issue of Social Education. To a greater or lesser degree, these proposals (1986) by Downey, Hartoonian and Laughlin, Engle and Ochoa, Stanley and Nelson, and Kniep deviate from the expanding environment format, although some elements retain its features. For example, Hartoonian and Laughlin suggest scope and sequence themes or strands such as tradition and change, cultural heritage and spatial relationships, seven in all. These strands are embedded into content focus clusters corresponding to primary, intermediate, middle school and secondary grades. These content clusters resemble the expanding horizons format, "starting with the immediate, familiar and concrete environment in the primary grades and moving outward to the more distant and abstract in high school: (1986).

On the other hand, Kniep's proposal for social studies within a global education format, which focuses on conceptual and persistent problem themes, all but loses touch with expanding environments except insofar as primary children may study 'local manifestations of global problems and issues,' because of their immaturity. And so on with the other proposals.

Curriculum developers in the social studies, then, will probably begin with serious consideration of the expanding environment organization at the elementary, and the stricter discipline orientation at the secondary level. This organization has the advantage of being in synchronization with most existing

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published materials. For those seeking an alternative format, suggestions can be found within the NCSS, model school districts or state agencies.

While the expanding environments scope and sequence roughly parallels the cognitive development of the child from egocentric focus and concrete operations to a more objective way of viewing the world and a formal operational mode, there is no evidence that this organization is a more effective one in promoting student achievement. Indeed, "of the empirical research to date, it appears that micro sequences have a much greater impact on learning than macro sequences" (Patten, Chao & Reigeleuth, 1986).

Micro sequencing in the social studies. Thus, curriculum developers must think clearly about the micro–elements that will structure their social studies program. For example, second grade programs in school districts and in published materials usually focus on the neighborhood as a step in expanding the student's environment. Units and lessons are then organized within the theme of neighborhood. My Neighborhood and Neighborhoods in Other Lands may be typical unit titles. This macro organization provides the topic overview for second grade and for the second grade within an entire program. But, within and between the topic heading strung together in this macro organization, the curriculum developer must decide on the smaller units of learning or the objectives to be subsumed under this larger organization.

For any given topic in the macro scope and sequence, decisions about the smaller learner outcomes can be made which will result in a more or less effective program. Under the topic of neighborhoods, for example, developers may stipulate a range of learning objectives. Concepts, generalizations, information, skills, affective outcomes and so on may structure the topic. If the developer fails to stipulate these micro elements, the specific learning elements may be left to chance. This can result in flat, information or topic oriented teaching and learning, as Goodlad noted, based on extensive classroom level observations of social studies teaching,

> Social studies, as a field of learning appears to be particularly conducive to the development of reasoning—deriving concepts from related events, testing in a new setting hypotheses derived from another set of circumstances, exploring causal relationships, drawing conclusions from an array of data, and so on. Teachers at all levels listed these and more as intended learnings. Their tests reflected quite different priorities. The tests we examined rarely required other than recall and feedback of memorized information (1984).

Scope and sequence models do provide some guidelines in selecting micro sequence elements. Almost all explicate or suggest substantive content, skills and values. Skills and values are typically integrated into the content, as is done with most published programs. The curriculum developer will probably want to do the same with local programs.

Unfortunately, the analysis of substantive content in the NCSS proposals is made difficult because of a lack of common definition. For example, the original 1984 proposal deals with content as themes, topics and to a lesser extent, concepts.

Some of the alternate proposals offered in the 1986 issue of Social Education may not be much more helpful in identifying useful micro–elements in scope and sequence. One proposal uses questions as organizers, another, persistent problems. Here again, the substantive content may take the form of information needed to address problems or answer questions.

The curriculum developer can think about the content elements that structure each of the topics and write objectives for these. Research supports the use of concepts and generalizations as the scope social studies curricula. Sequencing of these elements can also be designed according to the research on sequencing (Patten, Chao, & Reigeleuth, 1986). Examples of important concepts and generalizations can be found in the social studies literature.

For example, the Illinois State Board of Education (1986) has developed model learning objectives for grades 3, 6, 8 and 10 in the social sciences. Some of these are written as important social studies concepts. At grade 3, students are expected to attain such concepts as rules, roles, goods, services, wants, needs, specialization of labor and so on. These concepts can be used as the elements for micro sequencing. More direction can be found by examining such materials as Merrill (1979) and Gagne (1984).

A final word. Providing the infrastructure to a social studies program requires the curriculum developer to think through many decision points. The practical considerations, such as the availability of materials, intermingle with the theoretical. The result of careful work can be a strong, interesting, and relevant program for today's students—a program that can help them prepare for life in the 21st Century.

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Flexible, Personal, Thoughtful: Three Rubrics for the English Curriculum

by Richard L. Graves

As we move closer to the 21st Century, the major question confronting the English curriculum is this: Will English be defined as the study of grammar and literary texts? Or will English be conceived as human communication, i.e., reading, writing, speaking, and listening?

This is not a new question, but the reasons for responding to it appropriately are more compelling now than ever before. A rural village of the late 19th century would more closely resemble its counterpart of the 16th century than it would its counterpart of the 20th century. In other words, it is closer from 1890 to 1590, than it is from 1890 to 1990. Change is occurring at an exponential rate—in family life and social structure; in economics and technology; in transportation, communication, and business; in the total fabric of society.

If the English curriculum looks to the past for its inspiration and design, then it will find itself hopelessly irrelevant, incomprehensible, and impractical in the schools of tomorrow. It will become a dinosaur.

On the other hand, if the English curriculum can respond to the demands of the changing world, it will find itself in an enviable position. One of the great needs of our time (as well as the future) is the ability to communicate. Our nation is currently in a state of transition, moving into a post–industrial period in which the emphasis is not on manufacturing but on information. Never before has language been so important—for purposes of clarity, emphasis, persuasion, entertainment, negotiation, understanding, and so on. This is what 'English' should be about.

Looking to the future, I would suggest three guidelines for shaping the English curriculum. From the viewpoint of a traditionalist, these guidelines may seem distasteful, but I believe most English teachers will find them not only realistic but necessary for the continued vitality of the discipline.

First of all, **the English curriculum must be flexible**. We cannot assume that what was good literature yesterday will be equally valuable tomorrow. For example, I recall my father quoting lines from one of his favorites, Henry Wadsworth Longfellow:

Blessings on thee, little man,
Barefoot boy, with cheek of tan;
With thy turned up pantaloons,
And thy merry whistled tunes...

When I was a child, my father read every page of Treasure Island to me. He is dead now, and I naturally cherish those memories more than I can adequately express. But Longfellow and Stevenson will not be valued by future generations as they were by my generation and that of my father. There is no one literary work which is eternally and universally valuable. What is valuable is not the text itself but the unarticulated essence of the text.

Tastes change and texts change, but something deeper, something about the human condition, continues to express itself over and over, but in a different form for each generation.

Thus the English curriculum must not latch onto a single text but must be willing to seek out new texts which reveal this essence in terms understood by the current generation. We must be wise enough to understand that the literary taste of a single generation is not universal, though at times we may be beguiled into thinking so. Because we English teachers wield so much power in our own classrooms, it is easy to assume that **our** tastes should be **their** tastes. We must be big enough to resist that temptation.

This leads to a second major guideline for rethinking the English curriculum of the future: **The English curriculum must be personal**. When we think of the concept of 'discipline of English,' we must keep in mind that our subject is more than a body of knowledge, much more. It is a mistake to slice it up—by genre or chronology or subject matter blocks or whatever—and to assume that's all there is to it. It's a mistake because the student, the one doing the learning, is always at the center of the curriculum.

Although this principle touches all the areas of the English curriculum, it is nowhere more apparent than in the teaching of written communication. Here the primary concern of the teacher should always be on the growth of the young writer, not on teaching various grammatical conventions or rhetorical forms. I say that with some hesitation, because one of my favorite areas of English is the study of style. But over and over I have seen that the major question of the young writer is, "How am I doing?" Sometimes they say "Have you graded my paper yet?" but what they really mean is, "Have you taken the time to read my work, to really listen to my story? Do you understand what I am trying to say? Do you care? **Really** care?"

Young people are deeply interested in a personal response to their writing, which is in reality an extension of themselves. This universal truth was valid in the first century A.D. during the time of Quintilian, perhaps the greatest teacher of writing ever, and it will be true in the next century.

As English teachers, we must always remember that we are not just teaching **writing**, but **writers** as well. In

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English, the learner is always at the center.

Finally, **the English curriculum of the future must be thoughtful**. That is, it must be 'full of thought.' Its focus should always be on language, with an emphasis on the thinking and reasoning process, ways of solving problems, and the effective means of communication. English should emphasize common sense and clarity, the ways of language in the workaday world.

But 'full of thought' also means an appreciation of the beautiful. Life would be sterile indeed without the aesthetic dimension. English should call our attention to those things which are beautiful, the definition of which again changes from generation to generation. We should lead our students to discover poetry in new places, not just in the expected or ordinary, but in the events of our daily lives and the relationships with those around us. English should be a **living** subject with fresh discoveries occurring regularly.

'Full of thought' also includes ways of knowing beyond the regular and routine. The English curriculum in the technological world of the future should also be deeply concerned with myth and symbol, intuition, religion, and mystery. There is much in life we don't understand. We ask, "Why?" and wait for answers. Who would be so foolish to believe that the computer or any piece of technology will solve all the problems of humankind?

Flexible. Personal. Thoughtful. These three rubrics will not resolve all the questions and concerns revolving around the teaching of English. They might, however, provide some markers for threading the uncertain seas of the future. Above all, I hope they will remind us that English is included in the public school curriculum only because it is useful for young children, both today and tomorrow.

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Coordinating the School's Curriculum: Physical Education

by Gail E. Webster

The most basic principle underlying curriculum development in physical education is that it is qualitatively different from the academic educational program provided for all children. Physical education is unique in the total school curriculum as it is the only subject where the content is movement and involves the student totally (Bain, 988). Yet physical education remains a curricular outcast, often struggling for survival (Koslow, 1988). This struggle for survival often implies that the physical education program be designed to enhance or take into account the needs of all children. Nevertheless, developing, providing and justifying a physical education curriculum based on the unique characteristics of all children is not easy. Problems in physical education are easy to identify. Perhaps most of the problems lie in disagreement over the purpose(s) of a physical education program. Suggestions to solve the problems are more difficult to identify and implement. Certainly, the lack of research comparing the effectiveness of different approaches is a major contributing factor.

When facing problems in physical education, we are often quick to point at administrators for lack of support, lack of facilities, lack of equipment, etc. However, physical educators should take responsibility for exacerbating some, not all, of the problems. Many physical educators react to 'attacks' that threaten to eliminate physical education programs from the school curriculum. Teachers wait until under siege and then say, "But we are capable of having a terrific program if you would only give us the chance!" The opportunity for proactive effort to promote the values of physical education often are underutilized.

Problem of Goal Identification

A major problem is the inability of physical educators to cope with the tangled mass of primary objectives claimed for the programs (Koslow, 1988). Physical education has long tried to be all things to all people. Not only have we professed to achieve objectives related to skill development, fitness, leisure skills and lifetime activities, self concept, teamwork, and fun; we have felt the need to justify our programs by professing academics were enhanced by physical education activities. These claims have not solidified physical education's position in the total school curriculum. It has only served to add to the confusion.

In the physical education profession, many programs are conducted by the 'I believe' premise (Rink, 1987). Programs are designed in a particular manner because the teacher believes it is appropriate. Research based data, although not as abundant as in other curricular areas, are available. Yet, it is often unused to guide development and implementation of the curriculum in schools. It appears physical educators have a marketplace philosophy (Miller, 1988). Whatever current trend appears, the bandwagon gets full of converts and the trendy activity is included in the curriculum without apparent forethought as to its effect on stated objectives.

As a result, students are suffering from 'overexposure' (Rink, 1987). Ask secondary teachers what their purpose is for offering activities in physical education. A common response would be a desire to expose students to numerous activities giving them a basis for future participation decisions. How many of us participate in sports and games when we are unsuccessful? Merely exposing students to an activity does not provide the opportunity to acquire the necessary skills to ensure success more than 50% of the time for a new activity.

Problem of Accountability

What must be understood is that an adequate job of teaching the subject matter of physical education is impossible if a clear definition of the intended outcome is unavailable. We must be accountable for the curriculum based outcomes. Of course, achievement cannot be expected if there are five different goals to achieve in the time allotted. In addition, there must be a coordination across the levels in a school division to ensure that all students have a physical education program that is articulated across grade levels. Vertical curriculum planning must replace the horizontal planning within school divisions (Pangrazi & Darst, 1985).

Unfortunately, in practice, the physical education curriculum is not always coordinated across grades K–12 in schools. Learning experiences should build on previous years. Yet, units often begin at square one each year, regardless of the number of years square one has been taught. This behavior is unacceptable if physical educators are to be held accountable for student learning.

Faced with the necessity for accountability, physical educators must find ways to measure outcomes. Few standardized tests other than fitness tests are available that are appropriate for use at each grade level (Jewett & Bain, 1985). Thus, there is a reliance on perceptions of programmatic outcomes based on personal experience or experiences of others without benefit of valid support (Osness, 1987).

However, prior to determining how the assessment will be done, the primary

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curricular goal must be identified. The goal should be one that can be reasonably attained within the instructional framework available.

Many states now have essential skills or standards of learning for each grade level and/or subject area in the recommended curriculum, physical education included. The physical education standards that cross grade levels have attempted to include objectives that are sequential and reflect what is appropriate for a student at a particular grade level. These guidelines should enhance the articulation and coordination of the physical education curriculum in a school division. However, the existence of state guidelines does not assure that the goals or objectives will be addressed in an elementary or secondary school.

A study completed in Illinois secondary schools found the primary reason for selecting curriculum content (95%) was to provide a variety of activities for the students (Kneer, 1986). There was no theoretical basis for the content included in the curriculum. Even though guidelines in the form of goals or objectives were provided, teachers did not feel an ownership and thus did not use them.

Problem of Time

Motor learning takes time (Rink, 1987). However, in the United States, only 36.3% of the students in grades 5 through 12 participate in daily physical education (Ross, Dotson, Gilbert, & Katz, 1985), while 36.4% of the students in grades 1 through 4 have the opportunity (Ross, Pate, Corbin, Delpy, & Gold, 1987). Additionally, children in grades 1 through 4, on the average, receive physical education 3.1 times per week. Only 2.3 days per week are taught by a physical education specialist.

If physical education teachers want more time with the students, it will be taken away from another curricular area. Principals, as academic leaders of schools, are pressed to satisfy all constituents. There is pressure to document gains in required standardized tests taken by children and little pressure to document achievement in physical education. As a result, one often hears, "We just can't afford more time out of the classroom." as an explanation why children do not spend the state required minutes in physical education with a physical education specialist. However, the allocation of more time each day with the specialist will not necessarily detract from the student's performance in classroom activities.

Children in an experimental program did not experience any decrement in classroom performance when physical education was conducted for one hour a day, five days a week (Shephard et al., 1984). These findings supported earlier ones (Martens, 1982; Thomas, Chissom, Stewart, & Shelley, 1975). Therefore, it would appear that providing more opportunity to achieve physical education objectives will not impinge negatively on the classroom performance of the children involved.

However, the point remains, a student cannot become skillful in a sport without playing a sport. Practice must be pertinent, purposeful, progressive, paced, and participatory (Siedentop, 1983) for students to learn. The time allotted to physical education, especially at the elementary level, is not adequate to allow learning to take place. Students need to be exposed to a skill, activity, or sport, then afforded opportunities and provided with additional instruction that focuses on thorough or continued development of this skill. If a teacher is to be held accountable for student learning, students must have the opportunity to practice the material to be learned.

Suggestions

The implementation of the physical education curriculum will be better coordinated and perhaps more effective if teachers in a school division communicate and make decisions that reflect a sound curriculum based on available data on how children learn. The following are provided as suggestions:

1. Identify the one or two goals that will guide the curriculum for each age level and design learning experiences to achieve those goals.

2. Design the curriculum to be progressive and sequential in nature to enable the students to build on previous learning rather than repeat the same material each year.

3. Determine a means to evaluate student progress toward stated goals and objectives. Share the data with students, parents, and administrators.

4. Utilize the results of the evaluation when planning additional learning experiences to enhance the performance of students.

5. Make efficient use of the instructional time available. In addition, use available data to advocate for a specialist to teach at least the state required time for physical education with a reasonable number of students.

6. Articulate with administrators, other teachers, and parents to educate them on the goals of the physical education curriculum, which is perhaps most important of all. The articulation will allow more coordination between physical education and the rest of the educational program of students.

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Coming of Age for the 21st Century: Visual Arts Curriculum Planning

by Carmen L. Armstrong

Curriculum reform movements of the 1980's have affected visual arts curriculum generally and in specific ways. In general, the Discipline–based Art Education (DBAE) reconceptualization, originating out of art education theory, reflects the more broad reforms which view education as serious study. This approach is being given definition and heavy support by the Getty Center for Education in the Arts, has been reinforced by goal statements of the National Art Education Association, and is one of the major influences on the mandates for fine arts high school graduation requirements and the nature of fine arts goal statements of state boards of education. These directions lead to a new, vital role of art education within the general education of the young people of our nation in the next century.

This article explores some curricular history in the visual arts area that has helped shape this field in the 1980's. The nature of these changes in visual arts effects the more general reform recommendations which underlie expanded structure (content and behaviors) of visual arts education as well as those curricular challenges inherent in such an expansion. Recommendations will be offered for consideration in planning for the new discipline–based art education.

The Adolescent Period in Art Education

The history of art education shows that it has identified with a variety of justifications and curricular emphases. This vacillation can be explained by the adolescence of art education in relation to the other disciplines of formal education and its generally tenuous acceptance. Schools, and the society that has supported education, have not considered seriously that people can be educated to deal more intelligently with 90% of the information that comes to them in a lifetime through the visual sense.

In addition, art teachers, rewarded throughout their involvement with art for independent and divergent thinking, have frequently preferred to plan their own teaching rather than conform to curriculum plans to which they had not contributed. They became accustomed to a semi–isolated role in the school and have not articulated their contribution well. In many cases, they have not pointedly taught for efficient processing of visual information, nor created excitement about the world of art that has consistently existed throughout history and across cultures.

Recent Curriculum Developments in Art Education

Even in the 1960's, art education leaders with a vision for responsible art education did not advocate such independence. Eisner called for structured curriculum development in the visual arts, maintaining that ...artistic learning is not an automatic consequence of maturation" (1968). Eisner continued to describe the Kettering–supported curriculum development project which demonstrated 1) that artistic learning can be facilitated by instruction; and 2) that a curriculum developed with clarity and with instructional support for the elementary school teacher working in the self–contained classroom can be used effectively to enable even the very young child to obtain both competence and satisfaction in the visual arts.

Simultaneously, innovative approaches to curriculum development were going on in other parts of the country. Rouse & Hubbard (1970a) were papering the walls with huge scope and sequence charts in preparation for publication of Art: Meaning, Method and Media (Rouse & Hubbard, 1970b), the first structured and sequential curriculum in art education designed for self– contained classroom use in grades one through six with student texts and explicit teacher manuals.

This endeavor was followed by other published elementary level art curricula (Alexander, 1988; Chapman, 1986; Hubbard, 1987) and the Southwest Regional Educational Laboratory's (SWRL) Elementary Art Program (1976). Most of these projects used a significant number of photographs of works of art in their textbooks, and as such, were different from the almost exclusive art production emphasis of art education in practice. The SWRL program, however, provides filmstrips of works of art. As implemented in the Institute for Educators on the Visual Arts, a program of the Getty Center for Education in the Arts, this filmstrip/guide format encouraged teachers to engage students in serious discussion of the works of art presented. The Herberholz (1987) art reproductions and guide designed to accompany the Hubbard (1987) art curriculum, likewise promote students' serious contemplation and discussion of art. Poster–size art reproductions (over 800 available from Shorewood Reproductions) enable students to view and discuss visual qualities easily obscured in books and allow the information noted to remain accessible throughout the lesson or lessons for which it is relevant.

Continuing the trend toward structure and sequence, Planning Art Cur-

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riculum (PAC) (Armstrong, 1979) was developed in response to criticism from art teachers of too little teacher choice in the art curriculums published for self–contained classroom use. PAC is a card format system for art teachers to use in planning kindergarten through grade eight art lessons. It includes vertically sequenced concepts, goals, and art experiences together with student interests and characteristics typical for each grade level. Teachers plan lessons by selecting cards that, combined, are components of a viable art encounter. The art experience cards include some perceptual awareness and appreciative experiences, but this area could be more boldly expanded to specifically identify experiences based on the art history, art criticism and aesthetics content areas of art education.

Recent examples of art curricula designed for the secondary level art teachers (Mittler, 1986; Goldstein et al, 1986) emphasize the integration of art criticism, art history and aesthetics experiences with art production activities in keeping with current developments in the field of art education. Probably because of the wide variation in the structure of high school programs, no vertically sequenced secondary curricula in art are commercially available. Secondary art teachers need to responsibly address curriculum development as applicable to their own district programs, and many elementary art specialists will prefer to do so, also.

Current Status and Recommendations for Art Education Curricula

Based on recommendations of Manual Barkan (1966) at the 1965 conference on Supervision and Curriculum Development in Art Education, pleas for refocusing by leaders in art education (Madeja, 1980; Zimmerman & Clark, 1981), and results of research which exposed shortcomings of the studio emphasis of art education (Wilson, 1966a, 1966b, 1972), attention was drawn to the importance of more specific instruction in art history, art criticism and aesthetics content areas. As if the recommendations suddenly came of age, in 1985 the National Art Education Association published goals for art education that supported the four content area emphasis (art production as the fourth area). With the impetus of programs of the Getty Center for Education in the Arts in a variety of ways (1984 and continuing), this message has had great impact.

The educational reform movement also set the stage for a more 'serious' art education. State departments of education have responded with goals and objectives for the arts; states have legislated the fine arts as one of the major areas of study in the schools and have included visual arts in a variety of combinations in high school graduation requirements; and college entrance requirements are including the study of art. State assessment plans include the visual arts, and that prospect alerts teachers to seek means of gathering evidence of art learning by non–traditional means and to prepare students for state assessment by traditional instrumentation.

All of these changes have impacted on and will continue to influence local district curriculum planning as well as art teacher retraining and preparation. Art teachers who have entered the profession because of an affinity to a studio area will probably need to expand their knowledge base for curriculum planning and develop new strategies for instruction in aesthetics, art history, and criticism. Art teachers are rising to this challenge, and are requesting assistance in expanding the curriculum content and methods that they may have only casually addressed in the past.

Custom Planning a Visual Arts Curriculum

Planning art curricula, which has always been a gigantic task is now even more challenging with the emphasis on the more complete content—art history, art criticism, art production, and aesthetics. With each of these comes an expanded consideration of the process skills involved in their introduction—perceptual analysis skills, critical thinking, and relating and synthesizing skills, and verbal (oral and written) expression of students' observations. A broad representation of cultures and art forms is needed in selection of exemplary visual resources.

Starting with principles that have not changed, any curriculum must remain compatible with (yet continually challenge) the intellectual and physical capabilities of the student. Student interests can serve as motivators or subject matter possibilities and may 'customize' the structure of a curriculum based on the discipline content. Variety in dimension of art production activities, length and type of activities (discussion, analysis, production), media, historical and contemporary exemplars, etc., are obvious considerations.

Expansive and unwieldy discipline content could easily discourage curriculum planning. In art, there are simple to complex hierarchies in connection with numerous concepts and principles, but not one major hierarchical structure as commonly described for 'disciplines.' Therefore, curriculum development in art may be more complex—finding compatible and supportive links between concepts within hierarchies of domains of the four disciplines which comprise art education. Classification of that content is critical to making the best selections and combinations, to avoid undue redundancy, and yet to provide a comprehensive education.

Content and Behaviors Organization for Art Curriculum Planning

Expanding the domains identified by Barkan, Chapman & Kern (1970), a curriculum developer in art would consider visual arts **content** as having 1) a structural domain, 2) an historical domain, 3) an aesthetics domain, and 4) an art forms and media domain. One would also consider art **behaviors** as having 1) production inquiry strategies, 2) art criticism skills, 3) philosophic skills, 4) art historical inquiry skills, and 5) techniques and manipulative skills.

Content

The structural domain includes the subsuming and subordinate concepts related to the elements of art and principles by which they are commonly organized (Barkan, Chapman, & Kern, 1970; Davis, 1971; Armstrong, 1979).

The historical domain includes: periods, dynasties or eras of art; cultures; ethnic, folk, and popular arts; themes as related to contextual variables; styles; and individual artists. The aesthetics domain includes questions about the nature and value of art, meta criticism and media–related questions about art in general, and the way aesthetic theories (imitation, expression, formal organization, social institutions, or combinations of these) answer these questions (Armstrong, 1988). The art forms and media domain includes art forms categories such as painting, sculpture, design, weaving, etc.; media categories such as stone, acrylics, plaster, copper, dye, wood; and equipment categories such as loom, printing press, kick wheel, kiln, canvas.

Behaviors

The production inquiry strategy focuses on behaviors such as visual analysis, classify, hypothesize, synthesize, evaluate (Armstrong & Armstrong, 1977; Armstrong, 1979, 1986). The art criticism skills include description of facts, technical and sensory qualities; formal analysis; expressive qualities; interpretation; speculation; and evaluation (Feldman, 1967; Broudy, 1972; Hamblen, 1986). Philosophic skills include inference verification, plausibility, assumption and premise validity, and definition (Stewart, 1988; Erickson, 1988); and reasoning skills of observing, inferring, generalizing, defining, formulating and evaluating lines of reasoning, and making distinctions (Ennis, 1980) relative to the visual arts. Art historical skills would include documenting facts and conditions, reconstructing, interpreting meaning within the context of the era produced, explaining a work in terms of influences, traditions, themes; and forming principles that operate in the work (Erickson, 1983; Mittler, 1986).

Curriculum planning involves appropriately selecting the teachable subordinate concepts derived from any category of any domain that will contribute to a viable learning experience for students and arranging the experiences so that learning can meaningfully accumulate for the student. Some procedural suggestions follow:

1. Sort information that can be taught by domains and categories.
2. Sort within each category by complexity.
3. Assign levels of information to appropriate grade levels or courses.
4. Continue to plan for one grade level or course, looking for relationships between items in all categories of the domains that will contribute to a meaningful encounter with art.
5. Sequence encounters according to logical sophistication of conceptual development or within domain expansion, time periods, dimension variation, etc.

For example, imagine that all the items under each category of each domain of content and behaviors are written on separate cards. If there are 100 aesthetics generalizations that one desires to introduce over a five year period as encounter organizers (for selection of art historical exemplars, subjects of art criticism experiences, art production activity, and aesthetics discussion), the generalizations would be sorted into five groups that vary in sophistication or suggest application to different courses scheduled. Having done the same with each category of each domain, the curriculum developer would look for those good matches between components that have been selected to be taught at one level. The PAC (Armstrong, 1979) system is a model for this approach to synthesizing content in curriculum planning.

Horizontal sequencing (for logical movement from one encounter to the next throughout a term of study) would follow and be determined by logical conceptual sophistication or prerequisite learnings, part to whole considerations, chronological orderings, present to past, familiar to strange, strange to familiar, concrete experiences to abstract ones, or ever widening circles of understanding (Doll, 1986).

Validity and Viability of Curricula

A responsible, organized approach to content selection contributes to accountability for that content. Charts or grids where the curriculum developer would tally the frequency of use of content from hierarchies within a specific domain, or write in key descriptors, would help in demonstrating comprehensiveness and reinforcement of structural components without redundancy. Accountability for comprehensiveness and use in the curriculum is a content analysis validity check (Thompson, 1975).

Similar grid structures could demonstrate meeting the curriculum goals through the encounters planned (philosophic validity—agreement between purposes, content and means), subject validity (accurate and significant representation of the products of inquiry as well as the means of inquiry), and political feasibility (community expectations as well as a community– of–educated–persons' expectations). Viability means 'Does the curriculum work?' and, while a curriculum **plan** awaits this demonstration, it must appear to be able to work—in planning of time, difficulty level, resources, and teacher expertise needed (Thompson, 1975).

Summary

Recommendations for curriculum planning in art have expanded the content to include art history, art criticism, art production and aesthetics in integrated encounters, and have called for written, structured and sequenced curriculum plans. Planning art curricula may involve a course or as many as thirteen grade levels (K–12) and possibly multiple courses at each grade level in high school. Expansive content demands an organized structure in order for a teacher to be accountable for comprehensiveness and appropriateness of the curriculum, and a classification and sorting procedure is recommended to accomplish this.

Growing out of adolescence is never easy, but art education is proceeding in a responsible direction of curriculum reform as it enters the 21st Century.

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Curriculum Improvement: The Concept and the Activity

by Robert C. Morris

How are diverse young people to be assisted toward utilizing their intellectual and creative capacities? How are testing instruments and technology to contribute to the cause of cognitive mastery on increasingly complex levels? How is teaching to be evaluated? How is the social environment to be rearranged to resolve the problems of disadvantage? And finally, how are appropriate curricula to be constructed, coordinated and justified? All of the above questions merit investigation on their own, but the last question is in many ways a summary of all the questions that precede it. Given the current intensity of reform efforts on curriculum, it is hoped that the following article will serve as a guidepost for those involved in the articulation activity.

Any curriculum guidepost, regardless of its merits, will not have impact on schooling until it is used and integrated. But experience suggests that it has been easier to propose new curricula than it is to 'accomplish' curriculum implementation. In studies of these processes, it has become clear that the teacher, as the user of curriculums, plays a key role in the fate of any implementation program. The emphasis here will be on developing an implementation model with processes such as the outlining of goals and purposes, distinguishing between learner characteristics and objectives, subject content, assessment techniques, teaching/learning activities, support services, and evaluation.

The Instructional Design Plan

The approach and procedures described here will be called an instructional design. This method can be applied on any educational level—elementary, secondary, or college.

This plan is designed to supply answers to questions, that may be considered the 'essential elements' of instructional technology:

1. What must be learned? (objectives)
2. What procedures and resources will work best to reach the desired learning levels? (activities and resources)
3. How will we know when the required learning has taken place? (evaluation)

The plan itself consists of eight parts:

1. Consider goals, and then list topics, stating the general purposes for teaching each topic.
2. Enumerate the important characteristics of the learners for whom the instruction is to be designed.
3. Specify the learning objectives to be achieved in terms of the measurable student behavioral outcomes.
4. List the subject content that supports each objective.
5. Develop pre–assessments to determine the student's background and present level of knowledge about the topic.
6. Select teaching/learning activities and instructional resources that will treat the subject content so students will accomplish the objectives.
7. Coordinate such support services as budget, personnel, facilities, equipment, and schedules to carry out the instructional plan.
8. Evaluate students' learning in terms of their accomplishment of objectives, with a view of revising and re–evaluating any phases of the plan that need improvement.

This is above all a flexible process. There is an interdependence among these eight elements; decisions relating to one may affect others. What follows is a brief overview of each of these eight parts.

1. Goals, Topics, And General Purposes

What do you want to accomplish in teaching each topic? Most often, instructional planning starts with the broad goals. These goals may be derived from three sources—society, students, subject areas. Goals determined from our society include concepts such as establishing personal values inherent in change, developing responsibility and concern for self and others, and selecting personal objectives but being open to alternatives. Such goals involve philosophical and ethical considerations derived from the perceived wishes or demands of the community, the nature of the institution, or other direction–establishing elements that control the particular educational program (Kemp, 1977).

Students' educational goals may include job preparedness, problem–solving skills, or constructive use of leisure time. Those goals which relate to subject areas may be stated more specifically such as to develop the ability to communicate effectively by oral or written means (language arts). So, planning for instruction often starts with teacher–oriented statements of purposes selected in relation to the broad goals of an institution or program.

Because of a need to pay attention to student interests and needs, one may want to start planning with a consideration of learner characteristics. This approach is flexible—arrange the planning steps in an order that is most suitable.

2. Learner Characteristics

What factors do you want to know about the student group or individual

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learners that will affect plans for their learning? To best assure success, we should recognize and respect the student as an individual. Ideally, each individual should be assisted in pursuing learning at his or her own pace, schedule, and selection of learning experiences and materials. To serve both individual and group means, we must obtain information pertaining to capabilities, needs, and interests.

Learning conditions refer to the groups of factors that can affect a person's ability to concentrate, absorb, and retain information (Dunn & Dunn, 1975). We all know that some teenagers study best with popular music blasting. They feel comfortable with a noise background, ignoring it when they concentrate. How an individual responds to sound in the learning environment may be an important condition to that person's learning.

Dunn and Dunn (1975) describe four conditions: the physical environment (sound, light, temperature, and choice and arrangement of furniture), the emotional environment (individual motivation, persistence in a task, and willingness to take responsibility), the sociological environment(preference for individual or group work, response to an authority figure, and so on), and a student's own physiological makeup (sensory strengths and weaknesses, need for food, restlessness or need for mobility, daily use of time or biorhythm for efficient functioning).

Some students will find certain methods of learning more appealing and effective than others. The various learning styles will profit some students more from a visual approach; others from verbal (listening and/or reading) experiences; and others from physical activities and the manipulation of objects. The attempt to identify a person's unique learning style relates to a procedure called cognitive style mapping. This method provides a framework for describing and diagnosing each individual's way of searching for meaning when confronted with a particular educational task.

3. Learning Objectives

What should students know or be able to do, or in what ways should they behave differently, after studying this topic? This next step is the difficult but essential job of specifying learning objectives. I speak of learning objectives because the concern is with learning as the outcome of instruction. Learning requires active effort by the learner.

Objectives for learning can be grouped into three major categories—cognitive, psychomotor, and affective. The domain given most attention is the cognitive domain. According to Bloom, it includes objectives concerning knowledge, or information, and thinking–naming, recognizing, predicting, and so on (Doll, 1978). One of the challenges in instructional planning is to devise learning objectives and activities that can help students have experiences in all of these intellectual levels. Indeed, curriculum planners should arrange for students to attain objectives in the psychomotor and affective domains as well.

4. Subject Content

What subject content should be treated or what subject content supports each objective? A student's learning experiences must involve subject content. The content has to relate to the objectives and to the student's needs.

A definite structure is inherent in the subject content of some topics. In those cases enumerating subject content helps in the formulation of the learning objectives. At other times, objectives can be stated first. One should employ the procedure which seems appropriate to the situation, always recognizing the close association of objectives and subject content.

What is meant by the term subject content in the text of this instructional design plan? It comprises the selection and organizing of the specific knowledge (facts and information), skills (step by step procedures, conditions, and requirements), and attitudinal factors of any topic. If you make notes or prepare an outline of information for a lesson, a speech, or a report, you list subject content.

You might find it useful to ask questions like the following, as you prepare to list the content for a topic:

- What specifically must be taught or learned in this topic?
- What facts, concepts, and principles relate to this topic?
- What steps are involved in necessary procedures relating to this topic?
- What techniques are required in performing essential skills?

Answering questions like these will tell how to select subject content. Anyone who has ever taught anything to someone else knows that, for learning to be successful, certain parts of any content must be mastered first, as a basis for subsequent learning.

5. Pre–assessment

Does each student have the background preparation to study this topic, and may he or she already be proficient in what is to be taught? Now that we have examined learning objectives and the subject content, it is time to ask two questions: 1) is the student prepared to study the topic or unit? and 2) is the student already competent in some of the stated objectives?

In traditional instruction, these questions are answered by using placement and diagnostic tests as ways of determining students' background in the subject. General knowledge can be acquired through data gathered about learner characteristics, which was discussed earlier in this paper. But it is important to gain more specific information in order to plan learning activities beneficial to learners. Pre–assessment can give this information.

A prerequisite test determines whether students have the appropriate background for the topic—for example, can the students perform basic arithmetic at a level that qualifies them to start learning algebra? It is useful to prepare a complete list of required competencies in order to establish the basis for constructing the prerequisite test. The results of this test will indicate which students are fully ready for the topic, which ones need some remedial work, and which ones are not ready and should therefore start at a lower level.

A second reason for the pre–assessment is to determine which of the objectives students have already mastered. It may be proper to select or adapt for the pretest, questions and problems from the evaluation instruments. Some authorities recommend using the actual evaluation tests for both pretesting and final evaluation. In this case, the amount of student learning is determined from the gain in scores between pre– and post tests.

Finally, the results of pre–assessment may also affect instructional planning. It may be necessary to eliminate, modify, or add objectives to the program after the results are analyzed.

6. Teaching/Learning Activities and Resources

What instructional methods and instructional resources will be most appropriate for accomplishing each objective? All of the planning done up to this point has been preliminary to selecting the teaching/learning activities for the instructional plan. One must determine the most efficient and effective methods and then select materials to provide learning experiences that will utilize the content associated with each objective. The terms most efficient and most effective, along with the best way, are often used in education to describe what should be done. It is my purpose here to offer some basis on which to make decisions relating to an accepted level of achievement in a reasonable amount of time.

There are many roads to learning. Traditionally, teachers would present information to groups of students through lecturing, talking informally, writing on the chalkboard, demonstrating, and showing audiovisual materials. Today teachers no longer stick to these patterns consistently when structuring an instructional program. Even when this pattern of teaching is visible, it has its disadvantages.

When a teacher presents subject content to a class of students, the assumption is made that all students are acquiring the same understanding, at the same level of comprehension, at the same time. Students are being forced to learn in lockstep at a pace set by the teacher. We realize that this is not the way learning takes place. Each student learns at an individual pace, to his or her own degree of understanding. Therefore, the group presentation does have some disadvantages.

The current trend is to reduce the amount of time spent in teachers' presentations, in favor of devoting more time to individual study and to group activities. Thus, students are actively engaged in learning most of the time.

In the interactional teaching/learning pattern, teachers and students—or students themselves—work together in small groups to discuss, question, pursue problems cooperatively, and report. The importance of interaction cannot be overemphasized. It gives students and teachers an opportunity to get to know each other.

Other values also derive from the teacher/student interaction. These include experiences in listening and in oral expression when students organize and present their ideas. Students who need encouragement can be recognized, and those who make poor progress can be aided and identified.

7. Support Services

What support services are required to implement the design plan? In traditional education programs, educators often make plans for using certain instructional methods and for gathering or preparing materials, without considering what support services they will require. It is recommended that the services such as—certain equipment, a particular room, a sum of money, or specific professional or technical assistance be regarded. If these services are neglected, it could result in a severe limitation on a new program. Support services must be considered at the same time instructional plans are being made and materials, being selected. These support services were considered in this developmental plan:

1. Budget
2. Facilities
3. Equipment
4. Time and schedules
5. Coordination with other activities

8. Evaluation

How will the amount of student learning be measured? This is the payoff step in your instructional design plan—for both you and your students. You are ready to measure the learning outcomes relating to the objectives. Your objectives indicate what the evaluation should be. Certainly if achievements fall short of objectives, there will be no shortage of explanations or excuses.

One way to determine whether an instructor is teaching for high–level objectives—applying principles and problem–solving methods in the cognitive area, using tools and operating equipment under the motor–skill performance category or appreciation as an attitudinal objective—is to examine the final examination or other evaluation instrument. If the teacher is really attempting to measure the outcomes specified by the objectives, this will be reflected in the testing.

As a result of planning within an instructional design, it is intended that each student should reach a satisfactory level of achievement. When criteria are set and students successfully attain them, the concept of mastery learning is realized. This is the technique of prompting student success in learning as the proper outcome of an educational program.

Summative evaluation is concerned with evaluating the degree of the students' final achievement of the objectives, as shown by the unit, course, or module post–test. A competent evaluator will know how to devise instruments for measuring students' attitudes and instructors' reactions, and how to analyze the data on learning for each objective.

Summary, Inferences, and Implications

There is much talk about innovation, but much less discussion of what particular problems are being faced or what new resources are being utlized to solve them. The general goal of improving the school is too vague for effective focus of limited resources. To rebuild the total education program is far too large a task to be undertaken with the

resources most schools can command. It is necessary to identify a problem on which to concentrate the attack, a problem recognized as serious by those who will be involved in attacking it.

The issue of where responsibility lies for making school curriculum decisions is one that possesses great diversity of opinion. Teachers, administrators, school boards, and parents, all believe that they should have input and all vie for increased influence. The curriculum, however, is primarily decided upon at the moment of its enactment. This takes place at the most fundamental level: The dynamic interplay of ideas between child and teacher in response to the curriculum. This, however, is not to suggest that other forces do not play a critical role in helping to decide the thrust of a program.

Currently, teachers and administrators are feeling the sting of criticism leveled at the schools, which contends that inadequate and superficial educational activities are taking place, from elementary up through high school. In response to such criticism, various groups, with vested interests in education, are making their views known. Each viewpoint has validity and is an important segment of that scene that must be respected as such.

These clamoring demands on the process have implications for the principal agent of change—the teacher. Within the school, the teacher remains that principal delegate for nurturing knowledge and intelligence in students. Teachers, by the very nature of the role they assume in the school, make numerous decisions about the direction, depth, and content of what is brought to the students' attention. Likewise, students, individually react to the presented curriculum, thereby influencing their teachers' perception as to how the curriculum is being received.

This dialogue does not include the notion that the teacher should be allowed to indulge or otherwise become intoxicated with the power that accompanies that role. Rather, the position calls for a temperate and open–minded approach toward curriculum design. I feel that the eight parts of this instructional design plan need to be continually emphasized as teachers explore new methods of planning and instruction.

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Curriculum and Instruction: Acknowledging the Complexities of the Classroom

by Bruce A. McNair

Classroom practices have changed in the recent past. Forces that were energized by the many reports during the mid 1980's on the mediocre state of public education have put into motion a series of influences on school and teaching (Doyle & Harte, 1985; Fuhrman, Huddle & Armstrong, 1986; Glickman, 1987; Wise, 1988). As often is the case when something is not as it should be, there was a reaction, a quick response to long standing problems.

How could educators insure that students would learn more in school than in the past? More control of the actual classroom learning process in the areas of curriculum and instruction was one response. This control was located outside the classroom and even outside the school and local system. State governors, legislatures, boards of education and departments of education have passed new laws and regulations that have effected much of the fabric of classroom teaching and the learning process. This article will address some of the conditions that reforms have created and tell how a technocratic viewpoint of curriculum and instruction has resulted in rather restricted solutions to the problems of public education.

A major focus of the reform movement has been the content of the curriculum. There has been much emphasis placed on providing a uniform curriculum to all students in a state. Numerous states have established sets of objectives in each subject area in order to insure that all students are exposed to the same or similar experiences with the listed content. State curriculum guides are being divided into sets of specific information that should be taught at each grade level so that the scope, sequence and schedule is spelled out for the teacher. In addition, a majority of states have to adopted a statewide testing program in order to assess how each district, school, classroom and pupil measures up to others in the attainment of the state curriculum.

Formerly, state curriculum was used as suggested basic content. Now, new comprehensive guides are mandated. School systems, schools and classroom teachers are free to add other objectives, but this is more difficult to do since the state curriculum is becoming more inclusive and therefore does not allow for many additions because of time limitations. Publishing companies circulate booklets in the various states which indicate how their textbooks will meet all the content mandated by the state. When schools select textbooks, the strongest criteria for selection is how well each series matches the state's curriculum.

Because of their emphasis on the specific content which schools must use, the state mandates have far reaching effects on how the curriculum is viewed. To hold the notion that this mandated written curriculum somehow insures what is learned in the classroom is to view curriculum from the narrow perspective of content which is contained in a written guide and can stand apart from other considerations. If educators take the position that curriculum is a simple selection of subject matter, then simple solutions will be proposed for complex problems. State reform actions represent that view. The response to improvement is a simple one which said that content should be specified, and it should make certain that teachers use it. This says to everyone that curriculum is nothing more than a bound document which outlines and specifies a series of lessons.

Few would argue that things are this simple. A more complex and integrative understanding of curriculum would include more than the content that is listed in a guide to be taught to students. Experts in the field most often define curriculum in broader terms which include intent, teaching, environment and student's perception of the material (Oliva, 1988). Perhaps Frymier (1987) best summarizes the more complex and inclusive view when he identifies curriculum as not only what is taught, but how it is taught and why it is taught.

There is also much in the literature to support the view that curriculum is something more than what we plan to teach pupils. Eisner (1988) describes the explicit curriculum as that which is consciously taught to students. He adds another dimension called the implicit curriculum as that which students learn from the culture of the classroom and school. This concept supports the notion that it is not possible to make a simple listing of content that students should know, and describe it as the minimum basic or quality core curriculum. Weade (1987) further expands that curriculum is different at various stages in an action timeline. She sees these stages as the planned curriculum, delivered, engaged, enacted, received and finally the measured curriculum. Curriculum is more than what we consciously plan for students to learn. It is not sufficient to simply plan and mandate content in order to somehow give students information that everyone needs to know.

State mandates about curriculum, although often an attempt to improve learning, do not deal with the realities that something happens when the plans we make enter into the interactions be-

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tween students and teachers. They ignore the teacher who knows that the same materials in different situations need different treatment and emphasis. When curriculum is mandated, many teachers will just go through the motions of teaching so that they can cover the state objectives. It is not easy for teachers to feel in control when this technocratic view has reduced the curriculum by not allowing teacher input except at the level of 'adding' if time and energy permits. Certainly the fact that teachers have completed a college program and have studied in their subjects would suggest that this simple view of curriculum is not enough to fully use teacher expertise.

In addition to controlling the curriculum, many states have also embraced the notion that the 'teaching' of the curriculum can also be controlled. How teachers should teach has become another major focus of state reforms of education. While the content was being decided, a separate effort has been to define the way all teachers shall deliver the content. Sets of teaching behaviors have been developed that are supposed to fit any and all teaching situations. Briefly, these effective teaching strategies describe certain teaching behaviors which have been researched to support the assumption that their use will raise achievement test scores. Effective teaching becomes those teacher actions related to beginning the lesson with review, presenting new material, conducting guided practice, providing feedback and correction, conducting independent practice and reviewing weekly or monthly instruction (Rosenshine, 1986).

The idea that there is only one (appropriate) way to teach effectively is not reflected in the studies on diverse teaching strategies that can be used in the classroom. There are many such strategies which have been useful in teaching. Indeed, most teacher preparation programs introduce different teaching strategies and ask students to display a variety of these strategies in a student teaching situation.

Orlich et al. (1980), in their book Teaching Strategies: A Guide to Better Instruction refer to a broad spectrum of techniques and approaches including questioning, discussion, small group work, inquiry, discovery and simulations. Another similar text discusses different strategies as expository, discovery, discussion and inquiry (Jacobsen, Eggen, Kauchak & Dulaney, 1985). Gagne, Briggs and Stratton (1988) talk about teaching strategies as the ways teachers plan to help students meet objectives. These and other authors demonstrate that teachers are the ones who should decide on appropriate ways to present the content of the curriculum. This is what teachers are supposed to be trained to do.

When required to use a set of specific teaching behaviors, the teacher loses all strategy options. Knowledge of other teaching models is not only not used, it is unrecognized. Thus, teachers are required to use set teaching behaviors which eliminate professional decisions on how to teach. By reducing teaching to a single set of effective behaviors, assessment of instruction often becomes reduced to looking for a list of certain things that all teachers must do. In order to receive a good evaluation, the teacher often must act in mechanistic ways in order to insure she exhibits all the effective teaching behaviors.

Control of how teachers teach can be seen by reviewing the new statewide teacher evaluation forms (Georgia Education Leadership Academy, 1988). Evaluation on these forms is reduced to observing the act of instruction and ignores influences of content, students and environment. Quality is measured by how well a teacher is able to produce the effective teaching behaviors. The dynamics and complexities of the classroom are eluded under this system.

By separating the concepts of curriculum and instruction, the reformers adhere to a view that these are two distinct entities which can be reduced and analyzed. Prescriptions are then made for each entity which control the teacher's behavior. This reductionist and technocratic approach does not allow for one area to even influence the other, let alone see curriculum and instruction as intertwining. Rather, the reformers are viewing these concepts based upon narrow, simple and separate definitions. Curriculum is content that can be listed in a document and tested by end–of–year standardized tests. Instruction is a list of teaching that can be described and observed. These are linear and separate ideas—the curriculum happens first and then instruction happens—each has little to do with the other.

A more complex and integrated view of curriculum and instruction would include a meshing of the two concepts in which the teacher weaves the strategies with the content as needed into various teaching/learning events. This meshing creates a continually developing curriculum in which both the teacher and student behaviors are important to eventual outcomes. Weade (1987) refers to this process as 'the construction of meaning,' that is, the processes by which the academic and social meanings (of curriculum and instruction) are created through the interactions among teachers and students.

Teaching a lesson about community to second grade children in rural schools requires a whole different set of assumptions, approaches and behaviors on the part of the teacher than teaching the same lesson in an urban setting. The interaction between the students and the teacher during the lesson will have great effect on the actual learning that takes place. A curriculum guide that contains a unit on 'community' cannot in itself represent the nuances that the teacher must bring to the lesson in order to provide meaningful learning.

It does not appear possible to create good teaching and learning for most classrooms through a technocratic approach. Reducing curriculum to a specific content and instruction to particular teaching behaviors is unrealistic. Attempts to mandate curriculum and instruction as separate and simple aspects of the classroom process will only produce mechanistic teaching. As Wise (1988) states, "A teacher must make decisions based on knowledge of the student, of the subject matter, and of pedagogy in order to create the right conditions for learning." The blending of curriculum and instruction is central to the act of teaching.

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Measurement Validity in Curriculum and Instruction Evaluation

by William Steve Lang

A great deal has been written about evaluation design and eliminating the threats to internal validity described by Campbell and Stanley in 1963 (Airasian, 1974). Likewise, the issue of choosing the proper measurement tool or variable to be measured is not a new subject (Hastings, 1972; Kimpston & Rogers, 1986). Given that the evaluation model and measurement tools are carefully chosen, most researchers assume the measurement tool is valid. This is a serious problem in evaluation (Rossi & Freeman, 1982).

Measurement validity refers to "...the appropriateness, meaningfulness, and usefulness of the specific inferences made..." (Joint Committee of the AERA, APA and NCME, 1985). Accepted types of validity evidence include **content–related, criterion–related** and **construct–related** assessment of the measurement in question. Evaluators must be extremely careful to avoid substituting **face validity** for any of the above legitimate validity estimates (Borg, 1987). This paper will offer four illustrations that emphasize this issue. Since common evaluation tools are criterion reference testing, norm reference testing, observation and summative performance, examples of each of these are included.

True Story #1

A state department of education (DOE) decided to measure the effects of a new mathematics curriculum with a criterion reference test. Many students missed items related to protractors and rulers. The DOE decided the curriculum objective was inadequately presented to the students and had math consultants run workshops across the state in teaching measurement.

In fact, the materials (protractors and rulers) provided with the state adopted materials included a clear, one–way protractor and a ruler with right and left edges that were not flush with the measurement markings. The test items included a two–way protractor and a drawn ruler with the '0' and '12' inch markings flush with the left and right edges. The items were poorly written! The two–way protractor and flush–sided ruler confused many students who were asked to measure distance and angles. Criterion reference tests (CRT's) often suffer a lack of good item analysis. CRT's sometimes contain two few items per construct to measure accurately. The solution is to perform

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traditional test construction analysis on CRT's before using them. This might include item analysis, measures of reliability, tables of specification and factor analysis.

True Story #2

Researchers wanted to evaluate the effects of a new computer–based curriculum with remedial high school students. The two dependent measures of achievement were a standardized norm referenced test (California Test of Basic Skills) and the number of modules units successfully completed by each student. The CTBS indicated an overall yearly improvement of 2.2 normal curve equivalents (NCE's) while the average student completed 33 modules. Researchers were surprised to learn that the correlation between the dependent measures (N=4293) was only r=.05 (Lang, Branch & Thigpen, 1987)!

The problem here is that the CTBS, tough valid for some uses, does not 'match' the curriculum. Tallmadge and Horst (1978) explain:

> It seems highly probable that, where the content of a test shows a low correlation with the content of a curriculum, the test will be insensitive to whatever gains the curriculum might produce. The problem is aggravated by the fact that students gain only a few raw score points on a **total** standardized test during a normal school year. If only a few sections of a test are relevant to the curriculum, even dramatic gains on these sections may have little impact on the total scores...It seems to us that the only valid way to assess the effects of an instructional treatment is to use a test that measures what was taught. Not item by item of course—but the test items should be samples for the same domain as the teaching/learning exercises.

This problem is more pronounced when testing remedial or gifted students. The solution is to avoid NRT gain scores on special students unless you have **evidence** (not face validity) that the measure is effective with that population and curriculum.

True Story #3

A state department of education wanted to evaluate teachers for minimum competency. Five thousand educators were asked to identify a list of competencies essential for beginning teachers (Georgia Department of Education, 1985). A resulting observation instrument was developed and used extensively. Repeated study demonstrated a lack of criterion–related validity for the instrument despite the massive and costly development process (Hawn, 1982; Johnson, 1985; Lavely et al., 1987; Sloan & Capie, 1986).

According to the GDOE (1985), the problem of correlating student achievement test gains with observational teacher effectiveness is "...perhaps reflecting the lack of curriculum relevance." Presumably, this means better teaching will not produce better student achievement because the curriculum and student abilities are what matter. This author concludes instead that the observational instrument is simply not valid because the process of asking educators for indicators of effectiveness represents **face validity**.

A literature review and instrument assessment concluded this particular instrument lacked construct or content validity prior to its use. Whenever evaluation measures are observational, many complex issues are involved. These issues must be considered carefully in the instrument development. If an observational tool is necessary, refer to the literature and avoid the common problems. Suggested references would include Boehm & Weinberg (1977), Borg & Gall (1983), Borich & Madden (1977), and Hodge (1985). Evaluators should be careful not to substitute project size and political expediency for validity.

True Story #4

A small college was disappointed that Scholastic Aptitude Test (SAT) scores and high school grades were not accurately placing freshman students in mathematics classes. A committee chose the Comparative Guidance and Placement Test (CGP) to aid in placement decisions. The CGP Technical Manual (Education Testing Service, 1984) reported internal consistency for the math tests from .80 to .92. An evaluation of data revealed that placement decisions using the CGP did not improve the hit/miss ratio.

Data analysis on the students using the test confirmed the internal consistency at .87 using the Kuder–Richardson's formula 20. That same data revealed a Chronbach's a of .32 (Lang et al., 1987). Essentially, the test publishers had greatly inflated the internal consistency of the test which contained too few items, had unclear directions and too short of a time limit. The test was not valid for accurate placement decisions.

The lesson here for evaluators is clear. Check published reliability and validity figures with a sample from the target population. This is easily accomplished with a microcomputer and any number of common software packages.

Conclusion

The illustrations offered here are typical of the problems evaluators need to look for in measurement validity, but only represent some of the possible errors. The best designs and sampling methods are worthless if the measurement is faulty. In short:

1. Check criterion reference tests for good item analysis.
2. Ensure that norm reference tests 'match' the curriculum and target population.
3. Remember that observational measures require extensive development time and sophistication.
4. Don't blindly accept published validity and reliability figures.

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