HANDBOOK OF TEACHING AND POLICY

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CHAPTER 15

Teachers as Policy Brokers in the Content of Elementary School Mathematics

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No one has ever said to me, "Why aren't you teaching math?" or "Why aren't you teaching math?" I like the flexibility. I mean, if I didn't have that, I probably would be upset. But yes, I think in 1980's there was some kind of a change, with some flexibility within it. I wouldn't mind anybody saying, "Why aren't you teaching math?" I would make me stop and think, "Why am I?"

JACQUELINE, 15 JUNE 1980

Jacqueline is one of seven teachers (grades 2-3 in six schools and three districts) whom we studied throughout the school year 1979-80 to find out exactly what mathematics they covered, why they taught the topics they did, and why they did not teach other topics. Our aim in doing this study was not to learn about mathematics teaching per se, but to find out how teachers make content decisions. We considered a variety of potential influences on these decisions, including not only hierarchical factors, such as district test and textbook policies, but also interpersonal factors such as advice from other teachers and parents.

Mathematics is a good starting point for this inquiry. Even though it is a subject critical to many high-status occupations, it is treated as less important in elementary school than one might expect. Less time is typically devoted to mathematics than to language arts and reading. Our research raises questions of why this imbalance exists and how one might change either the time spent on mathematics or the nature of what is taught during that time.

Fenstermaker and Amarel, in Chapter 16 of this volume, argue that the autonomy of teachers to make content and other instructional decisions is essential to the good education of students. Prescriptive curriculum policy they view as harmful. They argue against rules and regulations whose "purpose is to instruct teachers on what and how to teach."

Not all teachers with reputations for excellence agree with this extreme position. Jacqueline, for example, was an enthusiastic follower of the new district-mandated textbook for fourth grade mathematics. She argued that students would benefit if all the district teachers followed the book closely. Yet she was a teacher who had confidence in her ability to teach mathematics. She reported having had good mathematics teachers throughout her own schooling and, in a previous year, had even developed her own unit to teach geometry, a topic that many elementary school teachers skip.

As researchers, we want to know how much the characteristics of district policy had to do with Jacqueline's decisions to follow the textbook so closely. In particular, how did these policies interact with Jacqueline's own convictions and other possible influences in making the textbook almost her sole source of content? Although the cases we studied may be exceptional—a possibility to be addressed in further research—our studies have led us to question various beliefs about teachers as well as certain assumptions about educational policies. For example, how much truth is there to the notion that teachers rely on outside guidance in curriculum matters? Under what conditions do textbook followings reflect commitment, not lack of commitment to the subject matter or content of instruction? Does lack of autonomy lead to abdication of responsibility on the part of teachers, as Fenstermaker and Amarel suggest?

Research has not yet shown that either autonomy or lack of autonomy invariably contributes to better-educated students. In fact, the evidence is that public school teachers are virtually never completely autonomous, nor are they completely subordinate to prescriptive curriculum policy. Through continued research, it should be possible to learn to what extent and under what conditions students benefit from teacher autonomy.

The extreme position that Fenstermaker and Amarel take derives in part from their belief about the proper content of education. In their view, subject matter is subordinate to other educational goals, which require teacher autonomy for their realization: "The exploration of subject matter should permit the teacher [as model] to demonstrate an inquiring mind, a critical and creative orientation to ideas, a respect for evidence, a tolerance for beliefs, a regard for truth, and a degree of detachment from the immediate times."

In our research, subject-matter autonomy—the structure and content of a particular discipline—plays a more important role. Rather than assume that teachers need great freedom to pursue the goals listed by Fenstermaker and Amarel, we remain open to the possibility that, under certain conditions, prescriptive curriculum policy may embody these goals. We are thereby relieved of putting as much faith in Fenstermaker and Amarel on the ability and motivation of each teacher to rediscover the more or less well defined paths that scholars have already taken toward the goals advocated in Chapter 16.

In contrast to Fenstermaker and Amarel, the chapter we have written is less marked by advocacy. Still, it does argue that empirical research can be relevant and useful in addressing issues of teacher autonomy. This argument begins with the assertion that content has received too little attention in studies of what teachers do and how schools are governed. Studies of governance have neglected the capacity that teachers have for influencing the content of instruction. Studies of teachers have emphasized teaching methods to the neglect of content. Yet, even in a highly developed and logically organized field such as mathematics, there are issues of content selection that teachers cannot easily resolve by themselves. Policies may help teachers, but they are no panacea. No external policy can anticipate all the conditions that diverse teachers of diverse students face. In the study of curriculum policy, therefore, it is necessary to deal not only with the characteristics of policies but also with the characteristics of teachers and students with which these policies are confronted. Current policies are policies of ignorance in the sense that they do not rest on an adequate understanding of how external policies affect what teachers and students do. Examples
from our research underscore the importance of teacher convictions in increasing or decreasing the effect of district policies.

Just as it is questionable whether the individual teacher can deal adequately with all issues of curriculum decision making, it is impossible for us as researchers to deal with all curriculum content (where content is defined inclusively to the cognitive, social, psychomotor, and affective outcomes of education). For this reason we limit ourselves to the cognitive content of elementary school mathematics. Our points do not necessarily apply to either secondary school mathematics or other subject matters. The issues raised, however, warrant being addressed in each of the other subject matters taught in school.

ASSUMPTIONS ABOUT CONTENT AND METHOD

Bronfenbrenner (1972) has suggested that there has been too much preoccupation in the United States with the teacher as purveyor of subject matter. But, in our view, researchers and educators have frequently taken content for granted. For example, among the decisions studied by specialists in the politics of education, content decisions do not loom large (Schwille, Porter, and Gant, 1980). Content is less salient in the literature than such matters as collective bargaining, school finance, school desegregation, and changes in enrollment. School finance studies use as measures of output, not learning outcomes but expenditures, which give little indication of what is being purchased for this money.

Content (in the sense of acquisition of knowledge) has not been of much interest to sociologists either. They have been more concerned about the control of students and the learning of values. Spady and Mitchell (Reference Note 2) cite ten works, including those of such well-known sociologists as Becker, Parsons, Simocoos, and Waller, in support of the contention that "control of students is at the center of school system concerns." A collection of syllabi for the sociology of education, published in 1976 by a section of the American Sociological Association, gives no emphasis to the cognitive content of instruction (Persell, Hammack, and Thelen, 1978). Likewise, the Marxist point of view exemplified by Bowles and Gintis (1976) gives less emphasis to content than to the organization of instruction—the correspondence between the hierarchies of school and the work place.

Even among educationists, content has often been taken for granted. For years, the dominant school of research on teaching looked for methods of teaching that would be more or less equally effective across subject matters. Subject-specific skills were assumed to be of less interest (e.g., Rosenshine, 1971). Similarly, among teacher educators and practicing teachers, questions of content have often been eclipsed by questions of instructional strategy or method (cf. Buxmann, 1982).

Whatever the reason, the taking of content for granted continues. In this volume, Elmore appears to subsume the selection of content under problems of choosing an appropriate instructional strategy. For example, he treats poor performance on standardized tests in mathematics and reading as a problem to be resolved by the teachers' choice of strategy (with support from the school system and other authorities). We would ask instead if the content of these tests is appropriate and if teachers have taught this appropriate content (as well as selected an appropriate strategy). Similarly, in the paragraph quoted below, Elmore assumes that teachers are able and willing to turn utopian content demands into a "well-organized strategy of instruction":

**FIGURE 14.1. CTS Results: Mathematical Thinking Test Intermediate Level Grades 4-5.**
Teachers receive a variety of signals about what to do in the classroom. In addition to the signals they receive from the mandated program about reading and math skills, they hear about their responsibility for teaching democratic values, discipline, the free enterprise system, health and nutrition, career choice, and the history of western civilization, to mention but a few topics. It is the teachers' responsibility to turn these signals into a well-organized strategy of instruction that responds to the range of skills and abilities they find among students in the classroom (p. 357).

We would ask whether it is justifiable to ask teachers to make the difficult content choices that this example implies.

In the last decade a new school of sociology has developed in Britain to challenge the taking of content for granted. According to this school, claims that some kinds of knowledge are worth more than other kinds have reinforced social inequality and posed an obstacle to social justice. Members of this school of thought follow Pierre Bourdieu, a French sociologist who sees schools as helping privileged families pass on their cultural capital and legitimizing this inheritance under the guise of meritocracy. According to an exponent of the "new" sociology of education, the experience of mathematics is an example in point:

Pupils have the chance to see that there is a high status group of those who can "do" mathematics and another, often larger group of lower status people who, though they appear to have had the chance to join the high status group, have failed to make it. Differentiation in such circumstances appears to be not only fair but also objective (Eggleston, 1977).

Our own approach to this issue does not presume that variation in content coverage always reinforces social stratification. Variation in content and its implications are matters for empirical investigation. We are therefore committed to measuring content coverage and to the investigation of the causes and consequences of teachers' content decisions.

PUZZLES OF CONTENT COVERAGE IN ELEMENTARY SCHOOL MATHEMATICS

Content coverage in American schools is a bit like a jigsaw puzzle. It is easy to put together a few pieces, based on personal knowledge and experience. But a national scene of content variation, in all its detail, is a challenge to assemble.

For many, to be sure, the content of elementary school mathematics is cut and dried. It is almost entirely computational skills with whole numbers and fractions. This point of view, however, is but one of several in a history of disagreement over what to teach (National Council of Teachers of Mathematics, 1970).

In the early part of this century there were frequent demands for the reduction of time on elementary school mathematics and the elimination of topics (Metter, 1934). Guy Wilson (1926b) carried out surveys of how adults use mathematics and drew on the results to justify combining the mathematics curriculum to the most commonly used computational skills—addition, subtraction, multiplication, and division of whole numbers; simple fractions; percentage; and interest. Although Wilson (1926)

propose to supplement drill with "meaning and understanding," his main concern was with computational skill. He declared that "the emphasis on one hundred percent accuracy is an important emphasis and should not require explanation...". Better perfect results are the only results that are wanted in the business world.

A sharply contrasting point of view is represented by a group of university mathematicians and scientists who met in Cambridge, Massachusetts, in 1963. They attempted to give direction to the school mathematics reform movement then gaining momentum. This group justified its recommendations through reference to the discipline of mathematics, saying that they wanted "to make students familiar with part of the global structure of mathematics."

... Mathematics is a growing subject and all students should be aware of this fact.
... The knowledge that there are unsolved problems and that they are gradually being solved puts mathematics in a new light, strips away some of its mystique, and serves to undermine the authoritarianism which has long dominated elementary teaching in the area (Cambridge Conference Report, 1963, pp. 8–9).

According to recent reports on U.S. schools (NACOME, Reference Note 3; Suydam and Osborne, Reference Note 4), this history of competing points of view has led to consensus on the teaching of whole-number computational skills but considerable variation in the coverage of such peripheral topics as metric measurement, geometry, graphs, statistics, probability, relations and functions.

In the future, even the core whole-number skills may come under increasing attack. Already, the availability of calculators leads Wheatley (1980) to propose that schools discontinue the teaching of long division with two-digit divisors.

A National Curriculum That Vanishes upon Examination

The content of elementary school mathematics would not be so problematic, at least in practice, if there were agreement on a national syllabus, such as exists in other countries. It might be said that in the United States there is such a curriculum, one that is implicitly defined by widely used textbooks and standardized tests. To examine this claim, we have analyzed the content of five of the standardized tests and three of the textbooks most widely used in elementary school at fourth grade. This analysis is based on a three-dimensional classification or taxonomy developed for the purpose (Kuhn, Schmidt, Porter, Ploden, Freeman, and Schwille, Reference Note 5).

Figure 15.1 contains the results of this analysis for the Stanford Achievement Test (STAN) and illustrates how this approach can be used to represent content at different levels of detail. The three dimensions of this classification matrix are (1) general content (i.e., conceptual understanding, computational skills, applications), (2) nature of the material (e.g., whole numbers, common fractions, decimals), and (3) mathematical operations the student must perform (e.g., multiplication, estimation, ordering). Specific topics are represented by the cells of the classification matrix (e.g., 3 of the 112 STAN items are devoted to skill in multiplying a multiple-digit number by a single-digit number). More general topics can be addressed by summing across cells to obtain material totals (e.g., 17 items on the STAN deal with multiplication).

The claim of an implicit national curriculum was supported in the analysis, but only at a fairly high level of generality. All the textbooks and tests we analyzed con-
tained material on addition, subtraction, multiplication, division, and geometry. Beyond these general areas of agreement, however, there was little evidence to support the concept of a national curriculum. Outside whole-number computation, we found substantial variation even at the marginal level of the classification (e.g., variation in emphasis on fractions, number sentences, estimation, and metric measurement). Still more variation could be seen at the specific or cell level. In the three textbooks, for example, over half the 290 cell-level topics covered (by one or more items in one or more books) were unique to a single book. Only twenty-eight percent of these topics were covered in all three books.

In examining the consistency between tests and textbooks, we found that only 69 cell-level topics were emphasized in all three books and five tests (Freeman, Kuhn, Porter, Knappen, Foden, Schmitt, and Schwille, Reference Note 6). The matched content covered was better for some textbook-test pairs than others. However, even for the best matched pair, no more than fifty percent of the topics on the test were covered by the equivalent of one lesson or more in the textbooks.

Thus, there is a good deal of variation in what might be taught in elementary school mathematics. Our research asks how teachers react to this variation. Who selects the content that is ultimately taught?

THE RESOLUTION OF CONTENT DILEMMAS: TEACHER POLICIES VS. EXTERNAL POLICIES

Teachers Make Policy

Teachers often face incompatible demands. They are subject to conflicting pressures from administrators, parents, and interest groups. In mathematics, for example, parents may wish more emphasis on long division while mathematics educators ask for less.

In principle, the policies adopted by boards and legislatures might resolve many of the conflicts and inconsistencies which teachers face. Teachers would have only to implement these policies. But in practice the educational policies of districts, states, and the federal government are often ambiguous or weak. Even where clear and strong, such policies may promote the interests of particular groups, often for good reasons (e.g., in the case of the handicapped, low-income children, the gifted), but nevertheless leaving teachers and local administrators to arbitrate among competing interests.

We therefore consider two types of policy: teacher policy as the definitive allocation of public resources by working-level personnel in education (Schwille, Porter, and Foden, 1980; cf. Lipsey, 1980; Emoro, this volume); external policy as policy in the usual sense—the laws, regulations, and other directives of boards, legislatures, and executive departments.

A Framework for Teacher Policies about Content

Teachers ultimately decide what is covered in the classroom. That is, they specify how much time will be devoted to a subject, what topics will be taught, and how long each topic will be taught, and how well topics are to be learned. In principle, it is possible for all these decisions to be made autonomously by the teacher, but in practice there is usually leverage exercised by external policies (formal or informal) at the school or district level. In addition, teachers are exposed to a variety of external influences which have nothing to do with external policies (e.g., another teacher, parent requests, newspaper articles).

In this semi-autonomous rule, teachers are better understood as political brokers than as implementers. They enjoy considerable discretion, being influenced by their own ideas of what teaching ought to be as well as persuaded by external pressures. This view represents a middle ground in the classic sociological contrast between professional autonomy and bureaucratic subordination. It pictures teachers as more or less rational decision makers who take higher-level policies and other pressures into consideration in their calculation of benefits and costs.

Teacher Repertoire and the Effects of External Policies on Content and Method. In the absence of external policies and other pressures, teachers are likely to select topics from their repertoire, that is, the topics they have taught in the past. Within this repertoire, we expect that the more a teacher regards a topic as appropriate for students and one that (s)he is ready to teach, the more likely it is to be taught.

The teacher's beliefs about appropriateness and realism may, in turn, be influenced by external policies, but the manner and extent of this influence is not well understood. It is commonly thought that external policies do not have much influence on teachers' beliefs about content, presumably because in the short run policies which run contrary to teacher beliefs engender considerable resistance (e.g., Oldham, Reference Note 10). If a call for new content is not too exoteric, however, it may cause less resistance than calls for change in a teacher's instructional strategies. It is important to remember that instructional strategies are the focus of much of the innovations literature which has led us to expect teacher resistance (e.g., the Rand change agent study as reported in Berman and McLaughlin, 1979). In the long run, we expect that external policies do gradually change teacher beliefs about content as these policies gradually gain more and more acceptance.

Students and Their Effect on Teacher Policies. Students, we believe, have a continual, though perhaps small effect on teachers' content decisions. For example, although teachers select instructional materials without being acquainted with the particular students who will be using the materials, teachers can evaluate the materials in terms of both students they have had in the past and students they expect to have in the future. Subsequently, when important decisions about grouping and classroom assignments are made at the beginning of the year, actual student characteristics can influence teacher decisions about who gets what content.

During the course of the year, teachers monitor the response of students and may modify content decisions as a result. The Dahllof-Lundgren steering group hypothesis suggests that teachers pick out particular students to pace the class, students at the borderline between those who are expected to learn the content covered and those who are not (Lundgren, 1972).

Students may also actively influence the content of instruction by making suggestions or requests which are taken into account by the teacher. In our case study of Jacqueline, such requests occasionally came to our attention (e.g., students asking for things they could do for extra credit, students asking to repeat a mathematical game). After one such request, Jacqueline went so far as to make a substantial change in the assignment of students to groups.

External policies give the teacher more or less leeway to respond to student differences. On the one hand, adoption of a districtwide textbook puts little constraint
upon teachers. They can delete topics that they consider inappropriate for students. On the other hand, a requirement to record student achievement on a set of district objectives discourages teachers from skipping topics. An external policy which mandates individualized, self-paced instruction can take much of the control over pacing decisions away from the teacher and give it to students. Such a mandate allows highly motivated students to move ahead quickly, but it also permits unmotivated students to lag behind more than they might in group teaching.

A Parallel Framework for External Policies

External policies which are likely to affect teachers' content decisions can be sorted into categories which, for the most part, parallel the teacher decisions discussed above (how much time, what topics, to whom, etc.):

1. Mandated or recommended time allocations. According to a national survey sponsored by the National Science Foundation (Weiss, Reference Note 11), forty percent of the school districts sampled had guidelines for the minimum number of minutes to be spent per day on fourth grade mathematics (an average of 38 minutes recommended or required).

2. Press for specific topics. Written objectives, textbook adoptions, and testing programs make it possible for schools or districts to influence, intentionally or unintentionally, the choice of topics to be taught. For example, according to Weiss (Reference Note 11), ninety-three percent of U.S. school districts use standardized tests in K-6 mathematics. Of these districts, fifty-four percent report making moderate or great use of these tests in revising the curriculum, while thirty percent report small use and ten percent no use (six percent no response).

3. Press for differentiating content among students. Grouping policies (including assignments to classrooms), pull-out programs with either a compensatory or gifted focus, and district adoption of individualized systems of instruction can affect the extent to which students of the same age are taught different content.

4. Press for standards. Tests required for graduation, tests for mastery of objectives, policies on retention in grade and mandated remediation all set standards for student learning and thereby foster persistent coverage of certain topics.

Giving Weight to External Policies

In addition to the four categories just listed, external policies have other attributes that may have an effect on content coverage. For example, some content-relevant policies reflect an intent to prescribe content, some do not. A district textbook adoption may or may not be intended as a prescription for content. Some teachers, especially those who are aware of a prescriptive intent, may perceive the text as a weak press for specific topics. Others may see the mandated text as nothing more than a pool of topics which they draw upon to fit (a) their own repertoire or (b) the content others (e.g., upper-grade teachers, parents) want them to teach.

The consistency of pressures on any given teacher is also important. In schools with heterogeneous clientele, ambiguities and inconsistencies in content messages are likely to be common (Lottig, 1969). To the extent that pressures are consistent, their impact will be enhanced (Foden, Porter, Schmid, Freeman, and Schwall, 1981). Where consistency is lacking, teacher autonomy may be increased.

Stills another means of giving an external policy more weight is to see that it has one or more of the following attributes of authority: the invoking of law or law-like rules, legitimation by a body of teachers, endorsement by experts or charismatic individuals, and consistency with social norms (e.g., the belief that a topic should always be taught at a certain grade level). Likewise, the power of a policy can be increased through use of rewards and sanctions. One particular category of rewards which the Rand change agent study has shown to be important is support to teachers for implementation of a policy (Berman and McLaughlin, 1978). In the case of content-relevant policies such support might include teacher training on unfamiliar subject matter, provision of paraprofessional aides, and automated record keeping.

Presumably, comprehensive external content policies could be given great weight if all the above attributes were present and taken into account by teachers. Policies of this nature probably do not exist in the United States. Closer approximations can be found in other countries (e.g., France) where hierarchical control of content is accepted and teacher autonomy is, for the most part, limited to instructional strategy.

Top-Down vs. Bottom-Up Studies of Content Policies

Implementation, a word made fashionable by policy analysts (e.g., Mazmanian and Sabatier, 1980), can be misleading if it leads us to look at external policies solely from the top down. From this perspective, the study of implementation starts with policy directives, derives intended outputs from these directives, and then assesses the extent to which the directives are carried out and the intended outputs realized.

The difficulties with this top-down approach, especially when applied to education, are now widely discussed in the literature. A top-down approach emphasizes hierarchical control, but hierarchical control plays a limited role in the loosely coupled world of schools (Bidwell, 1965; Weick, 1976; March, 1978). Teachers and building administrators have enough discretion to be able to adapt external policies to their own priorities as well as to pressures from their clients (Lipsky, 1980). Weatherly's (1979) study of the Massachusetts mandatory special education law illustrates both the impact and the limits of hierarchical control. This law and its regulations, strictly interpreted, required the immediate evaluation of many more children than could be handled. The lack of priorities in the law forced administrators and teachers to set their own priorities, to develop unofficial rationing techniques, and to use their own criteria for weighing the costs and benefits of making referrals.

Teachers may even have views of schooling that are incompatible with the views implicit in external policies. For example, Darling-Hammond and Wise (1981) discuss views of teaching which are opposed to the "rationalistic" views of teaching assumed by external policymakers. The rationalistic view, as they define it, assumes that schools can be assigned clear-cut goals and that teacher activities can be prescribed, evaluated, and ultimately controlled in terms of those goals. Such a view is still very much a part of top-down studies of implementation even when many variables which interfere with implementation are taken into account (Mazmanian and Sabatier, 1980).

The top-down approach is particularly problematic for the study of content decisions. In this case, even external policies are not particularly "rationalistic," at least in the United States, where there is a reluctance to be clearly and specifically prescriptive about what teachers teach. For example, in developing curricula for natural and social science the National Science Foundation was criticized for infringing on local auton-
omy and in 1976 was forced by Congress to stop funding implementation of its projects (Nelkin, 1978; Welch, 1979).

As a result of this ambivalence at district, state, and national levels, existing external policies are often unclear or weak as far as content is concerned. Nevertheless, such policies can still have an effect on teachers' content decisions, an effect which may or may not reflect the policymaker's intent. To understand this effect, the bottom-up approach exemplified by our case studies of seven teachers is useful. This approach starts with an analysis of what happens in classrooms and works back to see to what extent these happenings are influenced by external policies, together with other factors. Such an analysis will turn up (a) long-standing ways of doing things, which are not subject to scrutiny by higher authority, (b) anticipated and unanticipated effects of hierarchical pressures, and (c) the teacher's response to nonhierarchical influences (e.g., student pressures, pressures attributable to school norms, and the teacher's own views of what is desirable and feasible).

ILLUSTRATIONS FROM STUDIES OF TEACHERS' CONTENT DECISION MAKING

Teacher Policies, Given Six Simulated Pressures

In one of our earlier studies (Floden et al., 1981), sixty-six teachers from five areas in Michigan indicated how they would respond to various combinations of pressures to change the content of fourth grade mathematics. The six pressures came from (1) parents, (2) upper-grade teachers, (3) the school principal, (4) district instructional objectives, (5) textbook supplied to the teacher, and (6) standardized test results reported in the local newspaper.

The following example of these hypothetical situations is a mix of pressures from objectives, tests, and other teachers:

Investigators in the central administration has published, for fourth grade mathematics, a set of objectives which all teachers have been directed to follow. At the end of the year, a standardized test in mathematics is administered in each grade. The test results for each school are published, by grade level, in the local newspaper.

Shortly after your arrival, you study the set of objectives and the test which is used. You realize that these materials do not deal with five topics you have been accustomed to teaching in fourth grade. You also note that they do include material on five topics you have never taught to fourth graders.

Also imagine that the teachers in your school express a particular interest in mathematics at staff meetings and in conversations in the teachers' room. During these discussions you find that the fifth and sixth grade teachers feel you should teach five topics you have not taught to fourth graders in the past. They also question the value for fourth graders of five topics you have been used to teaching. The topics mentioned in each case are the same as those you noted in your examination of the test and the objectives.

In all the hypothetical situations, the pressures were limited to content decisions about specific topics. While the pressures were always consistent, they were not always clearly prescriptive in intent nor was there much attempt to give them authority.

No explicit reference was made to rewards for compliance or sanctions for noncompliance. In particular, no help was promised for putting into practice the changes in instruction that would be required. In short, when the hypothetical situations referred to external policies, these policies were not given much weight.

Nevertheless, the most striking aspect of the teachers' responses to the pressures was their reported willingness to add topics to their instructional content, whatever the source of pressure for change. In other words, teachers presented themselves more as potential implementers of educational goals than as autonomous decision makers. The teachers seemed less willing to give up topics currently taught and did not seem to consider the new topics as necessarily supplementing the old ones.

Objectives and published test results stood out as the most powerful pressures to affect teachers' content decisions. Textbooks were the least powerful pressure for adding content.

Our Design for Seven Bottom-Up Studies

In our case studies of seven teachers, the outcome of primary interest was the mathematics covered in each of the classrooms, as recorded in daily logs kept by each teacher. In weekly interviews, we discussed the logs; the use of textbooks, tests, objectives, or other materials; and any conversations or newly received documents relating to mathematics. In addition, we interviewed the teacher at the beginning of the year to ascertain his or her intentions and priorities and at the end of the year to probe the teacher's reaction to possible curriculum influences. A limited amount of classroom observation was also scheduled. Independent information on content-relevant policies and other attempts to influence content were obtained through (a) interviews with principals and other district personnel and (b) observation of meetings (e.g., building staff meetings, in-service workshops to explain test scores, open houses for parents).

The six schools and three districts in which these teachers taught were selected for differences in (a) external policies for the control of mathematics content (centralized vs. decentralized), (b) urban vs. small-town location, and (c) extent of teacher isolation within schools (e.g., self-contained classroom vs. open school). The most decentralized district (which we call Knapton) was an urban district with a management-by-objectives system, districtwide standardized testing, and guidelines for time spent on mathematics (forty-five minutes per day in fourth grade). In the least centralized district, was a small-town district with a strict policy of building autonomy in curriculum matters. The only breach in this autonomy was districtwide standardized testing, initiated one year before our study began. Sawyer, the third district, was also a small-town district but with somewhat less building autonomy. Following appointment of the district's first curriculum director one year before our study, a districtwide mathematics textbook was adopted and a districtwide standardized testing program instituted. To get some sense for variation in content decision making within the districts, two schools were selected in each district. The two schools varied in the extent to which the classrooms were self-contained.

Two Teacher Policies in the Aftermath of a District Textbook Adoption

Our case studies have a good deal to say about whether and why the seven teachers followed their textbooks. For illustration, we can take two Sawyer teachers, Jac-
queline and Wilma, and their response to the district textbook adoption. The district began to use a new mathematics textbook series in all its elementary schools the year of our study. The series was chosen a year earlier by a committee of teachers, together with the curriculum director. Although the committee later gave precedence to the textbook as the primary authority for what to teach (over district scope-and-sequence charts and Michigan Assessment tests), it never resolved the question of how much of the textbook teachers should cover. In fact, at the very last meeting in the year of our study, one of Jacqueline's colleagues once again asked whether the committee was going to decide what was important in the textbook. She declared that the teachers did not all know what they were supposed to be teaching.

The Sawyer textbook policy should thus been viewed as a weak policy for influencing teacher content decisions. According to our informants, it was recommended that teachers follow the textbook, but no one recalled specific examples of this recommendation being communicated to teachers. Rewards for following and sanctions for not following the textbook were little in evidence. For most teachers, including the two we studied, in-service assistance on the new textbook was very limited, in part because teachers did not express much need for this assistance. Hence, it is not surprising to find that the two teachers in our study relied principally on their own judgments in deciding how much to use the textbook.

Determinants of Jacqueline's Use of Textbook. For most of the year, Jacqueline taught two groups in mathematics. With only minor deviations, she led one group consecutively through the first nine of the thirteen chapters in the fourth grade mathematics text. When Jacqueline spoke of the changes in content she made between the year of our study and the year before, she attributed these changes more to differences in students than to differences in textbooks. Jacqueline perceived the students as high ability (relative both to another group taught by her team and to a group she had the year before).

We also studied Jacqueline's work with a remedial group of three students who were using the third grade textbook. Here again Jacqueline followed the text closely, though not as closely as with the higher group. In so doing, she taught content that other teachers might well have skipped in a remedial group (e.g., writing number sentences for word problems, rounding to nearest ten and nearest hundred, using estimation in word problems).

Our interviews throughout the year dealt frequently with Jacqueline's reasons for following these textbooks so closely. In responding to these questions, Jacqueline pointed to benefits for students in following the textbook. She held that the text ensures "continuity" in subject matter. Teachers who follow the text do not skip important topics; they do not teach topics out of appropriate sequence. According to Jacqueline, teachers who did not like the old textbook did pick and choose. They left out important chapters (e.g., number theory). In contrast, Jacqueline maintained that other teachers in her school and district liked the new textbook. She therefore predicted that they would follow it more closely than they had the old book, thereby increasing continuity across grade.

Following the textbook was seen not only as beneficial to the students, it also benefited the teacher by saving planning time. Time was important to Jacqueline, a very busy member of a team of four teachers. The team held planning meetings, but they were devoted in large part to science and social studies, the two subjects that were taught in tightest coordination among the four teachers. Outside these meetings, Jac-

queline was a demanding teacher who spent much time working with students. She was also an active participant in the local teacher organization and in university courses.

In spite of these advantages of following the textbook, Jacqueline's commitment to the new book was provisional. During a district curriculum committee meeting, Jacqueline told the committee that, after using a textbook for the first time, a teacher might find parts inappropriate. Later Jacqueline did object to parts of the text and even devoted to some extent. Most of these objections were not so much a matter of content as of strategy, that is, the method of teaching a topic. On rare occasions she did skip some peripheral content (e.g., use of flow charts). At times she also supplemented the text to put more emphasis on conceptual understanding.

Her criticisms were usually based on the observed or inferred response of students. For example, the text did not break the various multiplication facts into separate lessons as much as she had in the past. Although this lack of separation posed no problem for her current high-ability class, she repeatedly criticized this part of the text as unsuitable for students of lower ability.

Jacqueline did not consider skipping geometry with her high-ability group. But, although she was distressed that teachers might skip geometry without good reason, she did consider geometry expendable for any class that was well below average in achievement.

Jacqueline's use of textbooks also varied across subject matters. In science, she conjectured that if a new textbook did not compare favorably with units already developed by her team, the team would probably continue to use their own units. Jacqueline reported that she did not use the district textbook in language arts. She and other teachers regarded this textbook as deficient in both content and strategy.

In short, Jacqueline considered many factors in her decisions of how much to follow the text: the desirability of giving the book a fair trial, benefits of continuity to students, the opinions of other teachers, the characteristics of the text once she tried it, the time she had available. In the year of our study, these considerations led the district textbook to figure very prominently in Jacqueline's content decisions. However, this effect of the district adoption was so bound up in Jacqueline's personal policy that other teachers might respond to the same external policy in very different ways.

Determinants of Wilma's Use of Textbook. During our study Wilma taught fourth grade in the same district as Jacqueline, but in another building. Her conception of what was basic and what was peripheral in fourth grade mathematics was nearly packaged in what she termed a "subject clock." The subject clock was limited to basic content: (a) addition, (b) subtraction, (c) multiplication, (d) division, and (e) fractions. Topics such as geometry, measurement, and estimation were considered "trills." Wilma strongly believed that the five subject-clock topics should help children deal with real-life activities, such as collecting a pay check, purchasing things in a store, and determining what an item costs when it has been marked off a certain percent.

During this point of view, there are optimal periods during the year for learning new content, periods which are least disrupted by long breaks or by children's anticipation of some upcoming event. Wilma asserted that the greatest learning occurs in the period from January to spring break. Before January, the year is increasingly disrupted by Christmas. After spring break the students' thoughts turn more and more to summer, play, and getting outside.
Hence, according to Wilma, September through mid-November should be spent devoted to review of addition and subtraction. From mid-November through January, the main topic to be covered is multiplication, and then from February to Easter, students should concentrate on division. After Easter, the important topic is fractions.

Once fractions have been adequately taught, peripheral topics can be included in whatever time remains.

Wilma’s conception was carried out in practice. In almost all cases actual instruction on topics began no more than a week later than predicted earlier in the year.

Since all widely used fourth grade textbooks cover the five topics in Wilma’s subject book, she could make extensive use of any textbook. However, if a textbook were to follow the suggestion to delete the teaching of long division with two-digit divisors (see, e.g., Wheatley, 1980), we would predict that Wilma would follow her clock rather than the textbook. In several conversations, Wilma indicated that if the approach suggested by the textbook were not consistent with her thinking, she would ignore the book. In fact, Wilma did omit the geometry chapter, saying that it was not part of her subject clock. Unlike Jacqueline, Wilma did not follow the pages or sections of the new textbook in the order given. She rearranged the sequence to fit her internal clock. Even within topics, such as addition, she did not follow the textbook sequence.

Wilma was ready to consider topics in the textbook that she had not taught previously, but that fit her subject clock. For example, the new textbook included averaging, which Wilma had not taught before. She taught this topic because it fit well under division, one of her core topics. She admitted that in earlier years, she had never thought about teaching averages.

In short, unlike Jacqueline, Wilma was from the beginning convinced that following her own repertoire and priorities was better than sticking closely to the text. Both teachers had ultimately decided how they would use the district-adopted text. But Wilma’s strong commitment to her repertoire resulted in a continuation of earlier practices, whereas Jacqueline was more willing to give the text a try to see what advantages it offered.

A Teacher Policy in the Context of State and District Testing Programs

In the Finn district where buildings have enjoyed almost complete curriculum autonomy, the use of standardized tests was one possible exception to this lack of external control. In the fall of our study, the Michigan Assessment (MEAP) was administered to all fourth graders, here as elsewhere in the state. In addition, a widely used standardized test (we can call it the WUST) was given in each grade. This external policy for the use of the WUST was adopted by the district one year before our study on the initiative of the curriculum director, who had been impressed with the test while taking a course from an author of the WUST. However, in conformity with the district philosophy of building autonomy, the policy was not initiated until key building principals had also attended this course and been similarly convinced.

The curriculum director viewed the WUST as the district prescription for what to teach. However, as far as we could tell, there were no rewards or sanctions to be given teachers for performance on this test. Nor was the content message of the WUST entirely consistent with the messages communicated by the MEAP, the state-mandated test.

In Finn, WUST results were carefully reviewed in a meeting of school principals, which was followed by staff meetings in each building. One of the schools we studied, the principal circled all items on the WUST where the proportion of correct answers was not as high as district or national norms. But at the meeting he deferred to the teachers as authorities, asking them to determine whether the topic covered by each of these items represented something they should be teaching.

Donna, a teacher in this school, was closely monitored throughout the year. She did not increase her emphasis on any of these areas of relatively low student achievement when asked if the staff meeting on WUST results had been valuable. Donna made no reference to the analysis of strengths and weaknesses.

Although specific feedback from the WUST did not appear to affect Donna’s teaching, her and other teachers in her school repeatedly expressed concern for why the WUST scores in reading were so much higher than in mathematics. According to Donna, the other teachers attributed the lower scores in mathematics to earlier use of an individualized program. Donna disagreed, believing that this difference was the result of: (a) the fact that the teachers had placed so much emphasis on reading in recent years, (b) the use of different textbooks in mathematics in different grades, and (c) the lack of communication across grades. In Donna’s words teachers should “know exactly what (other teachers) have covered and are covering.” Thus, the effect of the WUST was not to cause Donna to give more emphasis to specific topics, but rather to raise teacher concern for overall mathematics performance and to give Donna an occasion for discussing the lack of articulation across grades.

In contrast, neither Donna nor her principal paid much attention to the MEAP results. In the principal’s words:

For this particular school in mathematics . . .[the MEAP] goals are worthless because our students function at a much higher rate than what they want as minimal objectives . . . it is utterly ridiculous, ninety-three to ninety-seven percent attainment . . . [and] doesn’t tell me my real needs for this building as far as individual kids are concerned.

A Teacher Policy within a District Management-by-Objectives System

In Knoxport, a district with more than thirty thousand students, all teachers in grades one through six were required to follow a management-by-objectives (MBO) system. In mathematics, the system included over one hundred objectives which were to be mastered in a prescribed order. The objectives were narrow in definition and focused on computational skills. For example, there was one objective for two-digit by two-digit multiplication and another for two-digit by three-digit. There was a district goal that each student master at least sixteen objectives each year, and district-level records of student progress were kept on all compensatory education students. However, we found no evidence of sanctions for teachers whose students did not reach sixteen objectives.

To facilitate use of the MBO system, there were tests for student placement at the beginning of the year, mastery tests for each objective, review tests for subsets of objectives, end-of-year tests for grades four through six, and forms for recording student achievement. In addition and of key importance were the assignment sheets, which tied each objective to relevant pages from each of several textbooks in use within the district.

The MBO system began to take shape eight years before our study. At the begin-
ning it was a pilot project to evaluate federal and state compensatory education programs. It was formally adopted and required of all teachers three years later. The number of objectives achieved by students in the MBO system continued to serve as the basis for evaluating nearly all curricular programs in the Knapp district. By virtue of the MBO system and without direct intent to prescribe content, federal and state categorical programs had an important effect on the choice of mathematics content in this district.

At the time of adoption, the MBO system was strongly opposed by many teachers despite its having been created by a committee with substantial teacher representation. However, Andy (our case study teacher) started using the system before it was mandated by the district. He was the first in his building and one of the first in the district, although he had no involvement in the development or revision of the system. When he began using the system, he was a member of the district mathematics committee. Dissatisfied with his approach to mathematics at the time, he accepted the district mathematics specialist's request to give the system a try. In general, our evidence suggests that this specialist had a major influence on the mathematics taught by Andy.

Later, Andy tried to persuade other teachers to use the system. His recollection is that eight or so teachers in his building were using the system by the time it was mandated by the district. Even so, according to Andy, it was never followed closely by all teachers, even at his school.

Andy himself allowed almost no exceptions to the system. Only two students in his class were allowed to skip any objectives during our study. When asked if he would likely to see any changes in the content of the objectives, Andy responded, "No additions, no deletions, only the re-ordering of objectives numbers 57 and 58."

Given Andy's policy, delivery of content was almost entirely in the hands of the materials, not the teacher. In contrast, another teacher we studied in the same district gave two periods of mathematics for her students, one for working individually on the MBO system and one for whole-group instruction on a textbook. We were also aware of teachers who made little use of the system.

In brief, Andy was a voluntary implementor who used the MBO system much the way it was designed. Still, his own decisions at points not prescribed by the system partially determined the content covered by students in his classroom. For example, he decided not to let students do as many objectives as they could without interruption. Instead, once they had progressed to a point in the objectives that he had selected, they were given enrichment assignments in the fourth grade textbook. Andy reorganized this textbook material and had all enrichment students proceed in fixed order. Students who completed this textbook enrichment were returned to the objectives. In addition, the quickest to finish the complete textbook were given a unit on metric measurement.

Andy chose assignments from the assignment sheet which tied textbooks to objectives. He rarely used knowledge of students in making these assignments. As far as we could tell, the primary consideration was whether the old or new textbook was on the shelf at the moment the assignment was made.

Still other teacher decisions influenced the pace at which students completed steps in the system. The system itself provided no advice on when a student should be permitted to take the mastery test. At the beginning of the year, Andy let students decide when they were ready. Dissatisfied with this aspect of his policy, Andy later tried other procedures (limiting testing to certain days, making the decision himself, setting goal dates for mastery), but when none of these procedures resulted in a better trade-off between pace and content learned, they were progressively abandoned.

In short, district policies had a major impact on the mathematics content covered in Andy's class. Nevertheless, factors other than district policy were important as well in determining what topics were taught, in what order they were taught, and how long was spent on each topic. In this semi-autonomous role, Andy was no mere implementor, but rather a booster and a broker for the system.

MISSING PIECES

The history of elementary school mathematics in the United States, together with our content analyses of present-day instructional materials, reveal important differences of opinion, even in this traditional subject, about what should be taught and tested. These differences surface from time to time in public debate but are rarely settled to the point of providing clear guidance to teachers. Teachers are expected to deal with predicaments that makers of external policy are unable or unwilling to resolve.

It is not our purpose here to take a position on control of the curriculum. It is rather to provide evidence that might be used in arguments for or against greater control. Fenstermaker and Amarel in this volume do take a stand. They argue for autonomy, but their case rests on hypotheses about the effects of greater autonomy which are yet to be substantiated.

However, their assumptions and our studies are consistent in one respect. They suggest that external policies do influence teachers' content decisions—despite the absence of many of the attributes that make for strong policies. The sixty-six Michigan teachers in our simulation study hypothetically abdicated their role of autonomous decision makers even when confronted with what we would judge as weak attempts to influence them. In each of the three districts we studied over the course of a year, policies did have a notable impact on individual teachers. Nevertheless, the seven teachers also exercised much discretion. These teachers were indeed political brokers, arbitrating between their own priorities and the implied priorities of external policies.

As for teachers in general, we do not know exactly what mathematics they cover, how autonomous they are in their content decisions, or whether their autonomy is of particular benefit to students. Moreover, what little we do know of other subjects suggests that the effects of autonomy may differ from subject to subject. Given this state of ignorance, it is premature to argue that the present trend toward more prescriptive curriculum policies on the part of districts and states has entirely and necessarily negative consequences.

Few would say that what children are now taught in school is optimal. In our judgment, teachers can be persuaded to change content more readily than one might think in the wake of federal curriculum development that did not live up to expectations (Welch, 1979). We recognize that teachers have and no doubt will continue to resist proposals for content that they have not been given the opportunity to learn thoroughly themselves or that they find too difficult to teach. But virtually all teachers do teach difficult content (e.g., long division) and many teach peripheral content that was once unfamiliar in elementary school (e.g., geometry, metric measurement, inequalities). Given our research and literature review, we believe that a large proportion of teachers would readily make changes in the content of their instruction when such changes are consistent with their repertoire. Our conceptual framework leads us to
predict that great many teachers would even make changes which are inconsistent with their repertoire, provided that these changes came from persons with perceived legal and expert authority and that the teachers receive ample training and other help in making the changes. In short, the "new" mathematics reform, in our opinion, left smart but because of irremediable teacher resistance but rather because of inadequate external policies in general and inadequate support for teaching in particular. 12

National policies to control content prevail in many countries. We may find that these policies increase continuity from grade to grade and from school to school and that this continuity is beneficial to students. If so, this sort of benefit has to be weighed against the disadvantages of prescriptive external policies. Fenstermacher and Amarel, for example, assert that prescriptive policies lead teachers to put too much value on indoctrination and compliance. Weinschank, Trumbull, and Daly (this volume) contend that diminished autonomy may result in the teaching profession attracting "only the passive, the unimaginative, and the unlettered while simultaneously depleting the vitality and commitment of the best practitioners now serving." These contentions deserve serious, empirical study. In this way we can better understand under what conditions external policies have such consequences and when they do not.

Educational research has had the salutary and chastening effect of showing that grand generalizations about education are generally unwarranted. Broad claims for the benefits of autonomy or control are not likely to be the "exception which proves the rule"—the logically required counter to this generalization about generalizations. It will take many pieces of evidence and much analysis to solve the puzzles of content decision making.

NOTES

1. We follow the "new" British sociology of education in calling for analysis of what educators take for granted. Similarities and differences between their work and ours are discussed in Schuller, Porter, and Gaates (Reference Note 1).

2. The essay for this state of affairs. Apple (1974) paraphrases recent comments of Stanwood Cobb, one of the early organizers of the Progressive Education Association. "Many progressive educators throughout the early decades of this century were quite cautious about even raising the question of what actual content should be taught and evaluated in schools. They often preferred to concern themselves primarily with teaching methods, in part because the determination of curriculum was perceived as inherently a political issue which could split the movement." Apple, however, cautions that Cobb's recent recollection of how it happened many years ago may not be accurate.

3. "Prior acquisition of cultural capital through cognitive skills in the family environment creates the impression of ease and brilliance in school whereas having to make up ground through methodical effort is seen as tedious striving that indicates lack of ability. "By treating socially conditioned capacities as if they were differences in native ability, the school legitimates ascribed inequalities and masks the differential transmission of cultural heritage. It serves to convince the lower social classes that they owe their destiny to their lack of individual ability and that they have chosen their fate" (Boyard's position as summarized in Murphy, 1979, p. 25).

4. "Ninety percent of adult figuring is covered by the four fundamental processes: addition, subtraction, multiplication, and division [of whole numbers]. Simple fractions, percentage, and interest, if added to the four fundamental processes, will raise the percentage to over ninety-five percent. Mastery of these essentials becomes the drill load in arithmetic for the grades. Beyond that, the work is informational problem work adjusted to child interests" (Wilson, Storer, and Dalrymple, 1959; also quoted in National Council of Teachers of Mathematics Yearbook, 1970, p. 122).

5. For another example of cross-currents and peripheral variation in mathematics content, this time described by nineteen teachers of grades three to five in a single district, see Kuhn, Reference Note 7.

6. The teacher Lue, described by Fenstermacher and Amarel in this volume, is an example of an autonomous teacher. For examples of a high degree of curriculum autonomy among teachers at the high school level, see Canick (Reference Note 6) and McNeil (Reference Note 9).

7. These powers of deformation and authority are adapted from the Spady-Mitchell revision of Weber's classic formulation (Spady and Mitchell, 1979).

8. The following statement by Edwards and Shankansky (1978) is a good example of this perspective:

"Top officials must take several steps to ensure proper implementation. They must issue policy directives that are clear and consistent; hire adequate staff and provide them with the information and authority necessary to carry out their orders; offer incentives for staff to execute policy as decision-makers intended and effectively follow up on the implementation actions of subordinates." (p. 321).

9. The same sort of accretion without deletion has been documented in a content analysis of geometry in German mathematics text books (Dawson, Reference Note 12).

10. Elizabeth Cohen (Reference Note 13) suggested to us that susceptibility to external pressures would be partially determined by the nature of collegial relationships within each school, as a result of the selection of the person in charge of teaming, resource teachers, instructional aids, and open-space building.

11. However, to avoid influencing the teachers unknowingly, we were careful about how we probed into such issues before the end of the year since content decisions were still being made.

12. See the Weinschank, Trumbull, and Daly chapter in this volume for further discussion of these inadequacies and the need for supportive policies.

REFERENCE NOTES


7. Kuhn, T. M. Elementary school teachers' conceptions of mathematics content as a potential...

REFERENCES