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The Impact of Subject Matter on Curricular Activity: An Analysis of Five Academic Subjects

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This article tests a framework connecting features of subject matter with curricular activities among high school teachers of five academic subjects. Using survey responses, it compares the conceptions of subject matter (defined, static, sequential) and curricular activities (coordination, coverage, consensus on content, standardization, course rotation, etc.) of English, social studies, science, math, and foreign language teachers from 16 high schools. Teachers differ in their perceptions of their subjects as defined, sequential, and static. For example, math and foreign language teachers score higher on those features than other teachers. In turn, certain curricular activities seem to differ depending on subject features. For example, in sequential subjects, teachers report more coordination with colleagues and more press for coverage of content than in less sequential subjects. Implications for research and policy are presented.

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Recently, educational researchers have departed from a search for robust generalizations about teaching that transcend subject matter (Good & Brophy, 1986; Gage, 1978) to a recognition of subject matter as a pivotal context for teaching (Shulman, 1986; Siskin, 1994; Stodolsky, 1988, 1993). Despite heightened awareness of the importance of subject matter, there are few empirical studies that have used a comparative subject matter approach in research on secondary school teachers. The research reported here is intended to address this important, but neglected, area.

Subject matter is one of the primary organizers of the professional life of secondary school teachers. From the moment high school teachers prepare for teaching, subject matter assumes a central role. We believe subject matter influences actual instructional practices, as well as how teachers think about curriculum, learning, and teaching. Because subject matter usually undergirds departmental organization in high schools, departments tend to reify subject matter distinctions in schools as institutions. Thus, subject matter intersects in important ways with teachers' individual and collective expectations for students and the manner in which departments enact curricular and other policies.

Elsewhere (Grossman & Stodolsky, 1994), we have detailed a conceptual framework relating considerations of content to the work of secondary school teachers. Among other components, the framework addresses connections among features of subject matter; teacher socialization; and teachers' conceptions about their subject, their goals, and their instructional practices. A variety of factors related to subject matter create different opportunities, constraints, and needs for secondary school teachers of different subjects. These factors include: the nature of the discipline and school subject; the particular students who enroll in different subjects; the policy environment related to curriculum and assessment; and the specific conditions in the departments, schools, and districts in which individuals teach.

In this report, we describe the conceptions of their subjects held by high school academic teachers of math, English, social studies, science, and foreign language. Teachers of the same school subject may share certain beliefs, norms, and values that establish a normative context in subject matter departments or networks. In a first analysis, we seek support for the premise that qualities of subject matter create a *conceptual context* for secondary teachers that varies from field to field.

In a second analysis, we investigate teachers' reports about curricular control, coordination, coverage, and related matters. We propose that features of school subjects—such as, degree of sequentiality and degree of definition and scope—have direct consequences on curricular activity. We test these ideas empirically by comparing what teachers in five subjects report about coordination, curricular control, and other curricular practices.

Framework of Study

For high school teachers, departments represent the organizational unit in which many policies and practices related to their work are established and

enacted. In almost all cases, high school departments are established along subject matter lines. Ball and Lacey (1984), Grossman and Stodolsky (1994), Little (1993), McLaughlin and Talbert (1993), and Siskin (1991, 1994) all suggest that high school departments represent distinctive subject subcultures in which members share norms, beliefs, and values. The concept of subject subcultures suggests that the nature of the teaching field is implicated strongly in the development and maintenance of norms, values, and policies. For example, policies regarding student tracking and placement, as well as specific teaching assignments, are usually set at the departmental level. Mandated curricular coordination is another example of departmental policy. We think these policies differ among departments in part because of the differences among subjects themselves.

School subjects differ in a number of respects, partly due to characteristics of the disciplines from which they derive. Characteristics of school subjects can be described at the level of individual courses or with respect to the set of curricular offerings of a department. In our analysis, we usually focus at the more general subject level, viewing conceptions of subject matter as an important ingredient of subject subculture.

Five features of subject matter, and teachers' perceptions of how these features apply to their own subject, seem especially salient. The features are: degree of definition; scope, or the number of distinct fields included in the school subject; degree of sequence; characterization of subject as static or dynamic; and the required or elective status of the subject.¹

Degree of definition refers primarily to whether there is agreement regarding the content of the school subject. Math and foreign language are examples of fields which are well-defined and in which boundaries are rather clear. In contrast, social studies, English, and, to some extent, science are less clearly defined. Disagreement about what constitutes the school subject has been documented in social studies (Marker & Mehlinger, 1992) and English (Applebee, 1974; Elbow, 1990).

Related, but not identical to definition, is scope—the extent to which a school subject is homogeneous or is composed of a number of disciplines or fields of study (Ball & Goodson, 1984; Becher, 1989). As is true at the elementary level (Stodolsky, 1988), high school social studies includes a range of disciplines (e.g., history, geography, anthropology, economics) that fight for a place in the curriculum. English is composed of various fields including literature, grammar, rhetoric, and composition which are blended in a variety of ways (Applebee, 1974; Barnes, Barnes, & Clarke, 1984; Grossman, 1993). Science as a school subject also is composed of distinct fields including biology, chemistry, and earth sciences, although, as Siskin (1994) points out, science teachers share a common methodological approach. Foreign language represents an interesting case because foreign language departments house curricular offerings in a number of languages such as French, Latin, or Russian. While these departments contain a number of languages, each individual language may be rather well defined. Last, mathematics seems more limited in scope and more homogeneous and coherent than the other subjects discussed.

The undergraduate majors of teachers are also related to scope or composition of school subjects. Individuals teaching the same school subject may share similar or disparate backgrounds (Grossman & Stodolsky, 1994). Social studies and science departments, as well as foreign language departments, are frequently composed of individuals who have had different majors. For example, a social studies department may contain history, sociology, psychology, geography, anthropology, economics, or political science majors. In contrast, math teachers will generally have taken very similar college courses in mathematics, and English teachers will also have shared a number of courses as undergraduates.

Sequential dependencies, in which prior learning is perceived as prerequisite to later learning, characterize some subjects more than others (Stodolsky, 1993). Across-course dependencies occur when students need to master specific content in a prior course in order to succeed in a subsequent one. For example, Ma (1994) found that sequence was a prominent consideration for algebra teachers who were concerned that students have prior knowledge to succeed in their courses. Across-course dependencies were less evident in the area of geometry. A need to cover topics in a particular order may also exist within an individual course. It seems that math and foreign language represent school subjects with greater sequentiality and more across-course dependencies than social studies, science, or English. Sequential subjects may require more attention to content coverage and coordination of curricular content than subjects without sequential properties. Teachers of sequential subjects may also have more knowledge of one another's practices and curriculum content.

The extent to which a school subject is perceived as static or unchanging versus dynamic is another feature we have studied. More dynamic fields are those with active production of new knowledge, changing theoretical positions, and a continuing need to stay up to date. In contrast, the content of more static school subjects may change less rapidly. Dynamic subjects may more readily present opportunities for change in instructional goals, curricular content, approaches, and technique. We suggest the school subjects English, social studies, and science are likely to be perceived by their instructors as more dynamic than mathematics or foreign language, even though new knowledge is produced in all of these subjects.

A last feature is the balance between required and elective courses in a school subject. Required courses in academic subjects serve all students and may often be beginning courses. Teachers of required subjects may be members of larger departments and may be subject to more external accountability—such as, external student testing programs and more external specification of curriculum. On the other hand, teachers of required academic subjects may garner more status and resources. Teachers of elective courses may work with more motivated students but may not always be assured of enrollees.²

Related Research

With the five features of subject matter in mind, we turn to an examination of research on curricular practices among high school teachers of different

subjects. In a study of particular relevance, Siskin (1994) interviewed teachers in academic departments in three high schools. She found English teachers resisted coordination of course content or teaming because they tended to formulate courses independently. Nevertheless, English teachers were willing to share curricular ideas and materials with one another and placed value on interpersonal relations with both colleagues and students. In contrast, some math teachers taught in teams and exhibited a consistent concern with the sequence of mathematical content and the proper placement of students. As in England where Ball (1987) and Bailey (1976) documented resistance to detracking in mathematics, similar concerns were voiced by math teachers studied by Siskin.

Social studies is a school subject with many disciplinary roots and teachers with various college majors. It is also a poorly defined subject. Siskin (1994) and Marker and Mehlinger (1992) describe chronic dissension among social studies teachers regarding the content of the curriculum. We expect social studies teachers to exhibit low levels of consensus about curricular content. Efforts at establishing curriculum standards for the teaching of social studies have floundered due to strong rival perspectives about proper goals and content. Perhaps it is not surprising that diverse political and moral positions bear on the task of defining social studies curricula.

Siskin (1994) also describes science teachers from three schools. She reports a general concern among science teachers with issues of material resources and equipment for instruction. Because science teachers tend to specialize, they do not team teach or coordinate course content except in courses such as biology where a number of sections are often taught. They do coordinate use of materials and other resources. Because science teachers are specialists, Siskin found they tend to maintain contacts with others in their field outside of the high school. For example, physics teachers have contact with other physics teachers and physicists through local and national networks and organizations.

Other research studies also contribute to understanding the impact of subject matter on curricular activities. Paule (1986) investigated curricular decision making in four high school subjects using a qualitative approach. Depending on subject matter, Paule found varying degrees of similarity in the curricula in departments in different high schools. More specifically, math departments in several schools had similar course offerings and sequence, while this was not the case in their social studies or English departments. At the level of course offerings, her results support the expectation that content covered is more similar in defined and sequential subjects than in less defined and less sequential subjects.

Archbald and Porter (1994) studied math and social studies teachers in six urban districts. They considered the role of curriculum guides, textbooks, testing programs, and other state mandates on teachers' curricular control, sense of efficacy, and job satisfaction. According to Archbald and Porter, all teachers reported reasonably high levels of personal control over curriculum and very high levels of control over pedagogy. However, math teachers

reported that state or district curriculum guides and testing programs had greater influence on determining their course content than did social studies teachers. Of particular interest, math teachers also indicated their departments had more influence on the content of their courses than did those of social studies teachers.

In Britain, a number of researchers have addressed matters of curricular control in school subjects. Protherough and Atkinson (1992), in discussing demands of the new national curriculum, note that English teachers have a long history of independence in establishing classroom curriculum, and efforts to nationalize have been met with considerable resistance. Ball (1987) and Ball and Bowe (1992) discussed department subcultures that support or resist curriculum policy changes. In case studies, Ball found that mathematics departments were particularly resistant to changes such as eliminating tracking or streaming, and Ball connected the resistance partly to a commitment to a particular course content sequence for particular students. Ball and Bowe found that responses to the national curriculum were influenced at many levels, including specific departmental composition, the role of the department head, and other factors. Ball and Bowe found some math departments viewed the new curriculum as very consistent with programs such as the School Mathematics Programme, which they had followed for years and they did not plan to make much change in their practice. Others found much new in the national guidelines and were unclear about their accommodation to it. British teachers differ to some extent from American teachers in training, beliefs, and practices. Nevertheless, the salience of subject matter in conditioning responses to curriculum change, particularly as seen in departmental reactions, is a finding that spans both countries.

Based on our conceptual framework and the research reviewed, a variety of curricular correlates and consequences should follow from teachers' perceptions of subject matter. Figure 1 displays a graphic summary of the expected relationships between features of school subjects, curricular control (autonomy), coordination, standardization, coverage, and stability.

Well-defined subjects, such as mathematics, may have teachers who agree more on curriculum content than teachers of less defined subjects, such as social studies or English. School subjects with broad scope—such as, English, social studies, or science—may offer teachers greater latitude in defining the nature of their classroom curriculum. Broad scope may also be associated with less course rotation among department members because teachers tend to be specialists in these fields.

Sequential school subjects such as math or foreign language may require greater departmental coordination of curriculum and consequently offer teachers less autonomy in choosing curricular content and materials. At the same time, the perception of sequence may create pressure on teachers to cover the curriculum so that students will not lose out in subsequent courses. Teachers of sequential subjects may also be more aware of one another's practices. We expect the combination of defined and sequential features to produce less curricular autonomy among teachers as well as more standard-

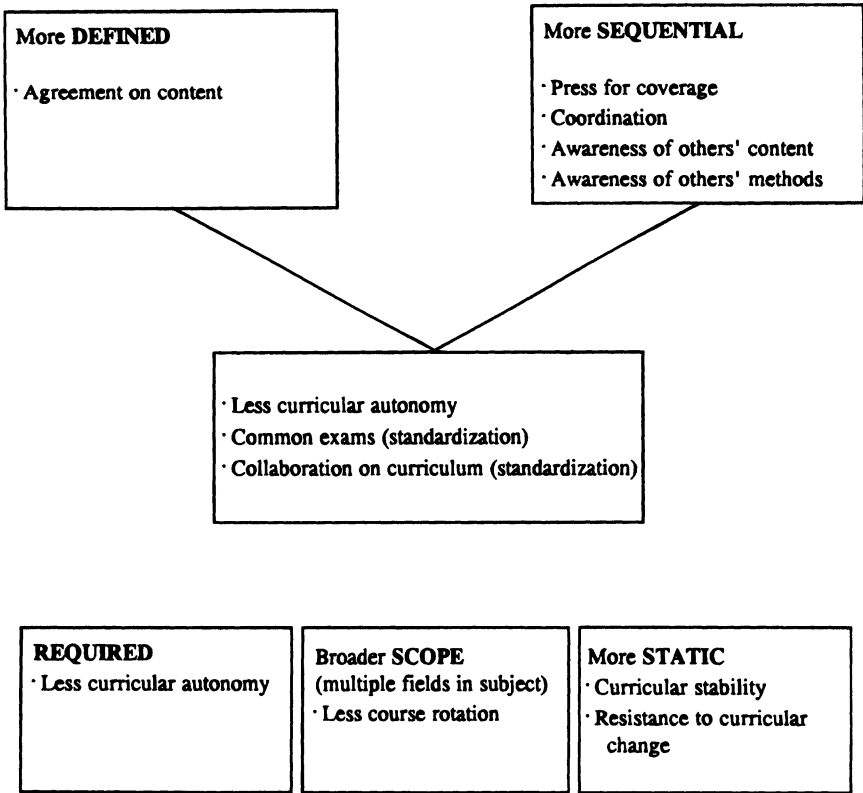


Figure 1. Correlates of subject features

ization. Standardization can manifest itself through common exams, using the same materials and activities, and following the same course syllabi.

Last, teachers of relatively static subjects may experience more stability in curriculum over time and may resist content change more than teachers who perceive their subjects as dynamic.

Method

We now turn to a description of the specific methods used to examine teachers' conceptions of subject matter, their reports on curriculum control and coordination, press for content coverage, and related concepts.

All teachers in 16 high schools were administered surveys in 3 consecutive years (1989, 1990, 1991) as part of a larger project (McLaughlin & Talbert, 1993) under the auspices of the Center for Research on the Context of Secondary School Teaching (CRC). The current study uses responses primarily from the 1991 survey, supplemented by some items in the 1990 survey. As members of the CRC research team, we formulated survey items and

created or adapted scales dealing specifically with conceptions of subject matter and other relevant topics.

In spring 1991, surveys were completed by 109 English, 85 social studies, 82 math, 81 science, and 42 foreign language teachers from 13 public and 3 independent high schools in both California and Michigan. The number of respondents to the 1990 survey, most of whom also responded in 1991, departed slightly from the 1991 figures.³

Three scales based on survey responses were developed to assess the subject characteristics *defined*, *sequential*, and *static*. All items composing these scales and the associated Cronbach's alphas are listed in the appendix. The features *scope* and *required* were not directly measured. Common knowledge, rather than direct measurement, forms the basis for describing subjects as having broad or limited scope, and it does so in terms of offering more required courses than electives. Specific survey items did assess curricular control, coordination, standardization, press for content coverage, and related concepts. These items are in the appendix.

The CRC sample seems generally similar to larger samples of high school teachers. Newmann, Rutter, and Smith (1989) analyzed survey responses of approximately 10,000 high school teachers from the High School and Beyond Study. Their survey included an item on curricular coordination identical to that in the CRC survey. The average response of the large national sample was similar to that of the CRC sample.

The statistical approach to analysis is straightforward. One-way ANOVAs were run on the mean responses to scales and survey items of the teachers grouped into the five academic subjects. Once an overall ANOVA has shown that there are significant differences across the five means, it is of interest to determine specifically which subject means are significantly different from one another. Duncan's multiple range tests were calculated to compare selected means in order to find out which means differ from one another. For example, in Table 1, a significant one-way ANOVA is reported for the means on the defined scale. The Duncan's multiple range test results show the means for math and foreign language are similar and both are marked with the superscript *a*. The test also shows that the means for science, English, and social studies are similar and each is marked with the superscript *b*. Because the two groups are assigned two different letters, we know that the subjects marked with *a* are significantly different from those marked with *b*. Thus, on the defined scale, math and foreign language are both significantly different in mean value from science, English, and social studies.

Results

Conceptions of Subject Matter

We have suggested that school subjects differ in terms of characteristics such as degree of definition and sequentiality. How do math, English, or social studies teachers view their subjects? Do math and foreign language teachers perceive their subject as more defined, static, and sequential than English

or social studies teachers? To answer these questions, we examine average scores on the defined, sequential, and static scales for teachers of five academic subjects. (See appendix for scales.) Table 1 shows the means and standard deviations on these scales along with results of ANOVAs comparing responses of teachers in the five subjects. The results of Duncan's multiple range tests are also in Table 1.

All teachers report their subjects to be somewhat defined (mean = 4.56/6),⁴ but, as expected, math and foreign language teachers see their subjects as significantly more defined than do teachers of English, social studies, and science, according to a Duncan's multiple range test. Thus, math and foreign language teachers agree more strongly than teachers of social studies, science, and English that their subjects are composed of "a well-defined body of knowledge and skills" on which teachers agree.

A pattern similar to that for defined occurs for the sequential view of subject scale. If teachers perceive sequence, they believe certain skills or topics are prerequisite to others or that there is a necessary order of coverage within and across courses. For example, they might agree that "students must practice basic skills within my subject before tackling more complex tasks." On average, teachers agree slightly that their subject is sequential (mean = 4.23/6) but a strong effect of subject matter is present. Math and foreign language teachers score similarly and rate their subjects as significantly more sequential than do English, science, and social studies teachers, according to a Duncan's multiple range test.

To round out the examination of conceptions of subject matter, we look at the static scale which includes items such as "Knowledge in my subject is always changing" (scored in reverse). As evident in Table 1, and as verified in statistical comparisons, the static scale sharply separates groups of teachers by subject matter. On average, teachers slightly disagree with the static scale (mean = 2.51/6). Math teachers do not rate their field as unchanging, but they score significantly higher on the static scale than all other groups of teachers. In contrast, English teachers hold a unique spot at the dynamic end of the scale, placing their subject as significantly more dynamic than all other subjects, according to a Duncan's multiple range test. Math teachers tend to characterize their field as cut and dry, while English teachers rather strongly reject that description. In addition, foreign language is rated as significantly more static than science, social studies, and, of course, English.

Although science teachers rate their subject as somewhat more defined than English and social studies, the difference is not statistically significant. Science teachers, along with those in social studies and English, describe their subject as slightly sequential and not static.

Overall, the results from the defined, sequential, and static scales are in line with expectations. Two subject clusters seem to occur in terms of the measured conceptions of subject matter. Math and foreign language compose one cluster sharing the features of defined, sequential, and relatively less dynamic. English, social studies, and science form the other cluster characterized as less well defined, less sequential, and more dynamic than math and

Table 1
Mean Responses to Conceptions of Subject Matter Scales for Teachers of Academic Subjects and ANOVA Results

Scale ¹	Math (<i>n</i> = 82)		Foreign language (<i>n</i> = 42)		Science (<i>n</i> = 81)		English (<i>n</i> = 109)		Social studies (<i>n</i> = 85)		Subject effect	
	Mean ²	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>F</i>	<i>p</i> <
Defined	4.92 ^a	0.73	4.89 ^a	0.75	4.57 ^b	0.90	4.34 ^b	0.82	4.36 ^b	0.91	7.96	.0001
Sequential	4.92 ^a	0.73	4.96 ^a	0.95	3.99 ^b	0.90	4.01 ^b	1.15	3.68 ^b	0.97	25.74	.0001
Static	3.35 ^a	0.88	2.93 ^b	0.99	2.30 ^c	0.82	2.01 ^d	0.75	2.36 ^c	0.99	31.65	.0001

¹Maximum scale score is 6.

²Alphabetic superscripts show results of Duncan's multiple range test. Each letter identifies members of a cluster significantly different from those with another letter.

foreign language. It is noteworthy that the three fields with wide scope and a variety of disciplinary strands have teachers with similar conceptions. For both defined and static, math and English represent the most extreme comparisons.⁵

Consequences for Curriculum

Since the data show that teachers perceive their subjects differently, we turn to a consideration of how these perceptions might connect to the areas of curricular control, coordination, standardization, agreement, awareness, and coverage. As displayed in Figure 1, these aspects of teachers' curricular practices are expected to vary with degree of definition, scope, and sequence. Correlates of static subject matter are also suggested, although they can only be tested very indirectly. Figure 1 shows certain aspects of curricular control to be associated with more than one descriptor, reflecting the clustering of subject matter features.

According to our model, teachers of more defined, more sequential, and possibly required subjects will experience less autonomy regarding curricular content than teachers whose subjects are less defined, less sequential, and elective. Table 2 contains responses of the teachers in the five subjects to a number of items dealing with curricular control or autonomy. (Items as they appeared in the survey are in appendix.) Two items (17d, 21b) indicate the extent to which teachers believe they control the content taught in their classes. A related item (25c) assesses the extent to which departments grant teachers curricular autonomy as a matter of policy. Teachers also rated how much control they have over selecting textbooks and instructional materials (21a) and selecting teaching techniques (21c).

Overall, academic teachers report moderate levels of control over the content taught in their classrooms (17d mean = 4.33/6, 21b mean = 4.65/6). Scores indicating the degree to which departments grant autonomy to teachers regarding content are similar (25c mean = 3.60/5). Teachers report only slight control over selection of textbooks and curricular materials (21a mean = 4.17/6), perhaps reflecting that textbook adoptions typically occur at the department, school, district, or state levels. Not surprisingly, all teachers report almost total control over the teaching techniques they use in their own classrooms (21c mean = 5.47/6).

In line with expectations for a well-defined and sequential subject, statistical comparisons show math teachers report significantly less control and autonomy over content than all other groups of teachers. However, there is a contradiction for foreign language in which teachers report a level of definition and sequence similar to math but significantly higher levels of curricular control and autonomy. Foreign language teachers may experience more autonomy regarding what they teach because foreign language courses are often electives and teachers are usually specialists in one language. Science teachers also report relatively high levels of control over curricular content. Science is not very sequential, but the qualities of being largely elective and composed of multiple fields are shared with foreign language.

Table 2
Mean Responses to Selected Items for Teachers of Academic Subjects and ANOVA Results

Item ¹	Math (n = 82)		Foreign language (n = 42)		Science (n = 81)		English (n = 109)		Social studies (n = 85)		Subject effect F	p <
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Curricular control												
Free to decide content (17d,90)	3.55 ^b	1.51	4.42 ^a	1.47	4.62 ^a	1.30	4.42 ^a	1.30	4.67 ^a	1.27	9.77	.0001
Control content, topics, skills (21b)	4.36 ^b	1.19	4.78 ^{ab}	1.24	4.92 ^a	1.00	4.59 ^{ab}	1.23	4.66 ^{ab}	1.14	2.46	.045
Dept. policy: curricular autonomy (25c)[max 5]	3.11 ^b	1.01	3.56 ^c	0.99	3.78 ^a	0.86	3.75 ^a	0.89	3.68 ^a	0.94	6.70	.0001
Control curricular materials (21a)	4.12 ^{ab}	1.31	4.54 ^a	1.21	4.45 ^{ab}	1.39	3.99 ^b	1.52	3.96 ^b	1.46	2.32	.056
Control teaching techniques (21c)	5.44	0.60	5.44	0.92	5.49	0.72	5.51	0.76	5.44	0.87	0.15	n.s.
Standardization												
Content same if taught by another (17a,90)	4.83 ^a	1.03	4.30 ^b	1.43	4.02 ^b	1.50	3.92 ^b	1.34	4.05 ^b	1.42	6.82	.0001
Develop common exams (17m,90)	3.58 ^a	1.90	3.16 ^{ab}	1.76	2.93 ^b	1.55	2.11 ^c	1.27	2.40 ^c	1.45	13.06	.0001
Develop teaching materials together (14g) [max 5]	3.23 ^a	1.23	3.02 ^{ab}	1.25	3.23 ^a	1.18	3.11 ^{ab}	1.33	2.67 ^b	1.30	2.59	.036
Consensus												
Similar ideas about content (14b) [max 5]	3.36 ^a	1.15	3.34 ^a	1.30	3.31 ^a	1.21	3.01 ^{ab}	1.22	2.84 ^b	1.24	2.85	.024
Little disagreement on content (14i) [max 5]	3.52 ^a	1.06	3.54 ^a	1.16	3.39 ^{ab}	1.22	3.29 ^{ab}	1.19	2.99 ^b	1.15	2.67	.032
Agree on how to teach subject (14m) [max 5]	3.97	0.86	3.90	1.11	3.91	1.10	3.74	1.11	3.59	0.99	1.80	n.s.

Coordination												
Coordinate course content with others (17g,90)	4.68 ^a	1.18	4.38 ^{ab}	1.27	3.86 ^c	1.54	4.07 ^{bc}	1.17	3.73 ^c	1.46	6.90	.0001
Dept. policy: coordinate content of courses (25a) [max 5]	3.78 ^a	0.80	3.49 ^{ab}	1.21	3.23 ^b	1.15	3.55 ^{ab}	0.93	3.33 ^b	0.89	3.58	.007
Coverage												
Important to cover curriculum (17f,90)	4.93 ^a	0.99	4.82 ^a	1.13	4.36 ^b	1.22	4.59 ^{ab}	1.12	4.34 ^b	1.20	4.30	.002
Awareness												
Know content, goals of others (17i,90)	4.74	1.14	4.56	1.22	4.34	1.14	4.39	1.24	4.35	1.24	1.78	n.s.
Know practices, goals of others (14h) [max 5]	3.62 ^{ab}	1.14	3.44 ^{ab}	1.30	3.77 ^a	1.13	3.38 ^{ab}	1.19	3.22 ^b	1.19	2.56	.038
Rotation												
Courses assigned with rotation (24f) [max 5]	2.80 ^a	1.23	2.25 ^{bc}	1.01	1.91 ^c	0.98	2.47 ^{ab}	1.35	1.96 ^c	1.02	7.85	.0001
Routine												
Same daily teaching routine (17e,90)	3.50 ^a	1.27	2.54 ^b	1.14	2.83 ^b	1.11	2.64 ^b	1.18	2.78 ^b	1.41	7.76	.0001

¹Maximum score is 6 unless otherwise noted. Items are from 1991 survey unless otherwise noted.

²Alphabetic superscripts show results of Duncan's multiple range test. Each letter identifies members of a cluster significantly different from those with another letter.

Interestingly, science and foreign language teachers tend to report more control over choice of instructional materials than do teachers of other (required) subjects. Last, social studies and English teachers generally report rather high levels of curricular control and autonomy in line with their being less defined and less sequential subjects.

Curricular standardization is another proposed consequence of a subject being more defined and more sequential. Two items reflect standardization or common curricula: "If another teacher took over the courses I teach, the basic content would stay the same" (17a) and "Teachers in my subject area department work together to develop common exams for particular courses" (17m). The Item 14g: "We often work together to develop teaching materials or activities for particular classes" may also reflect standardization, although it picks up a tendency to collaborate as well.

Responses of teachers in the five subject areas to the standardization items are in Table 2. Overall, standardization through common exams (17m mean = 2.76/6) and developing course materials together (14g mean = 3.06/5) is not widely reported. Teachers slightly agree that course content would be the same if another teacher took over their courses (17a mean = 4.20/6).

Standardization does vary by subject in the expected direction. As with curricular control, math teachers stand out as reporting the highest levels, with foreign language teachers next in line on two of the three items. Teachers do not vary much in their reported level of developing curricula together, but social studies teachers score significantly lower than all other groups.

Having looked at the joint consequences of being defined and sequential, we now consider each feature separately. If subjects are well-defined, more consensus about curriculum content is expected. To examine this issue, we looked at two items dealing with agreement about content. They tap agreement about what to emphasize in the curriculum (14bv) and general agreement about what should be taught (14i). In addition, we examined agreement about how to teach a subject (14mv).

The average level of responses to the items dealing with agreement on content suggests that teachers of all subjects do not really share common views about what to teach (see Table 2). In aggregate, teachers slightly agree with one another about what is important to emphasize in their subject (14bv mean = 3.14/5) and what should be taught (14i mean = 3.32/5).

Subject matter differences do emerge in line with our expectations. Less consensus about content occurs in the less defined subjects of social studies and English, while more agreement is reported in the well-defined areas of math and foreign language. Science teachers score in between. Statistical comparisons show social studies teachers to be significantly lower on consensus about content than math and foreign language teachers. Interestingly, all groups of teachers express somewhat more agreement regarding how to teach their subjects (14mv mean = 3.81/5) than regarding what to teach.

Sequential subjects are expected to produce greater curricular and content coordination among teachers. We expect math and foreign language teachers to report the most coordination, because these two areas are charac-

terized by a high degree of sequence and cross-course dependencies. Two items measure coordination. One assesses department policy of coordination of the content of courses (25a), while the other reflects individual teacher's efforts to coordinate content with colleagues (17g).

On average, a slight-to-moderate level of coordination is reported by all teachers (17g mean = 4.12/6), and some press to coordinate course content, but not a strong one, emanates from departments (25a mean = 3.48/5). The level of coordination in the sample is similar to that reported by over 10,000 teachers in the High School and Beyond sample. On the same item (17g), Newmann, Rutter and Smith (1989) report an average of 3.95. As expected, variation in coordination is associated with perceived sequence of the subject. Math teachers score significantly higher than teachers of most other subjects on the coordination items. Foreign language teachers generally report the next highest degree of coordination, with English teachers next in line. Coordination seems more a matter of departmental policy in English than a reflection of individual teachers' efforts. It is likely that coordination in English includes matters such as deciding in which courses certain books and texts are to be used. Finally, as low sequence subjects, social studies and science have the lowest levels of coordination.

Awareness of other teachers' content and teaching practices was another predicted correlate of sequentiality. The two items that assess awareness show a slight level of knowledge of other teachers' practices (14hv mean = 3.48/5) and moderately high awareness of the content and goals of other teachers' courses (17j mean = 4.46/6). Although the mean trend is in the expected direction, awareness of content does not significantly differ by subject matter. Knowledge of other teachers' practices and goals does show a significant difference, with social studies teachers being significantly less aware of one another's teaching than science teachers. Overall, the awareness items do not really support our expectations that awareness would be more prevalent in sequential subjects.

Press for coverage was presumed to occur most in sequential subjects because teachers in subsequent courses would expect students to have mastered certain skills and concepts in earlier courses. The sequential scale actually contains some items that incorporate this idea. In addition, teachers were asked to express their agreement with Item 17f: "It is important for me to cover the curriculum for my courses." As the data in Table 2 show, the sequential subjects of math and foreign language rank highest in stressing the importance of coverage. Social studies and science teachers stress coverage less, with English in between the two groups. Statistical comparisons show math and foreign language teachers score significantly higher on coverage than social studies and science teachers.

Scope, or whether a subject is composed of a common field or multiple fields, was expected to relate to course rotation. One would not expect departments to adopt a policy of course rotation, if teachers have different backgrounds and specialties, as in social studies or science. Although other factors are involved, more common background among department mem-

bers—such as, in math or English—might make it more appropriate to rotate courses. Our measure of rotation, Item 24f, shows the priority given to course rotation when making course assignments in a department. On average, rotation of courses is not given a very high priority (24f mean = 2.28/5). However, subjects vary significantly in the use of course rotation, with math, then English, reporting the most rotation and social studies and science reporting the least. Foreign language falls between these two groups. As expected, the subjects with broad scope in which specialists are most often found are those in which teaching assignments rotate least.

The final analysis represents a preliminary test of the idea that a more static subject matter might lead to curriculum stability and resistance to curriculum change. The only test available in the present survey material is an indirect one: an item which measures the extent to which teachers report their work as routine (17e). While the item deals with teaching techniques rather than content, it may provide a slight indication of whether static conception is related to stability. The item does show significant subject matter differences, although it is not strongly endorsed by most teachers (17e mean = 2.87/6). Math teachers score significantly higher than all other teachers in line with their higher static score.

Discussion

The data support the main elements of the conceptual framework, relating features of school subjects to teachers' conceptions and curricular practices. In general, the data confirm that the subject matter features of definition, sequentiality, and scope have curricular consequences in the areas of teacher control of content, standardization, consensus about content, coordination, coverage, and course rotation. Predicted relationships with awareness of other teachers' curricula and practices were not supported.

The responses of math teachers conformed closely to the expected curricular consequences of a defined, sequential, and somewhat static subject in which teachers are generally prepared in a common field. Math teachers report less control of curricular content, more consensus, coordination, standardization, press for coverage, and course rotation than teachers of other subjects. Math teachers might be viewed as the prototype of those who work in well-defined and sequential school subjects in which students are required to enroll in a number of courses.

Foreign language teachers also teach in a well defined and sequential area, but it differs from math in two important ways: The subject is not consistently required, and departments are composed of teachers with specializations in different languages. Many predictions were confirmed for foreign language—especially those associated with sequentiality. Foreign language teachers do express more consensus and report more coordination and concern for coverage than teachers of other subjects. Foreign language teachers score only slightly lower than math teachers on the items just mentioned. However, the areas of curricular autonomy and standardization show

a marked departure from expectations. Foreign language teachers report having considerable control over what they teach as well as the materials they use. In general, foreign language teachers do not standardize their courses, although there is some tendency to develop common exams. Because foreign language is composed of a number of separate language teaching sequences and perhaps because it is not required, teachers have more autonomy in curriculum than math teachers.

Social studies, English, and science represent subjects at the less defined, less sequential, and more dynamic end of the spectrum. Social studies and science are both composed of multiple fields, while English teachers tend to have a more common educational background. In most districts, English is required in all years of high school, while there are fewer required years of study in social studies and science. Teachers of all three subjects report relatively high levels of autonomy with respect to defining what they teach. They also report less standardization than math teachers. In keeping with a long history of disagreement about what social studies is, social studies teachers score lower on agreement about what should be taught than teachers of all other groups. Last, course rotation is not at all characteristic of social studies or science in which teachers have specialties in different fields. Rotation is reported somewhat more frequently in English, although not at a high level.

Department policies regarding the rotation of teaching assignments may affect teachers' work conditions in a variety of ways. Without policies or departmental traditions requiring the rotation of teaching assignments, teachers are more likely to "own" particular courses and develop expertise in the teaching of American literature, or algebra, for example, leaving the teaching of British literature or geometry to colleagues. While teachers might appreciate this stability in course assignments, rotation also provides more opportunities for continued learning of different topics over time. Policies that require course rotation may also result in teachers' exposure to a wider range of students as well as the strengthening of the development of a common purpose among faculty in the department.

English teachers report slightly more coordination and press for coverage than social studies and science teachers, although the differences are not statistically significant. The responses of English teachers suggest somewhat more concern with completing the curriculum and coordinating the departmental program. The required status of English and external testing programs in the subject may be at work. Despite these forces, however, the degree of autonomy granted English teachers in deciding what to teach is noteworthy. Coordination does not mean standardization of curriculum in the case of English.

The issue of external accountability has been mentioned in passing. The design of the present study does not permit an assessment of the role of external testing programs in shaping curricular policies and behaviors. The results of other studies (Archbald & Porter, 1994; Floden, Porter, Schmidt, Freeman, & Schwille, 1981; Madaus, 1988) of the impact of external testing

programs on curriculum are often somewhat ambiguous because testing programs occur along with many other policies. Although we believe subject characteristics such as definition and sequence may play a more central role in influencing curriculum, external testing programs may affect certain teachers and departments. It would be interesting to examine teachers of courses in which high-stakes external tests are administered. For example, it seems likely that teachers of advanced placement courses might report more standardization and press for coverage than teachers of other courses.

Earlier, the problem of identifying the proper level of analysis was raised. In general, departments and school subjects have been treated interchangeably in the present analysis. We have generally interpreted findings regarding school subjects as revealing features of subject and department subcultures.⁶ More direct analysis using departments as the unit of analysis seems promising. Aggregated responses of teachers within departments would reveal the specific role of departments in setting curricular policies. Department-level data would also reveal more specifically the nature of each conceptual and normative context for teachers. Such an analysis might facilitate understanding variation within school subjects in matters of curricular policy and activities. Using the same database we have used, Talbert and McLaughlin (1994) have shown departments vary in teacher professionalism and orientations toward students, as well as technical culture.

But conceptions also vary within departments. Individual teachers vary in their beliefs, curricular practices, and in their teaching assignments. A future analysis might explore the role of specific teaching assignments. For example, within departments, certain teachers may teach required courses, and others may teach electives. Perhaps their views about coverage and coordination vary. To determine the effect of teaching specific courses, it would be necessary to obtain reports from teachers at the course level.

The size of schools and teaching faculties may also bear on the issues examined in this article. Larger schools may be more apt to set forth policies regarding curriculum coordination and control than those in which faculties are small. Teachers in smaller schools may be more likely to teach a variety of courses and may in some ways be less specialized than their colleagues in larger schools.

We restricted this analysis to teachers of academic subjects. It is not clear that the same relationships between features of subject matter and curricular activity would hold in nonacademic areas. For example, would the curricular activity of teachers in the sequential area of instrumental music be similar to that of academic teachers? The contexts for teaching in nonacademic areas of high schools are a neglected area worthy of more attention.

We have documented differences in teachers' thinking about the subjects they teach. Where do these differing conceptions come from? What role is played by the initial exposure of teachers to their subjects in high school and college? Are views of subjects explicitly taught and discussed in higher education, or are they formed through more implicit processes? Do teachers with more extended preparation in their fields differ from those with less

exposure to the subject? When teachers depart from the normative view of their subject, what accounts for their unique perspective? How are different views of subject matter fostered—for example, what role does participation in professional associations and subject area networks play?

Questions for Policy and Future Research

The basic conceptions of subject matter we have reported at a group level may hold important implications for efforts directed toward reform. Rarely have reformers considered, specifically, the nature of teachers' assumptions about teaching and learning specific subject matter when working on policies meant to serve entire faculties and schools. Yet teachers' conceptions and beliefs regarding the subjects they teach, in tandem with departmental policies and norms, may greatly facilitate or deter reform efforts. Teachers who see their subjects as static, well-defined, and benefiting from curriculum standardization may be much less willing to experiment with instructional change than those who see their subjects as dynamic and endorse autonomy in selecting curriculum content.

In a sequential subject, such as math, teachers may feel they cannot put students at risk by altering their teaching practices or instructional content, possibly leaving students unprepared for subsequent courses. Changes in course content may not carry the same risk for students in English. Paradoxically, top-down changes and reforms may be easier to implement, at least superficially, in subjects in which norms of coordination and curricular standardization are stronger. In any case, teachers' responses to policies regarding curriculum and instruction will be mediated by their beliefs about subject matter, as well as the organization and norms of their department.

To produce change, then, it may be necessary to directly address teachers' conceptions of their subject matter and to understand variation in these views when they occur. Although we have not focused on variation among teachers of a particular school subject, it does exist. For example, while most math teachers view knowledge in their subject as somewhat static and highly sequential, there are some who see math as dynamic and nonhierarchical. How do different views of subject matter facilitate or hinder how teachers adapt curriculum and instruction to foster learning and achievement on the part of students from different backgrounds? We are exploring these issues in greater depth through case studies of math and English teachers at three different high schools.

By delineating and measuring salient features of subject matter, this article examined some of the curricular consequences of subject matter for academic high school teachers. Consequences include freedom or constraint in selecting what to teach, coordination of course content and materials, press for coverage, and curriculum standardization. These curricular activities are an integral part of the work life of teachers. We have shown that features of subject matter, such as sequentiality and degree of definition, are related to the manner in which curricular policies and actions are undertaken. Teachers of different subjects not only teach different content but also operate

under different curricular constraints and conditions. Subject matter creates not only a conceptual context for teachers but distinctive operational contexts as well.

APPENDIX

Scales and Items

Scales

Defined subject matter: $\alpha = .55$

- 4a. There is a well-defined body of knowledge and skills to be taught in my subject area.
- 4e. There is little disagreement about what should be taught in my subject area.
- 28b. There is a clearly defined body of knowledge that guides my work.

Static subject matter: $\alpha = .57$

- 4b. Thinking creatively is an important part of the subject matter I teach. (Scored in reverse.)
- 4c. Knowledge in my subject area is always changing. (Scored in reverse.)
- 4d. The subject I teach is rather cut and dry.

Sequential view of learning: $\alpha = .41$

- 5c. Students must practice basic skills within my subject area before tackling more complex tasks.
- 5i. If I do not cover my curriculum, students' future learning in this subject will be jeopardized.

Items

Curricular control

- 17. Please indicate the extent to which you agree or disagree with each of the following statements as descriptions of your teaching job and practices.
 - d. I have pretty much a free hand to decide the content of the courses I teach.
- 21. Using the scale provided, how much control do you feel you have in your classroom over each of the following areas of your planning and teaching:
 - a. Selecting textbooks and other instructional materials.
 - b. Selecting content, topics, and skills to be taught.
 - c. Selecting teaching techniques.
- 25. Please indicate how well each statement describes enforced policies and practices in your primary subject area department:
 - c. Wide degree of individual autonomy in curriculum and course content.

Standardization

- 17a. If another teacher took over the courses I teach, the basic content would stay the same.
- 14. To what extent does each of the following statements describe relationships among the teachers in your primary subject area in this school:
 - g. We often work together to develop teaching materials or activities for particular classes.

Consensus

- 14. To what extent does each the of following statements describe relationships among the teachers in your primary subject area in this school:
 - b. We have very different ideas about what we should emphasize in the curriculum. (Scored in reverse.)
 - i. There is little disagreement about what should be taught in our subject area.
 - m. There is a lot of disagreement among us about how to teach the subject. (Scored in reverse.)

Coordination

- 17g. I make a conscious effort to coordinate the content of my courses with other teachers.

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25. Please indicate how well each statement describes enforced policies and practices in your primary subject area department:
- a. Coordination of the content of department courses.

Coverage

- 17f. It is important for me to cover the curriculum for my courses.

Awareness

- 17j. I am familiar with the content and specific goals of the courses taught by other teachers in my department.
14. To what extent does each of the following statements describe relationships among the teachers in your primary subject area in this school:
- h. We have little idea of each other's teaching goals and classroom practices. (Scored in reverse.)

Rotation

24. Based on your own experience since coming to this school, what priority would you say is given to each of the following factors in deciding teaching assignments:
- f. Department policy to rotate course assignments.

Routine

- 17e. In my job, I follow the same teaching routines every day.
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¹Each of these properties can apply to the subject as a whole or to individual teaching assignments. We tend to treat them as properties of the subject, aggregated across individual teachers and their teaching assignments. For example, required or elective really applies at the course level, although the proportion of required courses offered in a department may also be determined. In fact, academic departments with many required courses gain greater status and more resources than those with elective programs.

²We also only addressing academic subjects here. In subjects such as vocational education, business, and the arts, the features described might not carry the same implications. For example, the status of subjects may be more dependent on being academic and required than on solely being required. Similarly, students in nonrequired courses in vocational education or business may not be as motivated as those in elective academic courses. Further analysis and exploration of curricular activity in nonacademic subjects is needed. We have limited data to address these issues but are currently collecting surveys from a new sample on the topic.

³We also studied 12 English and math teachers—four from each of the three schools—in a cross-case study and examined the core interviews collected by the larger CRC project for relevant information. Most of the survey items on conceptions of subject matter emerged from the case study and interview data analyses.

⁴Since there are unequal numbers of teachers in each subject, the grand mean is weighted toward those subjects with more teachers.

⁵Occasionally, as in Table 2, a mean will be identified as belonging to two groups. This signifies that the mean cannot be distinguished from the other means in the clusters marked. This circumstance is most common for means of middle value in the array.

⁶In some schools, departments are composed of a number of school subjects or organized without subject matter as a factor.

References

- Applebee, A. N. (1974). *Tradition and reform in the teaching of English: A history*. Urbana, IL: National Council of Teachers of English.
- Archbald, D. A., & Porter, A. C. (1994). Curriculum control and teachers' perceptions of autonomy and satisfaction. *Educational Evaluation and Policy Analysis*, 16(1), 21–39.
- Bailey, C. (1976). Mixed ability teaching and the defence of subjects. *Cambridge Journal of Education*, 6, 24–31.
- Ball, S. J. (1987). *The micro-politics of the school: Towards a theory of school organization*. London: Methuen.
- Ball, S. J., & Bowe, R. (1992). Subject departments and the “implementation” of national curriculum policy: An overview of the issues. *Journal of Curriculum Studies*, 14(1), 1–28.
- Ball, S. J., & Goodson, I. F. (1984). Introduction: Defining the curriculum: Histories and ethnographies. In I. F. Goodson & S. J. Ball (Eds.), *Defining the curriculum: Histories and ethnographies* (pp. 1–12). London: Falmer.
- Ball, S. J., & Lacey, C. (1984). Subject disciplines as the opportunity for group action: A measured critique of subject sub-cultures. In A. Hargreaves & P. Woods (Eds.), *Classrooms and staffrooms: The sociology of teachers and teaching* (pp. 232–244). Milton Keynes, England: Open University Press.
- Barnes, S., Barnes, D., & Clarke, S. (1984). *Versions of English*. London: Heinemann Educational Books.
- Becher, T. (1989). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines*. Milton Keynes, England: Open University Press.
- Elbow, P. (1990). *What is English?* New York: Modern Language Association.
- Floden, R. E., Porter, A. C., Schmidt, W. H., Freeman, D. J., & Schwillie, J. R. (1981). Responses to curriculum pressures: A policy-capturing study of teacher decisions about content. *Journal of Educational Psychology*, 73(2), 129–141.
- Gage, N. (1978). *The scientific basis of the art of teaching*. New York: Teachers College Press.
- Good, T. L., & Brophy, J. E. (1986). School effects. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 570–602). New York: Macmillan.
- Grossman, P. L. (1993). *English as context, English in context* (Tech. Rep. No. S93-2). Stanford: Stanford University, Center for Research on the Context of Secondary School Teaching.
- Grossman, P. L., & Stodolsky, S. S. (1994). Considerations of content and the circumstances of secondary school teaching. In L. Darling-Hammond (Ed.), *Review of research in education* (Vol. 20, pp. 179–221). Washington, DC: American Educational Research Association.
- Little, J. W. (1993). Professional community in comprehensive high schools: The two worlds of academic and vocational teachers. In J. W. Little & M. W. McLaughlin (Eds.), *Teachers' work: Individuals, colleagues, and contexts* (pp. 137–163). New York: Teachers College Press.
- Ma, L. (1994). *The sequentiality of mathematics students' readiness and teachers' strategies for adaptation*. Stanford: Stanford University, Center for Research on the Context of Secondary School Teaching.
- Madaus, G. F. (1988). The influence of testing on the curriculum. In the *87th Yearbook of the National Society for the Study of Education* (Part I, pp. 83–121). Chicago: University of Chicago Press.
- Marker, G., & Mehlinger, H. (1992). Social studies. In P. W. Jackson (Ed.), *Handbook of research on curriculum* (pp. 830–851). New York: Macmillan.

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- McLaughlin, M. W., & Talbert, J. E. (1993). *Contexts that matter for teaching and learning: Strategic opportunities for meeting the nation's educational goals*. Stanford: Stanford University, Center for Research on the Context of Secondary School Teaching.
- Newmann, F. M., Rutter, R. A., & Smith, M. S. (1989). Organizational factors that affect school sense of efficacy, community, and expectations. *Sociology of Education*, 62, 221–238.
- Paule, L. (1986). *The curriculum decision environment of high school English, mathematics, science, and social studies departments*. Unpublished doctoral dissertation, University of Oregon, Eugene.
- Protherough, R., & Atkinson, J. (1992). How English teachers see English teaching. *Research in the Teaching of English*, 26, 385–407.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Siskin, L. S. (1991). Departments as different worlds: Subject subcultures in secondary school. *Educational Administration Quarterly*, 27, 134–160.
- Siskin, L. S. (1994). *Realms of knowledge: Academic departments in secondary schools*. London: Falmer.
- Stodolsky, S. S. (1988). *The subject matters: Classroom activity in math and social studies*. Chicago: University of Chicago Press.
- Stodolsky, S. S. (1993). A framework for subject matter comparisons in high school. *Teaching and Teacher Education*, 9, 333–346.
- Talbert, J. E., & McLaughlin, M. W. (1994). Teacher professionalism in local school contexts. *American Journal of Education*, 102(2), 123–153.

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