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ABSTRACT

The traditional sharp distinction between vocational and academic education has come under increasing criticism for a number of reasons, including growing recognition of the failure of conventional curriculum and modes of instruction to respond to the ways in which students actually learn and increased awareness of the social, economic, and political consequences of a differentiated and hierarchically organized curriculum. Response to the criticism has been generally consistent with greater integration of vocational and academic education and has included academic "intensification" of vocational course offerings, transformations in the teaching of academic subjects, and reforms in the social organization of schooling. Vocational education has itself contributed the following to the reform of secondary education: broadened definitions of work education, instructional practices that bridge theory and application, practices of authentic assessment, and a history of engaging disengaged students. The following questions must be answered before the subject organization of high schools can be revamped and work education can be transformed: Which activities and topics of high school education are essential? Which elements of the academic curriculum "count" as work education? How are the goals of vocational and academic education in competition and conflict with one another? (Contains 88 references.) (MN)

National Center for Research in
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University of California, Berkeley

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INTRODUCTION

Proposals to integrate vocational and academic education challenge long-standing dichotomies between academic study and "real world" work. They challenge, too, the well-established subject hierarchies that privilege academic studies but accord vocational studies and work education only marginal status. Finally, such proposals respond to a litany of criticisms levied against contemporary secondary schools. Among them is the charge that neither the academic curriculum nor the formally designated vocational curriculum adequately prepares students for adult work as it is evolving.

From such criticisms spring proposals for a more fully integrated curriculum, promising more robust connections between school knowledge and meaningful situations of knowledge production and use. These proposals envision remedies for subject fragmentation, achieved through interdisciplinary curricula and through "problem-" or "project-oriented" tasks undertaken cooperatively by students. They seek remedies for persistent inequities in the opportunities and the outcomes of schooling, achieved principally through alternatives to tracking. They also require more credible attention to preparation for work and to participation in a democratic society.

Such proposals hold enormous promise for the transformation of secondary education. However, they also typically underestimate the contextual complexities of teaching in high schools. Some of these complexities derive from external constraints—for example, state-defined graduation requirements or university admission requirements that tend to push the curriculum toward curriculum coverage in discrete academic subjects. Some of the complexities reside in the beliefs that teachers, counselors, and administrators hold regarding students' abilities and motivations and the ways in which those beliefs play out in patterns of curricular organization and student placement. Still other contextual forces arise from the social organization of teachers and teaching; prominent among these is a form of subject organization modeled on the disciplinary structure of higher education.

This paper explores the ways in which perspectives on subject matter teaching and investments in departmental structure serve as resources or obstacles in the pursuit of more closely integrated vocational and academic goals. The paper is informed in part by recent studies of the subject organization of high schools and in part by a round of site visits to schools attempting to alter the substance and form of the high school experience. It begins by introducing the "legacy of subject specialism" as a context in which teachers' responses

to vocational goals might be interpreted. The second section summarizes the contemporary challenges to subject specialism and specifies three responses that are consistent—in principle—with the integration of vocational and academic aims. The third section assesses four contributions that vocational education makes to the integration agenda: (1) broadened definitions of work education, (2) instructional practices that bridge theory and practice, (3) practices of authentic assessment, and (4) commitments to the disengaged student. The final section relates some of the struggles that teachers experience and the compromises they forge in the pursuit of a more credibly integrated secondary education.

This paper does not offer a definitive set of findings. Throughout, and especially in the last section on the emerging struggles and compromises that teachers undertake, the paper relies on selected instances—conversations with teachers, observations of daily life in schools, and selected documents—to suggest a provisional agenda for talk, observation, and action. Its intent is to contribute to discussion and debate, to the framing of problems, and to the design of local experiments.

THE LEGACY OF SUBJECT SPECIALISM

Proposals to integrate vocational and academic aims anticipate that, given the right circumstances, vocational and academic teachers could readily cooperate in altering the nature of curriculum and pedagogy within subjects, locating new connections among subjects, and pursuing new relations between the school and the larger community. To accomplish such aims, however, teachers and those with whom they work must contend with the intellectual orientation, social relations, emotional satisfactions, and formal organization that comprise the legacy of subject specialism.

Despite the barrage of criticism, subject remains an important frame of reference and source of professional identity and community for secondary teachers. That is, "subject" is not merely the stuff of curriculum, texts, and tests; it is more fundamentally a part of being a teacher. In one of the few studies devoted to the subject organization of high schools, Siskin (in press) observes that "secondary teachers both describe and demonstrate the distinctive vocabularies, logics, and concerns of their subject specialties in subject-specific ways." Further, "these are more than simply idiosyncratic appearances of technical jargon; rather the discipline's language and epistemology are interwoven in ways teachers—as subject matter specialists—conceptualize the world, their roles within it, and

the nature of knowledge, teaching, and learning. . . . Teachers frequently explain who they are, what they do, and how they do it by anchoring their identities, actions and understandings in the subject matter itself" (pp. 269, 270).

Beyond the Stereotype of the Subject Specialist

To a large extent, the prevailing stereotype of the "subject-centered teacher" rings true. Teachers are bound to their subject perspectives in multiple ways: by their own recollections of going to high school; by processes of teacher preparation and credentialing; and by the subject imperatives contained in state curriculum frameworks, testing protocols, and approved textbooks. They work within departments organized by single fields or cognate disciplines, and affiliate themselves with other subject specialists in professional subject matter associations, informal networks, and the like. Teachers employ subject paradigms to express their priorities in teaching—what they want to accomplish or what students "need." They invoke standards of subject integrity to explain their enthusiasms or express their reservations about proposed changes in school requirements, curriculum, instruction, or assessment.

Yet this stereotype of the subject specialist masks the considerable diversity of views and practices in secondary teaching. Through close investigation of "subject communities" in high schools, we have begun to trace the various ways in which subject organizes teaching or teachers. Portraits of subject specialism illustrate some of the ways in which subject comes to be construed quite differently within and across subjects or schools (e.g., see Ball & Lacey, 1984; Becher, 1989; Bruckerhoff, 1991; Connell, 1985; Elbaz, 1983; Finley, 1984; Goodson, 1988a; Grossman, 1991; Siskin, 1991, in press; Stodolsky & Grossman, 1992).

Recent studies both reinforce and challenge the stereotype of the subject-centered secondary teacher. Certainly they demonstrate the salience of subject affiliation and the potency of subject status hierarchies, but these studies also qualify the stereotype in important ways. They show the dichotomy between "subject-centered" and "student-centered" teaching to be vastly oversimplified. The high school English teacher conceives neither the subject discipline nor the task of teaching in the same way as the university professor. In ways that seem less common among university subject specialists, high school teachers weave together their conceptions of subject and student. Secondary

teachers see their students in part through the lens of subject—what the subject enables or constrains in relation to students. Thus, one English teacher with whom we spoke attributes part of her satisfaction in teaching English to the fact that the subject "really lets you get to know the kids." Teachers also interpret the subject in part through their students—what it is in the subject that the student "needs" or "enjoys." Such inquiries also underscore the multiple bases of teachers' interests and commitments in teaching: subject is prominent among them, but is joined or in some cases overshadowed by teachers' investments in extracurricular activities or in nonsubject related involvements with colleagues or community.

The same studies also challenge monolithic conceptions of "subject." Some subjects appear "open" and "flexible," others more bounded, fixed, and sequential. Subjects differ in the latitude each offers for philosophical or pedagogical autonomy and flexibility. Both math specialists and teachers of other disciplines commonly describe math as fixed and sequential, specified in content and order of curriculum, and "cut and dried."[1] Nearly everyone sees English as far more open and fluid, leaving room for diverse purposes, content, and methods—though there are disputes within the English community about the diverse and competing definitions of the discipline (Grossman, 1991). English is presented as both more malleable and more permeable than math, a more hospitable site for innovation.

Despite such broad categorical differences, the meaning of subject varies also within disciplines and departments. Coining the terms "subject philosophy" and "subject pedagogy" to capture coherent views held by teachers about a subject and the way it is taught, Ball and Lacey (1984) reported considerable variation both within and between four English departments in British comprehensive high schools. Teachers held different and competing orientations toward the discipline and the way in which they preferred that it be taught (e.g., those who emphasized the creative/expressive aspects of English versus the "grammarians" who emphasized basic skills). In Bruckerhoff's (1991) recent portrait of two cliques of high school teachers, both the "Academics" and the "Coaches" considered themselves to be subject specialists, yet their views of subject and subject teaching were distinctly at odds. The Academics prided themselves on the breadth and depth of their

[1] Certainly there are exceptions to this view of mathematics. In a small interview study with math teachers who were actively involved in the Urban Mathematics Collaboratives and other mathematics associations, we encountered views and innovative practices that were notably different from the view portrayed here. For example, the activist teachers were quite ready to abandon the conventional sequence of high school mathematics courses (Little & McLaughlin, 1991). However, such views were not widely evident in the teacher interviews or surveys conducted as part of the larger study in mainstream comprehensive high schools.

disciplinary knowledge and held a predominantly canonical view of subject knowledge. They relied heavily on well-researched lectures as a pedagogical mode. The Coaches were philosophically more disposed to view the subject in instrumental ways, as one of several vehicles for engaging the attention of adolescents. They were pragmatically constrained by the demands of their extracurricular roles to "teach from the text."

On the whole, these investigations reveal something of the characteristic nature of subject perspective and subject commitment and of the variation within and between subjects. They suggest how such differences may shape classroom decisions or, in some instances, school practices. For example, math teachers who view mathematics as a hierarchical subject tend to be staunch defenders of homogeneous student grouping, while English teachers seem more likely to push for alternatives to tracking (see Ball, 1981, 1987; Cone, 1992). Embedded in these subject orientations, but rarely addressed explicitly in studies of subject specialism, are teachers' theories of schooling: views of what schooling should accomplish and what part teachers' subject preferences play in achieving those purposes. Yet it is precisely this analysis that must be made explicit if we are to move beyond the crude stereotypes of subject specialism in accounting for teachers' responses to proposals for the integration of vocational and academic studies.

The Standing of Vocational Subjects

In the subject-dominated world of public secondary schooling, vocational topics have long held an ambiguous place. Their standing is compromised first by the traditional subject hierarchies. As described elsewhere,

> The social organization of high school subjects mirrors the subject matter organization of higher education. Fields that are organized as recognized disciplines, holding departmental status in the academy, tend to command greater institutional respect and compete more successfully for institutional resources in the high school. This is not to deny that there are local variations, responsive to local community character and priorities, or to argue that the imprimatur of subject expertise is impervious to the relationships and reputations established by particular teachers in particular circumstances. On the whole, however, subject hierarchies favor those in the academic tradition. (Little, 1993, p. 139)

A status gulf separates vocational from academic studies in most comprehensive high schools. The history of vocational and academic studies in American secondary schools is a tale of two worlds: a differentiated curriculum, a divided student clientele, and

a bifurcated teacher workforce. This is not to say that this well-established status hierarchy goes uncontested, but that it has nonetheless remained stable throughout most of the twentieth century. The status asymmetry is exacerbated when vocational topics are viewed as "nonsubjects" (Burgess, 1983, 1984; Connell, 1985) and further reinforced when vocational students are defined by the absence of academic success (the "noncollege-bound").

The standing of vocational topics is further compromised in the comprehensive high schools by reductions in program offerings and by the common practice of "dumping ground" student placements. Vocational education has limited "subject presence" in many comprehensive high schools. While the core academic subjects offer a three- or four-year sequence of required courses and associated electives, the vocational programs have seen a steady erosion of course offerings. The "program" in various industrial trades, in business, or in home economics may amount to no more than a few sections of introductory courses. Even those students interested in concentrating in a specific vocational area are hard-pressed to assemble a coherent sequence of vocationally oriented instruction.[2]

Long-standing asymmetries between vocational and academic curricula have spawned a persistent campaign for legitimacy on the part of vocational educators (Connell, 1985; Little & Threatt, 1992). Confronted with a compressed curriculum and declining enrollment, vocational teachers justify their programs in ways that preserve student enrollment but that may inadvertently depress the status of vocational courses in the eyes of academic teachers. Specifically, the vocational educators distinguish between a "life skills" orientation and a "genuinely vocational" orientation, and focus on the former. From the perspective of the academic teacher, then, vocational topics may appear to amount to no more than the most rudimentary practices of daily adult life (e.g., balancing the checkbook, renting a place to live, and checking the oil). The complexities of a more coherent, sequential vocational curriculum (especially one that demonstrates a place for algebra, geometry, physics, or other topics central to the academic program) are less readily apparent. The focus on life skills sustains teaching positions by broadening the definition of an appropriate student clientele, but compromises teachers' own sense of subject. Here

[2] For a more complete description of the "compressed curriculum" in vocational education, see Little and Threatt (1992). In practice, students and teachers make accommodations by forming a version of in-school apprenticeship arrangements. On paper, a course may be listed as "Auto Shop I, II, III, IV," which permits students to gain successive levels of course credit while permitting the school to offer a small selection of course sections. See also Selvin, Oakes, Hare, Ramsey, and Schoeff, 1990; Oakes, Selvin, Karoly, and Guiton, 1992.

are the words of one drafting teacher whose sense of subject changed dramatically when he moved from a specialized vocational center to a comprehensive high school:

> I was teaching kids to become drafters and designers and engineers. And as they came over to me they knew what they wanted to do in most cases. . . . I had a student that came back last year and showed me a design that he did for a digital tire gauge and he gave me one as a present. He's at the state university now and finishing up his senior year in engineering. Those are the success stories that are neat, but those were the times when we taught subject matter.

Vocational educators are most strongly positioned to establish claims to a coherent subject where they can point to a sequence of courses that offer progressive sophistication with respect to the central concepts and skills of a field. Occupational high schools and career academies, for example, hold out a wide range of opportunities within a vertically organized occupational domain (e.g., health occupations). Conversely, vocational educators are placed at a disadvantage when they cannot point to the curriculum that offers evidence of subject depth and breadth and that is linked to more than the lowest level entry positions. Where vocational *topics* appear simple and shallow, vocational *educators* gain little recognition for subject expertise.

Finally, the regard for vocational topics (and those who teach them) is diminished by the relative privacy in which teachers work.[3] Teacher isolation sustains teacher stereotypes regarding the nature and importance of subjects other than their own. The insularity of the classroom hardens the boundaries that divide teachers and limits the understanding that teachers acquire of one another's perspectives and practices. Teachers typically have little familiarity with the content or methods employed by their colleagues in other departments (and, not uncommonly, even within their own departments). Nonetheless, teachers do form judgments about the importance of particular subjects and courses. They form opinions about the workload shouldered by their colleagues in other departments. These opinions are no less strongly held for being, on the whole, poorly informed. Teachers have scant bases on which to acclaim one another's genuine accomplishments, and even less on which to found a plan for "integrating" educational purposes, curricular content, and meaningful assessment.

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[3] This is not to say that if academic teachers were fully informed about the vocational courses of study and classroom practices in their schools they would be uniformly impressed. Our observations in mainstream comprehensive high schools supplied plentiful evidence of a "compressed curriculum" and uninspired pedagogy. In those schools that are seriously attempting to transform work education, however, the isolation of programs and teachers works to the disadvantage of any efforts to integrate work education with academic endeavors.

The mutual isolation and ignorance in which vocational and academic teachers work is mirrored in the professional and scholarly literature as well. As we begin to construct portraits of teachers' subject conceptions—the subject philosophy and subject pedagogy they espouse—we find few that illuminate the meanings that subject acquires among vocational teachers.[4] Of the twenty teachers whom Macrorie (1984) celebrates for "their practice of eliciting good works from their students" (p. xiv), only one is a high school teacher in a nonacademic subject. Sam Bush, a master cabinetmaker, teaches cabinetmaking in an independent school. His words convey something of what woodworking entails as a subject—a body of principled knowledge, a repertoire of skill, and a method of inquiry. For Bush, wood is a medium for discovery, for building character as well as skill. His views echo those of John Dewey (1916/1966) and offer possible common ground with academic teachers. But Macrorie has supplied us with a relatively rare portrait. There are few others, and those that are available tend to concentrate on the problems of status asymmetry rather than on the possibilities that reside in conceptions of subject teaching or of work education (e.g., Connell, 1985).

Subject Affiliation and Departmental Organization

Differences in world view and teaching experience are further bounded by an organizational structure built on departments. The department constitutes an intersection of the social organization of the school and the social-political organization of knowledge modeled on the subject disciplines of higher education. Studies of the academic departments in colleges and universities conclude that "departments divide faculty into different worlds, develop distinctive cultures, and control key decisions about professional careers and allocation of resources" (Siskin, 1991, p. 138; see also Becher, 1989; Clark, 1989; Johnson, 1990).

In secondary schools, departments are also "different worlds" in which teachers define meaningful intellectual and social practice, and in which schools concentrate symbolic and material resources. They are home to subject subcultures that may result "not only in different departmental policies and practice but also in different responses to the same external policies" (Siskin, 1991, p. 144; see also Werner, 1991). Such departmental

[4] By comparison to studies centered on academic subjects, vocational education has been relatively invisible in the most prominent studies of American secondary schools. Absent from the literature on secondary subject specialists is any detailed treatment of vocational specialism. The closest precedents are to be found in British studies of comprehensive secondary schools (Burgess, 1983) and the careers of secondary teachers (Sikes, Measor, & Woods, 1985).

differences in policy response bear directly on the efforts to achieve integration between vocational and academic education. Siskin offers a pertinent example from a case study of one comprehensive high school: "Block scheduling, according to the principal, is something for 'lab and activity-centered subjects.' Physical education and science—they really salivate at that [, but for] English and social studies it was a real problem" (p. 144).

The salience and stability of departments is greatest for the academic subjects. Based on surveys of twenty-five high schools, Siskin (1991) observes that the core academic subjects were always organized as distinct departments, while the "nonacademic" subjects were more likely to be combined in a variety of ways. She concludes that this is not merely a function of school and department size:

> Even in the smallest school, math and English had their own departments; even in the largest, they were not subdivided. Departmentalization may be, in part, a functional response to increasing school size, but the uniformity of academic divisions across size suggests that there are other processes at work and that these academic divisions are structured by forces external to the individual school. (p. 150)

Teachers' capacity for pursuing new organizational, curricular, and instructional possibilities is limited not only by their relative isolation from one another during the teaching day, but also by the insularity of departmental boundaries. Departments "fuel powerful tendencies toward balkanization" in secondary schools, according to Hargreaves and his colleagues (Hargreaves, Davis, Fullan, Wignall, Stager, & Macmillan, 1992, p. 8). Hargreaves' analysis echoes earlier criticisms regarding the fragmentation of secondary schooling—in particular, the analyses of "the shopping mall high school" (Powell, Farrar, & Cohen, 1985) and "Horace's compromise" (Sizer, 1984) that later informed the organizing principles of the Coalition of Essential Schools. Hargreaves and Macmillan (1992) begin to flesh out the theoretical dimensions of subject fragmentation in a way that the earlier critiques have not. Balkanized cultures, they posit, display low permeability (well-insulated boundaries), high permanence or stability of categories and membership, personal identification with singular reference groups, and a political alignment of self-interest with the subunit rather than the whole. As sources of personal identity, arenas for collective action, and concentrations of political power, departments are major contributors to balkanization. It is not yet entirely clear, however, whether well-bounded departments are good news or bad news or, more precisely, what the conditions are under which they turn out to be one or the other. Where departments form innovative communities, they may constitute a home for new ventures of sufficient focus and of manageable enough scale to

break old traditions. For example, the success of "writing across the curriculum" initiatives may rest on a cohesive and entrepreneurial English department.

In all of these ways, the realities of subject specialism turn out to be situationally complex. Subject perspectives are compelling, and subject organization remains remarkably resilient. Subject affiliations constitute a powerful referent in the careers of many high school teachers. The particular meanings of subject specialism or subject community, however, cannot be assumed apart from local context. Some subject communities more than others leave room for the kind of enterprises that respond to multiple purposes and that bridge subject boundaries. Further, traditional forms of subject organization, and traditional modes of subject teaching, are undergoing profound changes. This is the climate in which we entertain the prospect of integrating academic study with work education.

CHALLENGES TO TRADITIONAL SUBJECT ORGANIZATION

Subject is both a salient feature of high school teaching and a target of criticism by those who advocate dramatic changes in secondary education. Proposals to reconsider the nature of "vocational" and "academic" preparation coincide with other challenges to the traditional subject organization of high schools.[5] Vocational educators who have long been advocates of "learning in context" resonate to the claims of the cognitive scientists, who find the conventional curriculum and traditional modes of instruction to be a poor fit with how children actually learn (Duckworth, 1987; Lave & Wenger, 1991) or with the ways in which knowledge is generated and employed outside the school (Brown, Collins, & Duguid, 1989; Engestrom, 1991).[6] By this view, even "high status" courses in the academic curriculum might be deemed intellectually or cognitively impoverished; a transformation of academic learning would, in principle, benefit all children (e.g., Newmann, 1988; White, in press).

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[5] Attacks on subject specialism and departmental organization are most widely associated in the United States with Sizer (1984, 1992) and in Canada with Goodson (1988a, 1988b) and Hargreaves (Hargreaves & Macmillan, 1992).

[6] This is not to claim that the forms of "learning by experience" that one witnesses in vocational classrooms always approximate the conditions envisioned by contemporary cognitive scientists or, indeed, by John Dewey, but to observe that there is a convergence of basic principle regarding the conditions of cognitive development.

Other criticisms center on the social, economic, and political consequences of a differentiated and hierarchically organized curriculum: differentiated access to the curriculum contributes to the reproduction of existing class, gender, and race relations in the larger society. Curriculum tracking is the most visible structure of differentiated opportunity, and one that persists despite unfavorable evidence accumulated over several decades (Oakes, 1985; Oakes, Selvin, Karoly, & Guiton, 1992).[7] Those who advance a "critical pedagogy" ground their recommendations in an appeal to more genuinely democratic schooling (Carlson, 1992; Simon, 1992; Simon, Dippo, & Schenke, 1991). In part, their vision is achieved by expanding the domain of what counts as legitimate knowledge in the subject curriculum. All students would encounter the kinds of ideas, tasks, and materials that engender intellectual power, social competence, critical independence, and a commitment to social justice.

Criticisms of tracking arrangements come also from proponents of an economic development position; they argue that the present tracking arrangements and differentiated curriculum not only reduce the pool of well-educated workers, but also reflect a misunderstanding of the knowledge demands of the present workplace—including the knowledge demands required for the industrial trades. One recent newspaper account reports,

> At General Motors Corp., a carpenter now is required to know algebra and geometry. A GM plumber needs algebra, geometry and physics; an electrician needs algebra, trigonometry and physics; and a tool-and-die maker, model maker or machine repairman needs algebra, geometry, trigonometry and physics. . . . More and more companies will deny entry to high school graduates unless they have the requisite science and technology skills. (Rigden, 1992, p. A19)

Finally, criticisms arise from the pragmatic observation that students, even those most absorbed in the agenda of schooling, are rarely engaged by its dominant content and forms. In *The Shopping Mall High School*, Powell and his colleagues (1985) detailed the "treaties" by which teachers and students negotiated classroom order and cooperation at the expense of academic rigor (see also Cusick, 1983; Metz, 1990, 1993; Sedlak, Wheeler, Pullin, & Cusick, 1986). Similarly, Bruckerhoff's (1991) description of subject specialism among two faculty cliques in a social studies department is anything but encouraging when judged through the lens of the school's academic mission. Even the

[7] The Oakes et al. (1992) monograph is the first analysis of tracking focused specifically on patterns of vocational and academic course-taking. Its findings are consistent with other accounts. For example, see Cicourel and Kitsuse, 1963; Gamoran, 1987, 1992; Garet and DeLany, 1988; Oakes, 1985; Oakes, Gamoran, and Page, 1991; Rosenbaum, 1986.

clique labeled "Academics" persists in a narrowly conceived, canonical view of subject matter, taught in a traditional lecture-recitation manner that promises little genuine subject interest or mastery by students. One readily concludes from such analyses that the academic curriculum is not only intellectually barren, but also emotionally sterile and socially divisive.

In the wake of these challenges, schools have launched a spate of special initiatives to restore rigor and utility to the curriculum, to seek more meaningful connections among academic subjects, and to engage adolescents more productively with adults and with one another. Three kinds of reform initiatives dominate. Each is influenced by long-standing traditions of subject teaching and subject organization.

Academic "Intensification" of Vocational Course Offerings

Efforts to intensify or "beef up" the academic curriculum of vocational education respond to persistent complaints regarding the meagre basic skills demonstrated by graduates of vocational (and general education) courses and programs. Public dismay over unacceptably low levels of school performance and school completion helped to shape the terms of recent state and federal legislation. Under the terms of the 1990 Amendments to the Perkins Act (U.S. Congress, 1990), schools participating in federally supported programs of vocational education are expected to supply "coherent sequences of courses so that students achieve both academic and occupational competencies" (section 235). Some states have followed suit with special initiatives framed in much the same language; in 1991, for example, California funded High School Investment Grants whose main purpose was to place the integration of vocational and academic education on the broader agenda of reform and restructuring in local communities.

When viewed primarily as a remedy for poor performance, the intensification strategy rests heavily on structured programs of remedial basic skills instruction. Although common, the remediation response offers scant promise for substantial change in the relation between vocational and academic studies. Remedial materials and activities, typically oriented to "skill and drill," show uneven results at best and tend to be "only weakly connected to vocational skill training" (Grubb, Kalman, Castellano, Brown, & Bradby, 1991b, p. 43). Further, when schools rely heavily on basic skills remediation as a way to expand the academic content of vocational programs, they may simply confirm the

existing status hierarchy in which vocational programs acquire those students who are the least academically successful. According to Grubb and his colleagues, "When the purpose of integration becomes the enhancement of basic skills among vocational students, [integration] becomes a form of remediation" (p. 43; see also Carlson, 1992). The dominance of remedial academics signals a larger dilemma: Where vocational programs are targeted at entry level positions in occupations that themselves present relatively few academic demands, the level of academic instruction in those programs seems fated to remain low (Grubb et al., 1991b, p. 44).

When viewed not as remediation but as a remedy for inequitable allocation of resources, the intensification strategy assumes a rather different significance and requires a different set of practices. In this view, intensification responds to criticisms surrounding the equity of tracking arrangements that concentrate instructional resources on those designated most able—reserving the most advanced and highly regarded subject knowledge for those at the top of the system.

The intensification strategy is more ambitious—and more controversial—when it pursues quite a different configuration of vocational and academic instruction within defined vocational programs. Least controversial are attempts at selective "infusion" whereby teachers revise existing vocational courses to incorporate appropriate academic concepts or skills; thus, a math teacher expresses interest in helping a graphic arts teacher escalate the mathematics content of graphic arts classes beyond "simple measurement." In a more sweeping change, established programs of vocational instruction propose academic course offerings that are closely aligned to the vocational specialty but that traditionally fall within the purview of academic departments. Such arrangements impinge directly upon the established subject boundaries. When vocational agriculture teachers at one rural school proposed to offer classes in "plant science," for example, they justified their plan by referring to the knowledge of botany and biochemistry that is arguably essential to any work beyond basic labor in the agricultural field. When they sought academic credit for the course—for purposes of high school graduation or college admission—they found themselves embroiled in a dispute with science teachers over the content of credit-bearing biology classes and the certification of science teachers. The science chair voiced reservations about the "standards" met by such a class. He protested, "I can bring the real world into my class without creating another 'practical' class," and he illustrated by saying that he teaches combustion by asking students to describe and assess a fireman's options for putting out a fire. Implicit in his arguments are two claims: first, that any science

content offered in vocational agriculture is likely to be weak, "watered down," or even erroneous; and second, that vocational teachers are ill-prepared to teach science, while science teachers are adequately prepared to demonstrate the vocational uses of scientific concepts.[8]

Debates over the limits of academic intensification become more heated at the point where established patterns of student enrollment are threatened. Competition over student enrollment has strained the relations between vocational or other "electives" teachers and academic teachers in recent years (Little & Threatt, 1992). Competition centers both on the total number of students taught by a department (hence, the number of full-time equivalent staff and course sections supported) and on the distribution of "good" students. The science chair who responded skeptically to the proposal for a plant science class in vocational agriculture speculated that the availability of such classes would erode enrollments in biology as students elected "easier" courses to satisfy their science requirements. His comments paralleled those reported by Oakes et al. (1992), reflecting a view that students' abilities and motivations were relatively fixed by the time they entered high school, and that teachers and counselors were in a position to accommodate rather than alter them. Such a view induces competition among teachers for a fixed commodity—the academically able and motivated student.

Efforts to intensify the academic content of vocational offerings appear to be most readily supported when they do little to challenge the hegemony of the academic subjects and the college preparatory curriculum or to threaten the class enrollments that ensure academic teachers their preferred instructional assignments. Such efforts court opposition where they are seen as encroaching on the curricular boundaries of established departments, altering course enrollment patterns among the "good" students, and requiring a shift in the instructional assignments sought by academic teachers.

Controversy regarding the academic legitimacy of curriculum content and competition over student enrollment may both be mitigated when traditional programs of vocational education (especially those in the industrial trades) are replaced by a new breed of vocational offerings that stand to attract the participation of academic teachers. Such

[8] This is not to deny that the matter of teachers' qualifications to teach—the depth of their subject matter expertise—is an important one and that there are important and largely unexamined implications here for teacher education. In particular schools, it is also an empirical matter. Through their curriculum planning, instructional practice, and student assessments, teachers can demonstrate the nature and extent of their subject-pedagogical knowledge.

offerings (e.g., in the health occupations, air and space industries, or graphic arts and communications) are conceived in ways that hold out a wide range of occupational and future educational possibilities. Their elaborated academic requirements derive from their broader vision of occupational entry points and postsecondary options. (Career academies frequently emphasize that they are "college bound" programs, for example.) Designed in this manner, such programs may more readily attract academic teachers and more readily legitimate the award of academic course credits. They may prompt a professional conversation in which teachers join forces to alter curriculum and pedagogy in ways that expand the number of students judged academically able and motivated.

At its most fully developed, then, the intensification strategy promises to achieve both intellectual and social aims—to generate more academic content in vocational courses, to embed more practical connections in academic coursework, and to assure a more equitable distribution of instructional resources.

Transformations in the Teaching of Academic Subjects

Reforms to deepen and enliven the teaching of academic subjects form the counterpart to the vocational "intensification" strategy. In part, these reforms of academic teaching arise out of the public laments about the inadequate work preparation demonstrated even by college preparatory students and college graduates. That is, the press for a more credible link between schooling and work takes the form of pressures on the academic curriculum to be more directly, deeply, and imaginatively connected to genuine occasions of knowledge use.

Three elements of subject matter reform absorb the attention of academic teachers. First, reforms in subject matter teaching envision a constructivist approach to student learning. Such an approach is grounded in the claim that "There are general cognitive skills; but they always function in contextualized ways . . ." (Perkins & Salomon, 1989, p. 19). It challenges the conventional canonical views of curriculum and didactic modes of pedagogy: "Many methods of didactic education assume a separation between knowing and doing, treating knowledge as an integral, self-sufficient substance, theoretically independent of the situations in which it is learned and used" (Brown et al., 1989, p. 32). In an alternative view, learners' conceptual understanding arises out of structured

opportunities to make connections between formalized, abstract knowledge and real-world phenomena. Such opportunities are observably rare in schools.

Illustrative of this shift in subject matter teaching are some of the recent advances in math and science instruction. These developments respond to criticisms that traditional modes of instruction in these subjects equip students to apply formulas, but leave them unable to articulate basic principles or the conditions under which they might be used. Conventional modes of physics instruction enable students to match characteristics of a problem with the appropriate algebraic equation(s), but leave many students still puzzled by basic principles of physics in action. For example, students are unable to predict the trajectory of a ball when it is kicked off a cliff or emitted from a spiral tube lying flat on a table. White (in press) explains that "such questions do not call for computation or the algebraic manipulation of formulas; rather, they require understanding the implications of the fundamental tenets of Newtonian mechanics." White traces the difficulty of instruction grounded in "constraint-based formulations and the corresponding algebraic approaches to problem solving [that] obscure underlying causal principles" (p. 3). She replaces conventional forms of physics instruction with structured activities in a progressive series of computer microworlds (the ThinkerTools curriculum). Activities in the microworlds, in written exercises, and in classroom discussion lead students to a progressively more sophisticated grasp of basic physical principles and tenets of scientific inquiry. White's eleven- and twelve-year-old students outperformed conventionally taught high school students on tasks requiring an understanding of the relations of force and motion. Comparable developments might be readily located in other subject fields: for example, students come to understand not only history but historiography through simulations, the examination of primary materials, and collaborative investigation of contemporary problems. Approaches such as these offer a powerful alternative to traditional instruction, but also place substantial demands on the beliefs, knowledge, skill, and confidence of teachers.

Second, reforms in subject matter teaching seek more permeable boundaries between subject disciplines. This aspect of subject teaching reform responds to the criticisms that subject learning is overly segmented and fragmented; the secondary curriculum mirrors the disciplinary organization of higher education, but obscures the kinds of integrative and synthetic knowledge required in work or other domains outside of school (Hargreaves & Macmillan, 1992; Sizer, 1984, 1992). Selected special projects suggest an alternative form of high school organization. The Coalition of Essential Schools promotes

an interdisciplinary curriculum that prepares students for culminating "exhibitions" that require concepts and skills drawn from several subject disciplines (Sizer, 1992). On the whole, however, those teachers who express an interest in interdisciplinary teaching and assessment are left largely to their own devices; their interest is not yet well-supported in the development of actual courses or materials, and the available examples are not widely known or studied. In schools we visited, teachers were intrigued by the possibilities for portfolio assessment and for student "exhibitions," but were uncertain what forms they might take. Subject-specific curriculum development, if not exactly proceeding at a whirlwind pace, nonetheless far outstrips the comparable interdisciplinary developments. Yet it is precisely these boundary-spanning, or boundary-weakening, activities that are particularly compatible with the intent to integrate academic education with work preparation.

Third, reforms in subject matter teaching require comparable shifts in practices of student assessment. "Alternative," "authentic," or "performance" assessments promise a more credible match with students' cognitive processes and actual performance on complex tasks than have been achieved through conventional standardized measures. Progress is steady, if uneven; developments unfold in quite different forms and different arenas. Teachers individually and collaboratively explore the local possibilities of "portfolio assessment," largely independent of the efforts being made by cognitive scientists and statisticians to develop psychometrically sound methods of performance assessment that might be pursued on a large scale. One large project supported by the National Science Foundation, for example, seeks to develop "a principled basis for constructing and scoring conceptually rich performance tasks" that might range from various thought experiments ("What would happen if . . .") to collaborative research projects carried out by students (Frederiksen, White, Campione, & Brown, 1991). The burdens assumed by such assessments are several: to communicate learning goals of the sort encompassed by the various state curriculum frameworks or by evolving national standards; to serve as a source of instructional feedback for students and for teachers; and to satisfy the public demand for reliable and valid appraisals of student learning. The move toward performance assessment, like the increasing interest in interdisciplinary connections, is highly compatible with the aim to integrate vocational and academic education. At present, however, teachers' expressed interest in alternative forms of assessment far exceeds their professed skill and confidence in constructing, evaluating, or incorporating such alternatives—and also exceeds the resources presently available from the research and test development communities.

The transformation of teaching in the academic subjects, if successful, should render the world of adult work more visible and more meaningful in the secondary curriculum. However, *these subject teaching reforms are not themselves explicitly vocational*, even though they are compatible—in their general disposition toward teaching, learning, and assessment—with rationales for integrating vocational and academic education.

Reforms in the Social Organization of Schooling[9]

The anticipated changes in vocational education thus reside in a broader context of multiple and related reforms in secondary and higher education. Subject matter associations (e.g., National Council of Teachers of Mathematics [NCTM], National Council of Teachers of English [NCTE], and National Science Teachers Association [NSTA]) have promulgated new standards of subject matter teaching that challenge traditional views of the subject content, incorporate more inventive pedagogies, and require a broader range of assessment practices. The Coalition of Essential Schools, meanwhile, advocates integrating curriculum across traditional subject boundaries and engaging students in school tasks that more closely approximate the intellectual, social, and practical demands of genuine work and complex problem-solving. The Coalition holds out the image of the "student as worker" as one of its nine guiding principles. These and other reforms affect the priorities and preoccupations of administrators, counselors, and academic teachers; they can be expected also to affect the ways in which those educators view the integration of vocational and academic education. Some of the most ambitious programs to invigorate vocational education are embedded in larger programs of school restructuring, in which school administrators, department chairs, and other teacher leaders are grappling with unfamiliar perspectives and arrangements.

The two dominant reform strategies—(1) intensification of academic study for all students and (2) transformations in the nature of subject matter teaching—inevitably draw attention to the conventional structures that organize secondary schooling. Some teachers, vocational and academic alike, find new structures such as academies, houses, and career clusters an exciting remedy to the shopping mall high school. They believe the structures will provide meaningful links across subjects, will add to the "personalization" that

[9] This section is confined to commentary that links reforms in social organization of schooling to those bearing directly on the integration of vocational and academic education. For more comprehensive reviews of the school restructuring movement, see Murphy (1991) and Prager (1992).

students experience in schools, and will blur the existing dichotomy between college preparation and work preparation. Other teachers are concerned that subject integrity and depth will be compromised and that an increasing emphasis on interdisciplinary connections or on work education will mean an overall "lowering of standards."

In each instance, however, enduring structures of the secondary school stand demonstrably in conflict with the recommended strategies for improving conditions of school learning. To some extent, both the "vocational intensification" strategy and the "subject transformation" strategy founder on an insular departmental structure, fifty-minute instructional slots, the differentiation of "college-bound" from "noncollege-bound" students (and the stigma attached to the latter), a hierarchically organized curriculum, and narrowly defined criteria for evaluating student achievement. Both strategies would be well-served by a more flexible schedule, the elimination or modification of tracking arrangements, more permeable subject boundaries, and more meaningful student evaluation schema.

Nonetheless, the alternative structural configurations suggested by the two strategies do not necessarily coincide. Schools appear preoccupied by one or the other, or pursue the two along parallel, nonconverging paths. Ambitious efforts to enhance academic instruction for students who are outside the academic mainstream might be achieved through the development of career academies; academies incorporate academic teachers and a sequence of academic courses, but otherwise leave the basic departmental structure of the school untouched. A more comprehensive shift from departmental structure to career paths or career clusters highlights the intersection of vocational and academic aims, but may make the pursuit of reforms in the subject disciplines more difficult by limiting contacts among subject specialists. Similarly, an organizational structure that most readily facilitates the development of interdisciplinary curricula may bring related subject disciplines (and specialists) together without any explicit provision for vocational specialists. "Houses" are commonly staffed by interdisciplinary teams of teachers representing the core academic domains of English, math, science, and social studies. Other subjects (and purposes) including the arts, languages, and various vocational specialties remain literally and figuratively on the margins.[10] Students' experiences remain clearly differentiated, especially at the upper grades.

[10] In some, though not all, house arrangements, bilingual and special education also remain outside the house structure, and may in fact become more isolated (see Oxley, 1990; also Hargreaves & Macmillan, 1992).

Amid the restructuring landscape, radical transformations that touch the heart of the educational enterprise—the vision of what schooling is about, the nature of students' intellectual, emotional, and social experiences, the choices regarding what and how to teach—seem relatively rare. Compared to restructuring that centers on school governance and formal teacher decision making, we have found it hard to locate restructuring initiatives centered on a reconsideration of basic conditions of teaching and learning. In part, this means a relative scarcity of observable "trials" or "experiments," a tendency to advance structural solutions without attending seriously to matters of purpose and culture, and a propensity to seize upon early pioneers as models.

In one of the few detailed accounts of the development of alternative structures in high schools (in this instance, house structures), Oxley (1990) examines the difficulties that schools encounter in simultaneously taking subjects (and good subject teaching) seriously while attempting to grant other purposes and experiences parity in the organization of the school. She concludes, with some important caveats, that "house systems constitute a more effective form of high school organization" (p. iii). At its best, the house organization pursues two aims simultaneously: (1) a more personalized relationship between adults and adolescents and (2) a more focused and purposeful curriculum. In Oxley's sites, however, the change to houses from departments was motivated and justified in large part by concerns regarding student engagement, responses to student diversity, school orderliness, and dropout prevention. It represented a deliberate move toward "personalization" of the school experience, and a response to the increasing anonymity of large high schools. Justifications that centered on conditions of learning and standards for students' academic and practical achievements—though the case might readily be made—were less prominent and more ambiguous. At the same time, the organization of academic specialties, accompanied by a structure of student tracking and a proliferation of special programs, formed the major obstacle to the implementation of the house concept.

Oxley's investigations were among the first. Others now begin to emerge: Fine's (1992, in press) study of the charter schools experiment in Philadelphia; the national study of school restructuring being conducted by Fred Newmann (1993) and his colleagues at the University of Wisconsin; the case studies being produced collaboratively within the Coalition of Essential Schools (Muncey & McQuillan, 1993; Wasley, 1991); and the studies of "destreaming" efforts in Canadian secondary schools led by Hargreaves (Hargreaves et al., 1992). Together, these studies should not only exemplify the difficulty of undertaking (and understanding) changes in secondary schooling, but also underscore

its importance. We have little in the way of close observation and detailed record to inform our grasp of how structural alternatives advance or impede the integration of vocational and academic education. We have enough, however, to suggest that the consequences of structural changes—to houses or career clusters, for example—are anything but clear. It is one of the aims of our unfolding field studies to shed some light on these developments.

WHAT VOCATIONAL EDUCATION BRINGS TO THE REFORM OF SECONDARY SCHOOLING

Each of these reform campaigns challenges long-standing conceptions of secondary schooling. How is vocational education positioned to respond to the challenges and to exploit the opportunities they present? What do vocational educators bring to the discussion? The strength of vocational education—in principle, if not uniformly in practice—consists in (1) the import of vocational perspectives, topics, and activities for achieving the goals of secondary schooling; (2) instructional practices that overcome the distinction between theory and practice, and that prepare students for the work environment of the next century; (3) a principled support for authentic assessment; and (4) a history of engaging the disengaged student. In each of these areas, the reforms underway in vocational education promise a new image of work education that could be joined with other reform agendas for the redesign of secondary schools.

Broadened Definitions of Work Education

A broadly defined vision for vocational education is gradually displacing the widely criticized "narrow vocationalism" that has dominated secondary education. In this broadened conception, achieving the vocational purposes of education requires (1) that education "prepare individuals, including members of special populations, for substantial and rewarding employment over the long run" and (2) that vocational education "act[s] as a catalyst for a shift to an economy [characterized by] a 'high-skills equilibrium' . . . rather than an economy with low average skills, limited opportunities, older conceptions of work organization, and increasing inequality in skill and education" (NCRVE proposal, 1992, pp. 5, 6). These goals coincide with the aims of other reform movements: They embrace a high standard of intellectual achievement, anticipate a wide range of educational and occupational futures, acknowledge the rapid changes confronting the economy and the

wider society, and explicitly respond to demands regarding equity. Progress has been predictably uneven. To the extent that vocational educators and programs exemplify this broadened vision, however, they stand not only to overcome the lingering stigma attached to "voc ed" in comprehensive high schools, but also to help shape the future of secondary schooling.

The differences between two rounds of field research illustrate the direction of the emerging vocationalism, while also revealing the context created by the demise of traditional concepts of vocational education. In our three-year study of five ordinary comprehensive high schools, we found a steady decline in the number of vocational teachers and vocational course offerings. Vocational programs had suffered a steady erosion of staff positions, a corresponding reduction in course offerings, and an increasing confusion regarding program purposes (Little, 1993; Little & Threatt, 1992). At the same time, work, seen as an enterprise of the larger society and as the pursuit of individuals or groups, seemed nearly invisible in the broader academic curriculum.

These five "ordinary" schools typified the state of affairs that prevailed in most comprehensive high schools by the end of the 1980s (Clune, White, & Patterson, 1989; Oakes et al., 1992; Selvin et al., 1990). Vocational education has been disadvantaged by the diminishing support for traditional vocational offerings and the resulting compromises of curricular content and purpose (Little & Threatt, 1992). Traditional forms of vocational training are indeed withering, and traditional vocational teachers, especially in the industrial trades, are something of a dying breed in all the schools we studied (with the possible exception of vocational agriculture in rural areas). There would appear to be little credible base from which vocational educators and leaders might operate to influence the reform agenda in the high schools.

Vocational educators in these schools, it is fair to say, have been weakly positioned to achieve any meaningful integration of vocational and academic education. At the same time, our interviews with academic teachers suggested that their teaching priorities, curriculum-in-use, and instructional practices offered relatively few opportunities for students to make meaningful connections between academic concepts and real-world applications. We also found that vocational and academic teachers did share common interests in the academic accomplishments of students, in students' ability to make good use of what they learned, and in their social and emotional maturation. On the basis of that study, we sought examples of comprehensive high schools structured in ways that would

alter the general separation of the academic from the practical. Such schools might intensify the content and elevate the status of work education. We found such conditions in four schools in which the integration of vocational and academic education formed part of a broader reform agenda.

In a limited round of site visits to "innovating" schools, we found administrators and teachers experimenting with interdisciplinary divisions, career clusters, or academic houses combined with vocational academies. Such schools supplant traditional departments as the dominant mode of social organization, requiring that teachers move toward a curriculum that integrates subjects and that forges closer links between academic study and work preparation. In doing so, they challenge the traditional subject boundaries and subject hierarchies in secondary schools (see Little, 1993; see also Hargreaves & Macmillan, 1992; Siskin, in press). In addition, they call for a closer integration of the schools and community through arrangements for work and community service.

These and similar experiments constitute—in principle at least—an emerging family of alternatives to traditional work education. Among the most prominent examples are specialized occupational high schools (Mitchell, Russell, & Benson, 1989), career academies (Stern, Raby, & Dayton, 1992), and coursework emphasizing "applied academics" and career path or career cluster arrangements (Grubb, Davis, Lum, Plihal, & Morgaine, 1991a). Of these, the career academies have attracted the greatest attention and provide a useful illustration of the "broadened vision" at work in comprehensive high schools.

The academy model integrates the vocational and academic by redefining vocational aims to embrace a wider array of occupational possibilities. Thus we see academies devoted to career options in air and space industries, health occupations, visual arts and design, and finance (Stern et al., 1992). The academies replace traditional vocational courses of study (often demeaned by academic teachers) with occupational domains that display greater vertical organization, more credible links to higher education, and a certain high tech appeal.[11] Stern et al. (1992) see the academies as offering a solution to chronic problems of student apathy and low performance in high schools by responding to certain institutional "design flaws": in particular they see a design that "isolates schools from the adult world" and that pursues the teaching of subject matter "detached from its practical context" (p. xi).

[11] For a comparable development in Canadian secondary schools, see Davis, 1992.

Integration of vocational and academic content is central to the academy design, as is integration of classroom study with occupational mentorships and internships, summer employment, and other forms of connection with occupational settings and circumstances. Integration of content is managed to some extent through coordination of *topics*—for example, in a health occupations academy in which students simultaneously study the literary features of *The Andromeda Strain*, the effects and treatment of viruses, the nature of the immune system, and the geometric progression of unchecked viruses. Integration is sometimes managed through coordination of *products*: At a graphic arts academy, students studied the acid properties of paper in preparation for making and testing their own paper; they then used the paper to print poems they had written in their English class.

It remains to be seen whether these transformations succeed in legitimizing work-related applications of traditional academic subjects. Historical and sociological inquiries over the past two decades have illuminated the conditions that are conducive to changes in the definition and status of school subjects. Especially germane to this paper, they have traced the ways in which "marginalized" subjects gain legitimacy (see Connell, 1985; Goodson, 1988a). The relative status of vocational and academic studies might be expected to shift over time in a manner consistent with the following three propositions articulated by Goodson (1983) in his account of the emergence of "environmental studies" as an examination subject in British secondary schools: "(a) that subjects are not monolithic entities but shifting amalgamations of sub-groups and traditions. . . . ; (b) that in the process of establishing a school subject (and associated university discipline) base subject groups tend to move from promoting pedagogic and utilitarian traditions toward the academic tradition. . . . ; and (c) that in the conflict over [specific subjects] much of the curriculum debate can be interpreted in terms of conflict between subjects over status, resources, and territory" (p. 394). If the campaign to integrate vocational and academic education succeeds, it will be not only because its advocates have succeeded in adding advanced academic topics to vocational programs, but because they also have succeeded in redefining the meaning of "academic study" to legitimate the world of concrete experience.[12]

[12] That they will be able to make such a case is by no means certain. The "practical" or "concrete" applications of academic principles are not necessarily "utilitarian" in any straightforward sense. For example, some scholars argue that concrete experience alone is unlikely to engender abstract conceptual understandings in subjects such as science; the underlying relationships among physical phenomena are easily misinterpreted on the basis of observation alone (e.g., White, in press).

Instructional Practices That Bridge Theory and Application

Recent research on how persons learn has engendered various appeals for schooling as a form of "cognitive apprenticeship" that takes adequate account of the situated and social character of human learning (Brown et al., 1989). Such a cognitive apprenticeship would "embed learning in activity and make deliberate use of the social and physical context" (p. 32).[13] Students would be "exposed to the use of a domain's conceptual tools in authentic activity—to teachers acting as practitioners and using these tools in wrestling with the problems of the world. Such activity can tease out the way a mathematician or historian looks at the world and solves emergent problems" (p. 34). In the view of these cognitive scientists, there are presently few places in the high school curriculum in which students engage in "authentic activity" or as a routine matter produce publicly visible and meaningful work. Among the examples one might count dramatic or musical performances, science competitions, and some of the more ambitious and comprehensive vocational partnerships.

On the face of it, vocational educators would appear to be well-positioned to help schools construct a model of authentic activity and a "cognitive apprenticeship." Sizer (1984) gives us the example of Charles Gross, who teaches electricity in an inner city vocational high school. Classroom work combined vocational and academic aspects:

> Electricity is a subject demanding great accuracy: a mistake can mean a fire or a painful injury. Precision in planning, in following a wiring system logically and sequentially, and in understanding its operating realities (if not all the underlying physics), is as essential as is precision in language. Gross pressed both electricity and language: the students had to show and tell him what they were doing and why . . . each student had to explain his own reasons for wiring or switching a situation in a particular way. Precision, logic, hypothetical thinking, clarity of expression—all were staples of Gross's classroom. (pp. 147-148)

Charles Gross's success might well be attributed to two important features of his curriculum: (1) those students who continued in the electricity program as far as their junior year became part of a team, led by Gross, that rewired residential properties as part of a church-sponsored urban rehabilitation project (i.e., they learned in the context of paid

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[13] The fundamental precepts here are not new, though their special contribution may be to underscore the nature of learning as *social* practice. The burgeoning research on situated cognition has antecedents in the cognitive development research of activity theorists such as Vygotsky as well as in Dewey's philosophy of experiential learning. For the purposes of this paper, the importance of the situated cognition arguments derives from their timeliness, their ramifications for conventional academic instruction, and their overlap with an agenda centered on the integration of vocational and academic education.

work); and (2) students were able to see realistic employment opportunities in electrical contracting in their own neighborhood. Vocational programs are perhaps best positioned to demonstrate the nature of "situated learning" when they are organized in this fashion around a form of structured apprenticeship, and when they engage groups or teams of students in legitimate and complex tasks (e.g., when students study drafting and design, electricity, and woodworking in the context of a house construction project).

The disposition toward experiential learning that teachers of vocational or "practical" subjects espouse leads them to emphasize the links between knowing and doing in ways that are less often evident in the views or practices of academic teachers. Consider, for example, the way in which cabinetmaker and teacher Sam Bush employs cabinetry projects as a medium for student learning (Macrorie, 1984). (Bush teaches in an independent school for boys, hence the references to students as "the boys" throughout the text that follows.)

Bush begins his courses by introducing students to problems of design and proportion, and elicits from each student an idea for a project—something to build: "I never assign projects. . . . The boys create a design and then they bring that design into being in wood" (pp. 6, 7). To enable them to do so, Bush starts by requiring a written description of the project—the first expression of the idea—followed by "lots of drawing": "Before you start cutting you must know what you are doing. . . . I'm not concerned about a perfect drawing, but want to see the construction problems laid out and the proportions solidified."

Once building is underway, students learn the use of specific tools and techniques in the course of bringing their idea to fruition—a pedagogical decision that makes it virtually impossible to standardize instruction for a class. "A boy's first project may be very involved if he wishes. Then it just takes longer. Such a teaching formula consumes vast amounts of my time" (pp. 7-8).

Since he has turned much of the initiative for defining the "product" over to the students, to communicate and maintain a high standard of work, Bush relies in part on the continuity achieved by generations of students' work: "Tradition in this place does much of the teaching for me . . . The pieces of furniture you see standing around waiting to be finished by last semester's boys say more to the boys than I can say. When they walk into this great room, they see they are expected to do work of a very high quality" (p. 6). He

also pursues some of his own woodworking projects in the school's shop: "I feel it's important for me to be creating my own objects in the shop, so that the boys' efforts are not so much in a school shop as in an active, creative studio" (p. 8).

Sam Bush's account suggests a model—a conception of subject and pedagogy—that might well compel the admiration and emulation of academic teachers. (He sums up the *teaching* of woodworking as "a means to an end, which is understanding" [Macrorie, 1984, p. 4]). Admittedly, his is an uncommon standard in the comprehensive high schools we have visited over the past several years. Rather than witnessing an "active, creative studio" of the sort Bush describes, we more typically observed introductory woodworking classes in which students began with a series of structured exercises designed to introduce them to various tools and processes. They were to complete each of these exercises, a process that might consume several weeks, before they were permitted to begin work on the first of several relatively simple, standardized projects (of the breadboard or bookend variety).

In practice, then, models of authentic activity may be more sparse than we would wish. Some of the instances of experiential learning to which teachers point are admittedly trivial and mindlessly hands on. Some of the teachers we observed matched or exceeded the portraits of Charles Gross and Sam Bush; many, however, did not. Some were widely admired by academic teachers; many were viewed as pleasant people but inconsequential teachers; and some were viewed with disdain.[14]

The classroom (or studio) environment constructed by Sam Bush, the apprenticeship in electrical trade work provided by Charles Gross, and the most mature of the academy programs exemplify a shift in the relations between student and the materials and situations of learning and the relations between teacher and student. These are shifts consistent with the notion that students will engage in genuine work, not make-work activity. So a crucial question is this: To what extent does the learning environment in vocational classes and programs routinely exemplify the highest standards of "learning in context?"

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[14] Our observations were consonant with the scenario enacted by the hypothetical "redesign committee" in *Horace's School* (Sizer, 1992). As the committee's deliberations begin to center more exclusively on a program dedicated to traditional intellectual topics, the vocational teachers remain on the margins. In one of the book's hypothetical exchanges, Sizer conveys (but does not elaborate on) the peripheral status of vocational topics: "'Will you accept us?' the shop teacher asked. The question stung. The teachers in the academic departments knew what he meant but cared not to address it" (pp. 137-138).

Of course, proposals for a "cognitive apprenticeship" or "authentic activity" do not necessarily anticipate that the *academic* enterprise will thereby be rendered directly *vocational*. Rather, the standard of authenticity is derived from the system of beliefs, principles, and practices characteristic of a particular discipline (mathematics, history, and the like). To be an occasion of authentic mathematics learning, for example, an activity should engage students in the kinds of mathematical sense-making employed by mathematicians themselves. Examples are found in Schoenfeld's (1985, 1991) investigations of mathematical problem solving, and Lampert's (1986) experiments with fourth graders on the concepts underlying multiplication.[15] Nonetheless, teachers of topics that are designated nonacademic (ranging from occupational auto to the performing arts) may serve as powerful and credible models of instruction that embed theory and practice, knowing and doing. It is less clear how those same teachers might help to construct the specific activities by which academic topics might be transformed in the manner anticipated by Schoenfeld or Lampert. Still more problematic may be the institutional invisibility of powerful exemplars even where they exist (Do Charles Gross's colleagues know what he does?) and the absence of any mechanism by which colleagues could explore the transfer of curricular ideas and instructional methods between those contexts and the ordinary academic classroom.

Practices of Authentic Assessment

Vocational educators have long favored practical demonstrations of knowledge and competence. In that regard, they are aligned with those reformers who seek remedies for the apathy that students display toward high school (and for the teacher compromises that both result from and reinforce it) in assessments that measure students' accomplishments against a clear and significant external standard. Bishop (1989) argues that such forms of assessment would help to reduce the disincentives for hard work that reside in the present competitive system—a system that engenders peer resistance to academic competition and academic achievement. Genuine performance assessments of this sort would respond to two recurrent criticisms: (1) that there is little connection between the ways in which schoolwork is assessed and the way that actual knowledge use is judged in the work world; and (2) that there is a reward scarcity in high schools, with relatively few students holding a monopoly on a small number of rewards that acknowledge success on school tasks but that often signify little in the outside world.

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[15] A brief summary of the Schoenfeld and Lampert experiments can be found in Brown et al. (1989).

Companion to a problem-oriented or project-oriented curriculum is a shift toward practices of performance-based assessment. To the extent that vocational programs are able to generate meaningful examples of assessment that combine theoretical and practical knowledge, they may enhance their legitimacy in the eyes of academic teachers and advance the wider agenda of assessment reform. Vocational educators are able to speak to the possibilities in the use of completed projects to demonstrate student competence.

On the whole, we find academic teachers attracted by the promise that is inherent in such terms as "authentic assessment," "performance assessment," or "alternative assessment." We also find teachers to be largely uncertain what might be meant by them. It is not at all clear, however, that academic teachers look to their vocational colleagues to help them resolve their uncertainty. Certainly this is due in part to the nearly complete absence of interdependence between the two groups. Only in the academies or in similar career-oriented arrangements do we see vocational and academic teachers jointly designing an approach to assessment. In conventional departmental arrangements, or in alternatives built solely around academic topics (e.g., interdisciplinary teams and houses), academic teachers turn to their subject colleagues or team members to sort out the possibilities.

Another part of the explanation undoubtedly resides in the nature of the "performance" that vocational educators require of their students. To earn the regard of academic teachers and the wider community, performances must be sufficiently ambitious to compel admiration and must be rated by criteria that are clear, sufficiently high, and otherwise defensible. Vocational education has been home to some of the earliest and most extensive examples of performance-based assessment, but it has also been vulnerable to the charge that projects are often trivial and assessment criteria weak. Indeed, in our visits to schools over the past five years, we were astounded by the frequency with which "balancing a checkbook" came to stand for the level of practical accomplishments sought by a vocational curriculum. In contrast, the academic performance requirements associated with well-developed programs of work education may satisfy the standard of high performance expectations.

In principle, then, vocational educators bring to the reform initiatives a commitment to the assessment of knowledge-in-use. To sustain their part in the conversation (or debate), they must demonstrate that their assessment strategies and the tasks that they require of students rightly earn the approbation of both the public and professional communities.

A History of Engaging the Disengaged Student

Vocational classes are often populated with students for whom school has been something less than a rewarding experience; these are often the academically unsuccessful, the socially marginal, or the difficult students. The sources of student disengagement are several, and they offer quite different possibilities or obstacles to vocational teachers. Some students—a dwindling number, according to teachers—display well-formed interests and commitments in particular occupational arenas, but find little to support them in the academic classes they attend. These are the genuine "vocational" students about which vocational teachers speak in nostalgic or wistful tones (Little & Threatt, 1992). They are readily engaged by well-organized vocational programs and are often the reference point for teachers' arguments that "not all kids need to go to a four-year college."

More commonly, the students who concentrate in vocational classes are those whose main distinguishing feature is the absence of success in academic studies.[16] Among them are the limited- or non-English speaking, the special education students, the disruptive, and others who do not keep pace with the intellectual and social demands of the academic classroom. For vocational educators, the task of engaging such students presents an enormous challenge. At their best, they boast a record of success with these students who have found little reward in academic study, engaging them in forms and purposes of learning that are motivated by practical considerations and that yield practical results. At worst, they compound the failures of the past, doing little more than supervising classrooms that serve as warehouses or holding pens. The teachers of such students say they are discouraged and embittered by the "dumping ground" syndrome that makes a travesty of their expertise and their professional interests.

It does not escape the notice of vocational teachers that the students in their classes are disproportionately the poor and minority. Many vocational educators espouse commitments to the most disenfranchised students, especially those who have talents that are substantial but that do not earn recognition within the traditional academic frames. Some locate the problem in the system of student tracking that reserves a college-bound education for only some of the school's population. Others accept the classification of students as appropriate and simply express their desire for a larger share of the "good"

[16] Transcript studies show that most secondary students take at least one class that is designated "vocational" (e.g., Oakes et al., 1992). Many do so to satisfy graduation requirements calling for some version of a "practical studies" class. The proportion of students concentrating in vocational classes—taking six or more over their high school career, for example—is far smaller, and the members of this group are more likely to have been unsuccessful in academic classes.

students. In this arena, as with regard to the purposes they pursue, the curricular and pedagogical preferences they espouse, and the performance they seek from students, vocational educators display considerable variation among themselves. They are, however, more often than not well-equipped to speak knowledgeably about engaging the disengaged student.

By each of four vehicles—(1) a broadened conception of work education, (2) an invigorated curriculum and pedagogy, (3) a context for meaningful assessment, and (4) a capacity for responding to student diversity—vocational education has begun to move from the margins toward the center. We find vocational educators positioned in principle to contribute a way of thinking and a history of practice that are remarkably consonant with the aims of present reforms. We also find, on close examination, a host of internal contradictions that temper one's enthusiasm. On the whole, our recent visits to "innovating" schools have shown us more of an intersection of academic content and practical application than we were able to locate in our prior visits to vocational classes in conventional high schools. Our observations in the innovating schools suggest that educators can create a situation in which the work preparation offered by secondary schools achieves greater coherence, less stigma, and greater academic content, and in which most students achieve a solid academic grounding. They also suggest that it will not be easy.

THE STRUGGLES AND THE COMPROMISES

Descriptions of high schools with "integrated" programs of vocational and academic education have concentrated on what might be called the technical core of the school program—primarily the formal curriculum and the formal structural arrangements that organize students and teachers (Adelman, 1989; Grubb et al., 1991a; Mitchell et al., 1989). Missing from these descriptions have been the features of informal social organization that help us to explain why some ventures thrive while other structurally similar efforts fail. In the early stages of our field research, we have given special attention to the meaning of proposed reforms in the daily work and long-term careers of teachers. In this section, five topics form a provisional agenda for research and action. Each arises out of the recurrent themes in our conversations with teachers and administrators. Each constitutes an effort to take serious account of teachers' stated priorities (and perceived obligations) in teaching, their views of their students, their conceptions of curriculum, and their relations with one

another. Finally, each is directly linked to the subject organization and subject traditions of high school.

The Essential Activities and Topics of "High School"

Public conceptions of what high school should be and should accomplish (or educators' claims about what those public conceptions are) provide a crucial context for the campaign to achieve a defensible academic preparation for all students and to tie academic studies more clearly to the uses of knowledge in work. For the past decade, the relationship between work and schooling has occupied an increasingly central place on the public agenda. Agreement on the broad vocational goals of secondary schooling, while not uniform, is certainly widespread. Nonetheless, the precise translation of vocationalism into the topics, activities, and products of a high school education is not so clear.

To increase the presence and stature of work education in the comprehensive high school means, for most teachers, a shift in curriculum priorities and teaching practices. What will be added, abandoned, or modified in the daily classroom experience? What new relationship will be sought between the learning activities of the classroom and those provided by work, study, or service outside the classroom? In their conversations with us, teachers offered rationales to justify their subject curriculum by showing how it would supply students with the specific concepts or the habits of mind they needed to qualify for certain kinds of work in the future. Underlying the curriculum-in-use are teachers' broad claims that what students encounter in the classroom is—or should be—what they "need" for the future. Neither they nor we had many examples at hand to suggest a more precise connection between school subjects and the conduct of various kinds of work. Further, both they and we experienced a certain ambivalence in attempting to specify such connections—in doing so, we seemed at risk of narrowing the school curriculum to those concepts for which clear (and largely technical) workplace applications can be found. Implicitly, perhaps, we acknowledged that none of us could anticipate all of the ways in which algebraic thinking, the study of historical or literary interpretation, or the ability to construct and evaluate scientific explanations would enable persons to succeed in their work or otherwise pursue their lives. Our failure to do so did not seem an adequate ground for abandoning or curtailing those intellectual tasks in high school, though it might be reason for searching out some of the connections that would engage students more fully.

Teachers also invoke parental (and broadly public) expectations to account for their curricular choices. According to Reid's (1984) analysis of curricular topics and activities as institutional categories, schools are constrained by external views of what must be present for the school to count as a "real school" (see also Hemmings, 1988).[17] For example, Reid observes that "science in the secondary school legitimates itself through laboratory work which is only loosely related to the demands of specific content." In the period prior to the formation of comprehensive high schools in Britain, he recalls, the vocationally oriented secondary modern schools were "frequently barred from claims to be teaching science because they had no labs" (p. 69). Schools risk a certain loss of legitimacy in the eyes of a public if certain categorical activities and topics are not readily apparent in the available facilities or in the list of course offerings.

Students play an important but little-examined part in the persistence of institutional categories. They assess the significance of selected topics and activities not only for their immediate appeal, but also in light of their probable bearing on present school success and on educational and occupational futures. By Reid's (1984) analysis, students pay greater attention to the instrumental significance of a topic than to its contributions to learning: "The goal is success in the system as opposed to success in learning . . ." (p. 73). Prominent among the criteria by which topics and activities are judged are their status-relatedness—the leverage they promise in securing educational and occupational futures. Teachers' stories confirm the part that students and their families play in reinforcing traditional course offerings, topics, pedagogy, and assessment. In the daily classroom exchanges, clear subject boundaries and content maintain the predictability of "going to school." A science teacher reports,

> If you spend a day talking about the Vietnam War [in a science class], they don't think it was really history; they don't think it was really English: "Oh, well we didn't really do anything today. She was just telling us something interesting" [or] "Oh, well, you know, this doesn't count 'cause I know it's not science; I know it's not math." And if I ask about it on a quiz, they go, "Well that's not fair!"

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[17] Reid (1984) posits four characteristics that define the attractiveness of particular topics and activities to wider publics. They are (1) centrality, or the extent to which the topic or activity is viewed as central to membership in some categorical group such as the college bound; (2) universality, or the extent to which the topic is viewed as essential for all or for some; (3) sequential significance, or the extent to which the topic is a prerequisite for future student progress; and (4) status-relatedness, or the degree to which topics are chained in sequences with career significance. Mathematics is high on all dimensions (though "higher" mathematics is not universal, and its status-relatedness increases as its universality declines). The study of metalwork forms a counter-example in Reid's analysis: "progress through metalwork activities, where the curriculum moves from lower to higher skill levels, does not confer status. . . . [Thus,] centrality, universality, sequential significance and status-relatedness are socio-historical or ideological rather than educational or epistemological facts" (p. 71).

Parents, employers, university scholars, educational administrators, and politicians are all "carriers" of the institutional categories that define legitimate schooling and shape teachers' commitments to the established topics and activities of the classroom. Despite the critical commentary launched by all of these groups, they do not yet share a view of the way central topics and activities might be re-ordered. Indeed, they sometimes find themselves in fundamental opposition.[18] Teachers' perspectives on what it means to teach adolescents—what counts as worthy innovation or as a compromise of strongly held views—differentially dispose them toward an integration of vocational and academic education. Although most agree that preparation for adult work is one of the functions of schooling, most are also at a loss to say how work might become a focus or an occasion of academic study.

Competing Demands: Other Reforms in Subject Teaching

The landscape of subject matter teaching is shifting. Much of the impetus to innovate in secondary teaching comes from an altered conception of subject learning. The direction of that change is consistent with the integration of vocational and academic education.[19] This is especially true when new visions of subject teaching emphasize connections between abstract concepts and the occasions of knowledge use in work or other domains of adult life (as in the chemistry course promoted by the American Chemical Society). A promising point of departure might well be the question, *How can subject fields better illuminate the character of contemporary work and society?*

The fact of the matter, however, is that reforms in subject teaching seem rarely to take their point of departure from that question, or even incorporate it seriously when considering what knowledge and skill students should be able to demonstrate. On the whole, subject specialism is reinforced, not attenuated, by the main reform initiatives. The impetus for reform is conveyed in state curriculum frameworks, national subject standards proposed by professional associations such as the National Council of Teachers of Mathematics (NCTM), state standards for teacher licensure, the certification standards being developed by the National Board for Professional Teaching Standards, and by

[18] This is an arena in which inquiry is well-informed by the micropolitical perceptive introduced by Ball (1987). Ball's examination of the "micro-politics of schooling" not only illuminates the salience of within-school reference groups and the mechanisms by which they come to wield or surrender power, but also links the formation of reference groups to theoretical orientations toward competing theories of schooling, teaching, and subject.

[19] When Stern et al. (1992) assess the fit between career academies and other reforms, they cite the reform impetus to link schools more meaningfully and closely with employers and the movement to create wider choice for students and families. However, they do not talk about the fit with other subject teaching reforms.

statewide student assessment protocols. In each of these, we have witnessed a move to transform the high school curriculum in ways that value long-term gains in students' abilities over their short-term facility in reciting low-level knowledge.

Some of the changes underway in the academic disciplines represent a substantial departure in perspective and practice for secondary teachers. A math chair reports that "A lot of things are happening in mathematics" that she finds "exciting and also scary at the same time." The teachers in her department are confronted with the same changes, reflected in the standards of NCTM, but not all are disposed toward them the same way. The chair relates, "A teacher . . . mentioned to me yesterday that he just breaks out in cold sweats when he thinks about turning on a computer. And he's got to do some things like that, so it's going to be very uncomfortable for him . . ." That prospect may well preoccupy teachers such as this, making the fit between vocational and academic aims seem a far less pressing matter. The math chair anticipates

> big changes if we go to an integrated kind of mathematics where we just do course 1, course 2, and course 3 and not call it Algebra, Geometry, Algebra II. Because all the teachers were through Algebra, Geometry, Algebra II; they know what goes in those courses. They haven't been through the other courses so it's scary that you're going to teach something when you don't know really what's in it.

Further, what teachers or departments find attractive or problematic in particular reform proposals is in part a function of the way they conceive subject and subject learning. Siskin (1991) contrasts the ways in which English teachers and math teachers respond to proposals that implicate class size. English teachers, pleading adverse consequences on the volume of students' writing they must read and assess, found any increases in class size to be anathema. Among math teachers, large class size was less problematic as long as the academic tasks could be cast in terms of generating right solutions. When student performance is judged by tallying correct answers, grading student papers can be handled quickly, or even handed off to teaching assistants or departmental clerks. One might anticipate, however, that if the challenge in learning math were to generate multiple routes to a solution, or to write about how one arrived at solutions and why, and if the grade depended on the quality of the problem-solving path, student evaluation might not be so readily delegated and class size would be a more volatile issue.

To the extent that subject considerations and subject-specific reforms carry weight in teachers' work and occupy whatever discretionary time they may have, they require us to

think somewhat differently about how we might achieve and assess the integration of vocational and academic education. Should the proposed subject teaching reforms succeed, the traditional subject curriculum will be made far more lively, more credibly connected to practice, and more engaging for students than it now is. The impact on work preparation will be powerful but may be quite indirect—it will arise from students' experiences with collective projects, with problem solving, and with intellectual tasks that require genuine understanding rather than superficial "exposure" (see Meier, 1992). At the least, we must distinguish between the explicit incorporation of work-related applications or habits of mind—an overt and formalized curriculum of work preparation—and the indirect effects that follow from an academic curriculum that produces more enduring benefits for larger numbers of students.[20]

The Compelling Standard of "Curriculum Coverage"

Subject-related achievements are by no means the only way that teachers judge their own success in the classroom or derive personal satisfactions from their work. Nonetheless, the subject arguably supplies the most central and uniform metric of accomplishment for individuals and schools. Schools chart student careers by the accumulation of course credits; completion of course requirements is linked to high school graduation and university admission. Individual teachers—even those who decry the evils of "coverage"—describe the range of topics they expect to teach in a one-year course. The metric of coverage is pervasive and persistent, even among those who have entered voluntarily into projects that are founded on a principle of achieving greater depth ("less is more," in the terms adopted by the Coalition of Essential Schools).

Coverage is both disparaged and defended. Teachers fully understand the superficiality of a curriculum that organizes topics and skills on a rapid conveyor belt of units. Their comments often resonate with Newmann's (1988) judgment:

> We are addicted to coverage. This addiction seems endemic in high schools—where it runs rampant, especially in history—but it affects all levels of the curriculum, from kindergarten through college. We expose students to broad surveys of the disciplines and to endless sets of skills and competencies. The academic agenda incorporates a wide variety of topics;

[20] On the whole, attention to such "indirect effects" has taken three forms: (1) criticisms of the "hidden curriculum" of schooling, (2) studies of the economic return to years of schooling, and (3) studies of the differentiated content of academic instruction (including content variations among courses of the same title but enrolling different student populations).

to cover them all, we give students time to develop only the most superficial understandings." (p. 346)

Newmann inventories some of the destructive consequences of a coverage mentality, concluding that "beyond simply wasting time or failing to impart knowledge of lasting value, superficial coverage has a more insidious consequence: it reinforces habits of mindlessness" (p. 346). But Newmann also acknowledges that coverage is itself a habit difficult to break. He records the guilt that teachers express when they are unable to reconcile their felt obligation to "cover" content with the time that students require to achieve genuine understanding, saying, "The press for broad coverage causes many teachers to feel inadequate about having to leave out so much content and apologetically mindful of the fact that much of what they teach is not fully understood by their students" (p. 346). A science teacher who is attempting an "integrated" curriculum in chemistry exemplifies Newmann's argument:

> The American Chemical Society program has a lot of good ideas, but it glosses over a lot of stuff. I like the fact that the ACS is . . . putting in a lot of involvement and problem-solving activities [that show] where chemistry must be employed. So it shows people how chemistry is applied in our day-to-day lives. But in advancing that agenda in the curriculum, they expect you either don't need the nuts and bolts or you know the nuts and bolts, and I find [in my classes] that I assume the former. We don't need the nuts and bolts so we're just going to kind of talk about these things in general terms and it becomes this real "qualitative chemistry." [But] I think that maybe they ought to be getting also the ability to quantitatively [analyze]. And all their labs expect quantitative analysis at the end.

As teachers elaborate on the prospects for achieving greater depth and practicality in the curriculum, they begin to reveal some of the tensions and trade-offs they anticipate. To some extent, each subject presents its own configuration of possibilities and dilemmas. For most, broadening the range of instructional strategies is an acceptable route toward depth, and one that seems to honor the subject requirements. Thus, a math chair reports that students achieve a better understanding of mathematics when they write about it:

> My goal here with our own department the last several years has been to increase writing in the math classes. We do lots of writing. The first assignment is to give me a math autobiography. Every quarter my kids have some kind of a writing project.

Nonetheless, such methods require more time. Does slowing the pace of instruction mean eliminating important concepts? Here some of the differences among subjects begin to show up. One math teacher offers, "I think you can do 'less is more' in

English; you can read three books instead of six books. But I don't think you can do 'less is more' in math." Another agrees: "You can't teach 'less is more' in math. There isn't anything you can throw out."

"Deep" understanding of a subject might be thought to follow readily and naturally from practical applications that increase opportunity for students to discover the concrete manifestations of abstract concepts. However, teachers are reluctant to tie curriculum priorities only to those concepts for which practical applications seem most readily apparent. Math and science teachers express the greatest reservations (though they are not alone), lamenting the compromises that seem to result from attempts to make the curriculum more "practical":

> You can't say, "Well, if you can't find an application for it, let's throw it out." The application may come when the student is in advanced math. You need the building blocks beforehand. [Someone] told a math teacher, "Well, why don't you do an exhibition on the trajectory of a ballistic missile and relate it to the Desert Storm War?" "They don't have the skills yet for that." "Well, isn't it a simple Distance-Rate-Time problem?" "No, it is not. It is a study of parabolic movement." [math teacher]

> Science and math are kind of linear. You really need to have a foundation before you can put it to work on a project, or really address . . . some thesis like, Why should we conserve minerals? Why should we be careful about the way we use certain things? Why should conservation be our way of life? Unless you've got basic understandings of atoms and the way atoms act in the real world in reactions, then you may not really have a powerful way to advance conservation. . . . So, I understand "less is more," where you can delve into things and explore and so forth, but a lot of times in a year's course, "less is more" ends up being less. Science has been, you know, not really hard science anymore . . . . It makes you wonder about what you're doing. [science teacher][21]

Slower pace ("less is more") creates special discomfort when teachers cannot readily detect gains in students' understanding or engagement. A science teacher commented,

> We have done less and less and less. Biology used to be just one year and we used to cover not only biochemistry, but the bio-geochemical cycles and the role of chemistry in nature. We would also cover biochemistry in systems and then we would cover the human body. Approximately twenty-three units. And I'm to the fourteenth unit right now of what I used to teach

[21] In neither of these comments do we discover any sense of how students come to an increasingly sophisticated grasp of complex practical problems over time; rather, there is an underlying assumption that the pursuit of such practical issues as resource conservation must wait until students have a command of all of the conceptual and methodological elements required for a solution. Ironically, each of the teachers displays a subject-bound view of what counts as an essential element. For example, the problem that the math teacher defines as "a study of parabolic movement" might be defined by the science teacher as a problem in force and motion. Claims such as these may do more to assert and defend teachers' independence on matters of curriculum (employing the subject paradigm as a resource) than to explain or explore possibilities for student learning.

in a year, and this is the second year of the course. So, I've slowed down incredibly to try to enrich and address the needs that my students have for discussion and so forth; and yet, I don't necessarily see them doing a hell of a lot more.

The obstacles to depth in the high school curriculum are formidable (though Newmann, Sizer, and others would argue they are not insurmountable). As Newmann (1988) remarks, formal education encapsulates a "legitimate need for a certain degree of coverage" in the education of the young (p. 347). When this legitimate need is combined with a testing industry that supplies the single most visible guarantor of public accountability, a textbook industry that reifies disciplinary knowledge in unit outlines, and university admission procedures that specify completion of particular course content in the high school, the result is (or has been) a curriculum strong on breadth within a few core academic subjects but weaker on conceptual depth, connectedness, and situated use. (It remains to be seen how evolving experiments in standardized performance testing—testing that better approximates students' actual performance on complex tasks—bear upon the movement toward greater depth in curriculum. See Frederiksen et al., 1991). Other obstacles to achieving curricular depth arise from the teachers' perception of what it means for a student to have "learned" the subject they teach. This is not to say that the views teachers express are uniform, or are uniformly defensible. They are neither. Teachers within the same discipline disagree about what counts as "essential" concepts and skills and about the ways in which students best learn them. Teachers sometimes express views that are clearly at odds with some of the advances in the discipline or with theories of learning. Their views are, however, a reasonable clue to the practices they will embrace or eschew in the classroom.

What Counts as "Work Education" in the Academic Curriculum?

When confronted with the practical possibilities for specific work applications in the academic curriculum, teachers' experience and imagination run short. Most teachers can imagine an increase in outside speakers or career-oriented counseling and school-level activities far more readily than they can imagine a shift in the nature of curriculum content, pedagogy, assessment, or teacher-student relations. One teacher in a school that is planning career clusters said, "In the classroom, I don't think it will be a major change" for the academic teachers. Among the examples we heard, most concentrated on how one

qualifies for a job rather than how knowledge came to be used in doing work. The former turns out to be easier to convey than the latter:

> I do a career project every year with my [math] students. The last three years that's been writing a letter to someone in a field, asking what mathematics they needed to take to get there, and then what mathematics is used. Because a lot of kids will say, "I'm not going to use this higher math in my job." However, what they're hearing back is that they had to take it to *get* to that higher job, and that's important just for some of the kids, so that, that they'll be one of the competitive people then, in getting that job. You know, they've had the background. [math teacher]

Another common theme highlighted work-related attitudes and habits, most of them focused on compliance with authority relations in the workplace (e.g., see Claus, 1990). Despite the burgeoning attention to problem solving, critical thinking, and cooperative learning, the teachers with whom we spoke did not elaborate on the ways in which such activity might prepare students to take initiative on the job, or to be competent members or leaders of a group of workers:

> Whenever a student gives me a paper, I'm the boss—you work for me. Does the boss like the looks of it? You know, a couple of times I've returned it and say, "Do that over—you're not going to have a job." [business teacher]

In his critique of work education a decade ago, Boyer (1983) proposed that students spend one semester in a course dedicated to the academic study of the history, politics, and economics of work. Such a perspective seems nearly absent in the schools we have visited—especially when considered as a separate course. The coordinator of one business education academy is planning a course, "Business in English," that will examine the treatment of work in various works of English literature.[22] The course is intended to satisfy an English elective requirement for students in the academy program. The chair of another English department describes activities that she plans to incorporate in her class to expand students' perception of the meaning and types of work:

> My students do a family history report. This time I will include a family employment history. Students will investigate what members of their family have done, and why. This should generate a greater sense of work. [Work] doesn't just happen on the day you graduate.

[22] In the interest of supporting the development of such courses, NCRVE has organized an annotated bibliography of novels and short stories that might be used in the academic study of work (Koziol, 1992).

The impetus and the opportunity to figure out "integration" seem greatest in the career academies or in other closely interdependent teams that have incorporated an explicit orientation toward work preparation. Teachers' conversation in those settings, in so far as we have been privy to it, tends more toward the discovery of possibilities for curriculum coordination than toward worries over the compromises in subject integrity. Academy teachers concentrate on blurring the boundaries among subjects and between the vocational and the academic:

> We try to eliminate the old differentiation between vocational and academic. We're always being asked, "Who's your technical guy?" and we're uncomfortable about that. We still cling to some of that [differentiation]. One of us is responsible for graphic arts, one for English, one for math and science. But our goal is to cross-teach more.

> We like to relate a concept to a real-life concept. We like to think in those terms. They had to learn about acids and bases in chemistry. They got all the theory, but then they had to use the theory to test the acidity of paper they would use to print their poems. If it's acidic, it doesn't last a long time.

To gain the attention of the subject specialists—and especially those who teach the more advanced academic courses—the integration of academics and work requires (1) that the workplace applications of academic concepts and skills be made more visible to academic teachers (the only workplace that teachers tend to know well is school); and (2) that the "work connection" be seen as adding both rigor and utility to the academic curriculum, rather than requiring a compromise with subject integrity (see Stern & Dayton, 1990).

What Teachers Can Achieve: Issues of Preparation and Opportunity

Multiple reforms compete with one another and with the daily immediacies of the classroom for teachers' time and attention. Academic teachers may experience simultaneous demands to advance reforms *within* subjects (e.g., the new mathematics standards) and to participate in efforts *across* subjects (e.g., interdisciplinary work in math and science or in the humanities). In principle, these various reforms are compatible. In practice, each is demanding of teachers' intellectual resources, social relations, time, and energies. Teachers sometimes experience them as being in conflict. In particular, academic teachers may view the integration of vocational and academic education as compromising the aims of subject matter reforms. An English teacher on the verge of taking early

retirement found new enthusiasm for teaching in one of the career academies. But other teachers experience a sense of loss or compromise when what they are asked or required to teach departs radically from the subject as they know it or have been prepared to teach it.

What might we anticipate in the early stages of "collaboration" among teachers who have taught largely or exclusively within separate departments? Stodolsky and Grossman (1992) observe that the subject perspectives, vocabularies, and epistemologies are sufficiently different from one another that teachers might have to learn a new language to speak meaningfully to one another. Yet the opportunities to understand one another's language, and to forge accommodations among the perspectives, seem sparse. The elaborated meanings regarding "subject" or "work" on which teachers rely are taken for granted but rarely are made explicit, visible, and/or accessible to discussion and debate. Despite the frequency with which we encounter references to subject disciplines or subject topics, there is remarkably little talk recorded in our interviews or field notes that maps the contours of subject philosophy or subject pedagogy.[23] Rather, there are truncated topical references that signal subject affiliation, but reveal little of the specifics of subject that might establish the grounds for integration (or separation) of theory and practice. When social studies teachers speak of "doing Manifest Destiny," they employ a shorthand language that masks both the philosophical and pedagogical aspects of their belief and practice in the teaching of history.

The truncated, compressed language of these subject specialists can be traced to three related circumstances. First is the pervasive isolation or independence of teaching, leaving teachers to form opinions about entire "subjects" on the basis of their partial knowledge of what individual teachers do in their classrooms. The possibilities for collaborative work rest in part, then, on the visibility and credibility of local teaching performances. Second, superficial treatments of subject teaching are consistent with the "coverage" standard by which teachers' obligations are judged to be met. There is rarely a reason to communicate to others what "doing Manifest Destiny" amounts to in conception, pedagogy, and assessment—only a reason to assure one another that it is being "done." Finally, teachers themselves command little knowledge about the uses of their subjects in occupations other than teaching; the opaque character of the world of work, at least as it employs the fundamental concepts and skills supplied by a strong academic education, is

[23] I am indebted to Susan Threatt for her observation that, despite all the categorical subject references in those texts, there was almost no detailed "subject talk" in them. This may, of course, be an artifact of our field research methods (especially in the case of the interviews); or it may accurately depict a situation in which subject is made routinely opaque in the discourse among teachers.

equally problematic. Teachers, not surprisingly, are most intimately familiar with the workplace of the school itself. About the various ways in which their subjects inform other kinds of work, most can only guess.

To act knowledgeably on the basis of a changing conception of teaching and learning is not merely a matter of adequate time. It is a matter of interdependence among teachers—the reasons they find for joint work with one another and with persons in a range of other occupations and work situations. It is a matter of the perspectives and practices that teachers acquire in their formal programs of teacher education and in the formal or informal activities they encounter in the course of their work. Finally, it is a matter of the vision of schooling that is embedded in the social organization of schooling and in the resources and rewards of teachers' work.

CONCLUSION

This essay places proposals for integrating vocational and academic education in the context of subject specialism in the comprehensive high school. Certain aspects of subject specialism prove especially salient to the intersection of vocational and academic aims. Some strategies more than others promise to modify the status hierarchy in which academic subjects dominate over those deemed "practical" or "vocational." Some more than others actively construct more permeable boundaries (or more durable ties) among the "different worlds" that now demarcate school subjects. To integrate vocational and academic purposes, programs, and personnel will require that advocates capitalize on the range of challenges to the subject organization of secondary schools that undergird present reforms.

The arguments developed here stem from extended field research in five "ordinary" high schools where vocational and academic aims remain quite separate and traditional vocational education is in decline; and from preliminary site visits to several "innovating" schools in which the relationship between academic study and work preparation is more fluid. Systematic comparisons between the two would be premature. Nonetheless, four provisional conclusions seem warranted. They express our present understanding of the materials at hand and serve as the point of departure for subsequent work.

- *The subject organization of secondary schooling is well-buttressed and highly resilient.*

  There is no instance—even in schools experimenting with career paths or career clusters—in which schools have displaced the traditional subject disciplines as the organizing focus for teacher and student assignment. The subject organization—usually in the form of departments—either continues to dominate the school structure or exists as a kind of parallel structure alongside houses, divisions, or clusters. It is unlikely that the intended integration of vocational and academic education will succeed in the absence of the other remedies entailing a reconceptualization of secondary schooling and the place it accords to the subject disciplines. That is, the integration agenda will be advanced only by coming to terms with the status hierarchy that exists among subjects, departments, and teachers in secondary schools (Ball, 1987; Burgess, 1983; Little, 1990, 1993; Neufeld, 1984). Further, it will be advanced when teachers begin to confront the "addiction to coverage" that persists despite demonstrably negative consequences for learning (Newmann, 1988, p. 346).

- *Teachers' commitments to the subject disciplines, and their response to subject reform proposals, are mediated by their beliefs about students.*

  Despite the power of the subject stereotype, subject is not the whole story. It may not be the most important story, even though subject-related rationales figure prominently in the explanations teachers offer for their support or opposition to particular reform proposals. Embedded in teachers' accounts about *what* they teach, or what they should be teaching, are commentaries about *whom* they teach. The resilience of a hierarchical and differentiated subject curriculum can be rationalized on the basis of subject disciplinary traditions and paradigms, but it may be better explained on the basis of firmly held beliefs about the abilities, motivations, and dispositions of high school students. Like Oakes and her colleagues (1992), we were struck by the apparently widespread belief that students' abilities and motivations are relatively fixed by the time they reach high school. Thus, the integration agenda may proceed most steadily and surely in schools where such beliefs are genuinely open to question.

- *Multiple reform efforts, to greater or lesser degrees compatible with one another, compete for teachers' time and attention.*

  Multiple reforms compete for teachers' time, attention, and interest, and for the professional development resources of a school and district (see Little, in press). Most visibly, efforts to enhance the rigor and credibility of vocational education ("intensification" strategies) sit alongside efforts to enrich the teaching of the academic subjects. Of the two, the subject reforms are currently the more powerful: more visible to teachers and administrators; more advanced in development of exemplars; and more readily aligned with teachers' existing capacities, commitments, and circumstances. Nonetheless, they present difficulties. For example, secondary teachers are pressed to participate in interdisciplinary curricula at precisely the time they are asked to reconsider their approaches to subject matter teaching—the latter reinforced by new state curriculum frameworks, standardized test protocols, textbook design, subject-specific university admission requirements, and teacher licensure policies. State and local policymakers continue to judge the success of reform efforts on the basis of standardized test scores even while they urge the development of alternative assessments. Reforms targeted to increase "critical thinking" sit in tension with the basic skills reforms that began in the 1960s and that remain a prominent part of the school improvement landscape (Carlson, 1992). Into this mix one adds the goal of integrating vocational and academic education. The sheer magnitude of the reform agenda and the multiplicity of reform "projects" requires us to consider not only the direct consequences of formal vocational education programs, but also the indirect benefit that accrues to work education from other transformations in secondary schooling—in particular the benefits that arise from improvements in academic instruction.

- *Persuasive exemplars are in short supply.*

  Vocational and academic pursuits have been so separated and so differently valued that persuasive models of integration are hard to find. Everywhere we go, educators are either grasping for good models or are struggling with the furor that results when a school is labeled a "model." Meanwhile, both vocational and academic teachers express a general uncertainty about what they are called upon to do by the various reforms—about what content and methods might replace conventional curriculum and instruction in specific subject areas, about what form "integrated" or "interdisciplinary" curricula might take, or about what the "infusion of careers" might mean. Some of the proposals for the integration of vocational and

academic education require little change in teachers' perspectives or practices; others imply dramatic shifts in what it means to attend or teach in high schools. Despite the genuine uncertainties and difficulties, however, many teachers share a sense of urgency. They do plunge ahead in planning and in pilot programs, convinced that business as usual will not suffice. Ideas and programs proliferate, and the number of innovating schools continues to grow. Our task is to learn from them and with them and to avoid the temptation to anoint them prematurely as "models" while they struggle to re-invent the established traditions of high school.

Proposals for the closer integration of vocational and academic studies offer one promising and ambitious avenue to the revitalization of secondary education. Such proposals gain currency by virtue of the escalating sense of urgency that surrounds the high schools—especially those in urban areas, but not exclusively so. They also engage teachers, individually and collectively, in confronting the essential purposes of schooling and the ways in which their daily work advances or frustrates those purposes. The discussions or debates that ensue reveal the contours of belief and practice within a school, sometimes locating the grounds for common action and sometimes giving expression to enduring and deeply felt differences. Perhaps more than other reform proposals, those centered on the vocational purposes of schooling also engage teachers with individuals and institutions—counselors, parents, employers, social services agencies, postsecondary institutions, and the students themselves—whose choices directly and indirectly shape the structure of opportunities for students. It is true that these proposals place at issue the traditional images of the subject specialist, the traditional definitions of the subject curriculum, and the traditional forms of subject organization. It is also true that the traditional stereotypes surrounding "subject" have never been adequate to account for the rich diversity of perspective and practice among teachers. The campaign to integrate vocational and academic pursuits makes visible the complexities surrounding subject affiliations and the place they occupy in defining what is worth knowing.

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