

*February 1996*

*This paper was published as a monograph of the League for Innovation in the Community College.*

**COMMUNITY COLLEGE INNOVATIONS IN  
WORKFORCE PREPARATION:  
CURRICULUM INTEGRATION AND TECH PREP**

W. Norton Grubb  
Norena Badway  
Denise Bell  
Eileen Kraskouskas

School of Education  
University of California, Berkeley

This monograph is a joint product of the National Center for Research in Vocational Education, the League for Innovation in the Community College, and the National Council on Occupational Education. It was supported by funds from the Office of Adult and Vocational Education, the U.S. Department of Education, to the National Center for Research in Vocational Education, the University of California, Berkeley.

# COMMUNITY COLLEGE INNOVATIONS IN WORKFORCE PREPARATION:

## CURRICULUM INTEGRATION AND TECH PREP

### *Table of Contents*

Acknowledgements	i
Executive Summary	ii
Introduction	1
I. Federal Initiatives and Other Support for Workforce Innovation	5
II. Enhancing Skills for the 21st Century: Integrating Academic and Occupational Education	10
Combining Academic and Vocational Content in Individual Courses: Infusion, Writing Across the Curriculum, and Applied Academic Courses	12
Multi-disciplinary courses combining academic perspectives and occupational concerns	17
Tandem Courses, Clusters, and Learning Communities	22
Capstone Courses	25
Teaching Developmental Education and ESL in Occupational Contexts	26
Organizational and Structural Changes	31
The Benefits of Curriculum Integration	31
III. Strengthening the Educational "System": The Community College Role in Tech Prep	36
The Activities of Community Colleges in Tech Prep: The Changes in High Schools	38
Explaining the Lack of Changes within Community Colleges	42
Three emerging models of tech prep	47
The Future of Tech Prep: Assuming the Costs of System-Building	51

IV. Requirements for the Future: Stability and Administrative Leadership	56
Footnotes	62
Appendix: Sources of Information	64
References	68

## ACKNOWLEDGEMENTS

This monograph is a collaboration among the National Center for Research in Vocational Education (NCRVE), the League for Innovation in the Community College, and the National Council on Occupational Education (NCOE). It began as an idea of Terry O'Banion of the League to survey the "landscape" of workforce innovations in community colleges, a landscape that has become increasingly crowded with changes and innovations in the past decade, and increasing difficult to understand. This monograph, the initial one is what will hopefully be a series of collaborations, depends largely on research conducted by the National Center for Research in Vocational Education at the University of California at Berkeley, funded by the U.S. Department of Education. And the National Council for Occupational Education, the organization of administrators and faculty most concerned with the occupational mission of community colleges and technical institutes, has been consistently supportive of these efforts because of its interest in those changes that can enhance occupational purposes.

The greatest debt of the authors in preparing this monograph is to the large number of faculty, tech prep coordinators, instructional deans, and other administrators involved in both the integration of academic and occupational education and tech prep. These individuals, too numerous to name, gave freely of their time and their insights into the programs they are establishing; they very often sent curriculum materials, work plans, and other documents to help us understand their innovations. This is in every way, their work, and a tribute to the numerous individuals in community colleges and technical institutes involved in promising reforms.

This monograph also benefited from an initial review of its content, and a subsequent review of a draft monograph, by an advisory committee composed of administrators and faculty from League colleges and from the National Council on Occupational Education, convened by Terry O'Banion. These individuals also made helpful suggestions about institutions to contact about promising practices. In particular, the following individuals provided comments that were especially helpful in revising the monograph: Debra Bragg, Pat Donohue, Lynn Hall, Jim Jacobs, W. Gary McGuire, Terry O'Banion, and Peggy Tyler.

W. Norton Grubb  
University of California, Berkeley, and NCRVE

Terry O'Banion  
League for Innovation in the Community College

Pat Donohue  
National Council on Occupational Education

## EXECUTIVE SUMMARY

During the past fifteen years, a great surge of interest in the preparation of the workforce has affected all institutions. Community colleges and technical institutes are central to these innovations, because many of the changes emphasize the preparation of individuals with some postsecondary education but without a baccalaureate degree, the "backbone of our economy" – precisely the individuals prepared by community colleges.

In this climate, innovations have multiplied faster than they can be absorbed. Furthermore, federal legislation providing support for some of these changes has been unstable, and is likely to disappear into a consolidated block grant giving states more discretion. The purpose of this monograph is therefore to describe two innovations with considerable support independent of federal funding – the integration of academic and occupational education, and tech prep programs linking community colleges with secondary schools – in order to clarify the many forms they take and to clarify their benefits to students, to employers demanding higher-order skills, and to community colleges themselves.

While these innovations can be viewed as ways of enhancing the quality of occupational programs, they are also ways of reshaping community colleges *for all students*. They help students make the transition from secondary to postsecondary education and providing a range of instructional methods for the range of competencies that students will require as employees and citizens. In the process they give community colleges a central role in reshaping the entire educational system.

*Integrating Academic and Occupational Education:* Curriculum integration in community colleges takes many forms, as befits a flexible practice that can be modified to local needs and resources as well as employment conditions. In some of these, instructors infuse some academic content into an existing occupational course, often quickly and informally. More formalized ways of doing so can be developed, of course, of which Writing Across the Curriculum is probably the best-known. And many institutions have developed their own applied academics courses, which take conventional academic subjects and infuse them with the material and applications from various occupations. These applied or hybrid

courses, which can be found in a great variety of subject matter and occupational areas, thereby provide a context or setting for teaching higher-order competencies that go beyond abstract academic content.

A different approach to integration involves the development of multi-disciplinary courses, taking the concepts and analytic methods of academic subjects – history, literature, ethics and philosophy, the study of societies and cultures from sociology and anthropology – and applying them to technological developments, to the nature of work and its consequences, and to other employment-related issues. They usually involve the collaboration of both occupational and academic faculty, and provide novel ways of examining both academic subjects and more occupational themes.

Many institutions have developed tandem courses – where individuals take a pair of courses that have been jointly developed – or even three or four courses together, usually referred to as clusters or learning communities. Such practices provide many opportunities for integrating content, incorporating higher-order or SCANS competencies, making sure that academic prerequisites are covered, exploring occupational applications, and making the interconnections of different perspectives clear to students. They can also be applied to remedial (or developmental) and ESL courses by combining remedial or ESL courses with an occupational courses, enhancing the motivation of students needing basic academic skills or English instruction while providing some of the particular competencies required in particular occupations.

*Tech prep:* Tech prep programs linking community colleges with high school programs have become ubiquitous, often as vehicles for curriculum integration or the enhancement of secondary-level content. The most frequent changes so far include the enhancement of the high school curriculum, a process in which community college instructors have been crucial in clarifying the demands of postsecondary education; efforts to explain or "market" the value of tech prep; and the development of articulation mechanisms smoothing the transition from high school to college. In addition, a few tech prep programs have instituted other changes like special counseling, career exploration, and work-based components, illustrating the flexibility of this innovation.

In most cases, however, tech prep has not yet made substantial changes within community colleges. The most important reason is that these programs have not been in place long enough for many tech prep students to enter the

postsecondary component – though coordinators report that they may be on the cusp of important changes because larger numbers of tech prep students will enter community colleges in the next few years. Other barriers include the resistance of faculty and the uneven support of administrators. Finally, in some tech prep approaches, reforms in high schools – either of vocational programs, or of programs for all students – are more important goals than changes at the community college level.

A more systemic problem is that it is often difficult to identify individuals as "tech prep students". Furthermore, many students in the high school portion may benefit – by graduating from high school rather than dropping out, for example, or continuing to a four-year college rather than the community college – without enrolling in the community college that sponsors a tech prep effort. Thus the benefits of tech prep are often diffuse, and accrue to students and the educational "system" as a whole, not necessarily to particular community colleges. One implication is that the costs of *system-building* efforts like tech prep need to be borne by the system itself, through state or federal funds, rather than by individual institutions.

Both curriculum integration and tech prep have multiple benefits. They can enhance the content of both secondary and postsecondary coursework, responding to the demands of employers for higher-order competencies. They prepare secondary students better for the demands of postsecondary education, and provide community colleges with the range of competencies they will require on the job and in other walks of life. Both innovations are multi-faceted and flexible, able to incorporate a variety of goals and to reflect different local conditions.

The continued development of these innovations in workforce preparation depend on institutionalizing the changes made so far, extending them beyond the volunteers and enthusiasts who have participated in the initial stages. In turn, this will require *stability* in both the funding and the climate of reform that has led to these reforms. And *administrative leadership* is a final requirement, since few changes can be carried out by individual faculty: only administrators can provide the coordination among faculty and the institutional commitment necessary for these reforms. But the rewards can be substantial, in helping community colleges fulfill their promise as innovative, teaching-oriented, non-



traditional institutions responding to their multiple missions with flexibility and foresight.

## INTRODUCTION

During the past fifteen years, a great surge of interest in the preparation of the workforce has affected all educational institutions. Motivated in part by the fear of economic decline, the renewed emphasis on occupational preparation has resulted in numerous commissions reports, federal and state legislation, local reforms of many kinds, and new initiatives from business and industry.

Community colleges and technical institutes are central to these innovations. In large part policy-makers and business leaders have focused on the middle-skilled jobs of our economy, the jobs for which community colleges prepare students. For example, one report that described in stark terms the directions this country faces, *America's Choice: High Skills or Low Wages!* stated that

more than 70 percent of the jobs in America will not require a [four-year] college education by the year 2000. These jobs are the backbone of our economy, and the productivity of our workers in these jobs will make or break our economic future.

The report's program to promote a high-skills economy then recommended a system of technical and professional certificates and associate degrees "for the majority of our students and adult workers who do not pursue a baccalaureate degree". In the innovations intended to improve the preparation of individuals for these critical jobs, community colleges and technical institutes are central.

But the downside of this renewed interest in workforce preparation is that reforms and proposals have multiplied faster than they can be absorbed. The programs and proposals that have been introduced during this period include at least the following:

- accountability measures, including performance measures required by federal legislation.
- proposals to enhance the academic competencies and "higher order" skills of the workforce, including federal initiatives to integrate academic and occupational education;
- tech prep programs linking secondary schools with community colleges;
- school-to-work programs adding work-based learning to educational programs;

- the expansion of short-term job training programs, for groups ranging from welfare recipients to displaced workers;
- contract education, provided by community colleges to specific employers to upgrade certain skills of their workforce;
- state-funded economic development programs, providing still other funds for firm-specific training, often with the intention of attracting business and industry to an area;
- proposals to develop skill standards, specifying the skills required in certain occupations and industries.

And, with all these changes, federal legislation that provides support for some of these innovations has not remained stable. At the moment Congress is considering legislation to consolidate vocational education, job training, and adult education legislation, giving states greater authority over how to spend these funds. Small wonder, then, that community college administrators and instructors often complain about the "reform du jour", the sense that there have been too many reforms that come and go, overlapping in their purposes and unclear in their effects.

The purpose of this monograph, therefore, is to clarify certain innovations in workforce preparation and to highlight those emerging practices that have the most promise for community colleges. We begin with two particular innovations – the efforts to integrate academic and vocational education, and tech prep programs – because they have attracted a great deal of attention, and have led to practices that should continue even if federal funding for them is reduced or eliminated. The two are appropriately examined together, because tech prep programs often include curriculum integration or have been used to fund integration activities; indeed, to some extent our separation of curriculum integration (in Section II) and tech prep (in Section III) is artificial and violates the practice in some community colleges of combining these reforms. However, they are conceptually distinct innovations since curriculum integration can take place in community colleges without the links to high schools that define tech prep. Conversely, as we will show in Section III, tech prep programs have often failed to change postsecondary curricula, and have sometimes fostered curriculum integration in high schools but not necessarily at the postsecondary level. And the focus of each is different: curriculum integration emphasizes changes in curriculum and pedagogy, while tech prep stresses relationships between secondary and postsecondary education.

While we start with these two particular reforms, over the longer run we hope that the joint efforts of the National Center for Research in Vocational Education, the League for Innovation in the Community College, and the National Council for Occupational Education will continue to examine other workforce innovations, providing community college administrators and faculty a thorough understanding of the variety of occupational initiatives. In particular, these two reforms are examples of a more general innovation that would seek other forms of integration as well – for example, integration across occupational areas, particularly in institutions where occupational programs have fragmented and proliferated; integration *across* community colleges, which would benefit from learning about one another and sharing their experiences in innovation; integration with business and industry and with work-based learning, the vision of the School-to-Work Opportunities Act of 1994; and integration of longer-term occupational education with shorter-term job training.<sup>1</sup> Over the long run, the creation of a coherent system of workforce preparation depends on institutionalizing all these forms of integration, replacing the fragmented non-system we now have.

Throughout, we stress that there are varying ways to understand the value of these two particular innovations, as well as other initiatives we will examine in the future. On the one hand, these reforms can improve the quality of occupational programs, increasing the skills of workers in ways that should enhance their mobility over the long run and respond to the demands for a better-qualified workforce. On the other hand, a broader interpretation is that they are ways of reshaping community colleges in fundamental ways for *all students*, not just for a subset who have chosen occupational programs. For example, the efforts to integrate academic and occupational education lead to forms of teaching that provide a clearer context or setting for academic subjects and for developmental education. The collaboration among instructors can help "build communities" within the community college, as *Building Communities*, the 1988 report of the Commission on the Future of the Community College, called for. And some tech prep programs, with their emphasis on developing coherent sequences of courses from high school into the community college, have helped counter the tendency of both students and faculty to think in terms of isolated courses. As the report of one tech prep director stated,

This project may have come to life under the auspices of the tech prep project, but it has opened a window on the fundamental mission of the community college, indeed of all education.

These innovations start out as ways of enhancing occupational preparation, which is only one mission of the community college; but they can end up as innovations that influence many of these missions.

Throughout, we emphasize that there are many different approaches to both curriculum integration and tech prep. We provide numerous examples in order to clarify the range of practices and the variety of options. These reforms are therefore flexible enough to match the tremendous variety of community colleges and technical institutes as they vary in size, student composition, mission, and local labor market conditions.

Finally, we stress that, while these two innovations have been financed by federal legislation, support for them is much deeper than federal support. In Section I we outline these different sources of support, clarifying that – whatever happens with federal legislation in the turbulent times ahead – the more fundamental reasons for curriculum integration and tech prep will persist. The innovations should therefore outlive the federal legislation on which they currently depend. Then Section II and III describe the innovative efforts in community colleges in curriculum integration and tech prep, respectively, while Section IV summarizes the benefits of these innovations.

## I. FEDERAL INITIATIVES AND OTHER SUPPORT FOR WORKFORCE INNOVATION

In their current form, both the integration of academic and occupational education and tech prep programs have been stimulated by federal legislation — specifically, the Carl Perkins Amendments of 1990. Section 238 of these Amendments stated that

Funds made available . . . shall be used to provide vocational education in programs that . . . integrate academic and vocational education in such programs through coherent sequences of courses so that students achieve both academic and occupational competencies.

In theory, this required community colleges (as well as secondary schools) to use all their federal funds for such integration efforts. In practice, most community colleges initially made little progress in implementing this provision, partly because the idea was so unfamiliar, and most of them continued to spend federal funds for capital equipment, for remedial or developmental efforts for occupational students, and for updating courses and materials (Grubb and Stasz, 1993; Boesel, 1994). However, as we describe in Section III, more recently community colleges seem to have increased the amount of experimentation with Perkins funds, and the number and variety of integration efforts have expanded substantially. In some states, state-level initiatives reinforced and interpreted federal requirements; for example, Colorado directed its community colleges to develop integration plans in late 1990; California made this a priority beginning in 1994; Ohio has been especially active in developing capstone courses (described below); Kansas has circulated a standard form for colleges to describe key practices related to integration, allowing innovations to be shared among practitioners; and New Hampshire has developed a list of core competencies for integrated courses, quite similar to the skills articulated by the much-cited Secretary's Commission on Achieving Necessary Skills (SCANS, 1991). But state enforcement has varied widely and can often be satisfied with paper compliance; most successful efforts at curriculum integration have been locally-developed.

Similarly, tech prep programs have been funded with federal funds. The 1990 Amendments established a separate allocation for tech prep programs, requiring seven "essential elements" in all programs:

- formal articulation agreements between secondary and postsecondary institutions;
- a core of required courses in math, science, communications, and technologies, including at least two years of high school and two postsecondary years;
- curriculum development appropriate to the consortium;
- in-service training for both secondary and postsecondary instructors;
- training for counselors;
- equal access for special populations;
- preparatory services to help all populations participation in tech prep.

In response, tech prep consortia developed around the country, including both secondary schools and community colleges. As Section III clarifies in greater detail, most tech prep initiatives have emphasized innovations at the high school level, and with some important exceptions the amount of change within community colleges is still relatively small. Nonetheless, we stress that the conception underlying tech prep remains a valuable one, with substantial benefits for community colleges as well as high schools.

These two innovations have been incorporated into subsequent federal legislation, the School-to-Work Opportunities Act of 1994. This Act provided funding for new school-to-work programs; but because the funding for such programs has been quite modest — \$150 million for fiscal year 1995, with funding designed to vanish after five years, compared to \$1.2 billion for the Carl Perkins Act and nearly \$5 billion for job training programs, for example — this Act is perhaps best interpreted as a *vision* for work-related education and a stimulus to experimental efforts, rather than a *funding source*. The Act specified a three-part program incorporating an educational component, a work-based component, and "connecting activities" to ensure the consistency of the two. Furthermore, the educational component is to include a "career major", defined as "a coherent sequence of courses . . . that integrate occupational and academic learning, integrate work-based and school-based learning, and establish linkages between secondary and postsecondary education", and it requires programs to incorporate at least one year of postsecondary education. School-to-work programs should incorporate both curriculum integration and the spirit of tech prep linking secondary and postsecondary efforts. The school-to-work vision therefore proposes three different forms of integration: the integration of academic and occupational education; the integration of secondary and

postsecondary education; and — the new element in school-to-work — the integration of work-based and school-based learning.

But nothing stays the same, least of all federal legislation. Currently Congress is considering legislation to consolidate a number of vocational education, job training, and adult education bills, to reduce overall funding by 25 percent, and to allow states considerable freedom in deciding how to spend the remaining funds. The specific details remain unclear because different versions of this legislation have not yet been reconciled.<sup>2</sup> However, it is virtually certain that both the Carl Perkins legislation and the School-to-Work Opportunities Act will be eliminated in the process of consolidation, thereby ending funds earmarked for curriculum integration and tech prep.

Fortunately for these innovations, there have been other sources of support for the ideas of curriculum integration and tech prep. Probably the most insistent support for a broad range of both "academic" and more specifically occupational skills has come from the business community. As the Committee for Economic Development (1985) declared: "Business, in general, is not interested in narrow vocationalism. It prefers a curriculum that stresses literacy and mathematical and problem-solving skills." The Commission on the Skills of the American Workforce portrayed the future starkly in the title of its widely-cited report as *America's Choice: High Skills or Low Wages* (CSAW, 1990), and went on to describe the skills need for a "third industrial revolution" encompassing

the demonstrated ability to read, write, compute, and perform at world-class levels in general school subjects (mathematics, physical and natural sciences, technology, history, geography, politics, economics and English). Students should also have exhibited a capacity to learn, think, work effectively alone and in groups and solve problems.

The Secretary's Commission on Achieving Necessary Skills (SCANS) of the Department of Labor outlined *What Work Requires of Schools*, complaining that "we are failing to develop the full academic abilities of most students" (p. vi) and arguing that "tomorrow's career ladders require even the basic skills — the old 3 R's — to take on a new meaning". Among the five competencies and three "foundation skills" advocated as part of "high performance schools", the report illustrated the need for greater competence in the conventional academic capacities like reading, writing, mathematics, and computational skills as well as



"thinking skills" like decision-making, problem-solving, and knowing how to learn (SCANS, 1991).

This position from the business community has also been supported by community college educators themselves. A 1984 report on the economic roles of community colleges, *Putting America Back to Work* – written well before the current interest in "higher-order skills" – stressed that:

Training for one job is not going to serve a worker all of his/her life. Foremost in any training program must be instruction that concentrates on *how to learn*; if possible, on *enjoying learning*; and on *making a commitment to learning throughout life*.

The report went on to recommend a two-tiered system, in which the first tier includes a broad background in math, science, communications, analytical and reasoning skills, together with a second tier of more job-specific content (*Putting America Back to Work*, 1984, p. 29). In 1988 the Commission on the Future of the Community College stated "if technical education programs are too narrow, if work cannot be a broadening experience, then the students may achieve only short-term gains." The Commission then went on to recommend "exploring new ways to combine technical and general studies throughout the undergraduate experience", and declared that "Community college faculty should take the lead in closing the gap between the so-called 'liberal' and the 'useful' arts", particularly by developing "up-to-date programs that integrate the core curriculum and technical education" (*Building Communities*, p. 21). And in its guide to assessing institutional effectiveness, the League for Innovation in the Community College included the issues of whether students are achieving a broad general education, stating that

Community colleges generally consider broad, general education critical for their students. This includes proficiency in written and oral communication, computational skills, and an understanding of history, social institutions, science and technology, and the arts. Another essential skill is the ability to work cooperatively. (Doucette and Hughes, 1990, p. 16-17)

Thus the idea of integrating academic and occupational education has been present in community colleges for well over a decade.

Similarly, the idea of linking secondary and postsecondary institutions to create more coherent programs – the heart of the tech-prep vision – has been supported from many sources other than federal legislation. The idea is often associated with Dale Parnell, who stated in *The Neglected Majority* (1985):

There is a lack of clarity in what high schools and postsecondary institutions expect of their students. Furthermore, there is poor communication between these two educational entities. Even more serious, there is a subtle but stubborn provincialism that suggests that program *articulation*, the careful building of bridges between high schools and colleges, and program *evaluation*, the careful measure of program success or failure, are extraneous to the primary mission of either group.

But the idea of linking secondary and postsecondary programs was present much earlier than that. In 1968 Oregon recommended identifying the elements of effective articulation between high schools and community colleges, and subsequent advocacy of the idea came from the National Institute of Education in the early 1970s and from the Commission on Secondary Vocational Agenda's (1984) report *The Unfinished Agenda* (Bragg, 1992, Ch. 2).

Support for integrating academic and occupational education and for tech prep need not depend, therefore, on federal funding. These innovations have been widely supported by the business community seeking to upgrade the skills of those in middle-skilled jobs, and community college educators have already affirmed the value of these innovations. The benefits to students are substantial as well, as the emerging practices described in the next two sections will demonstrate.

## II. Enhancing Skills for the 21st Century: Integrating Academic and Occupational Education

When we first began to ask what curriculum integration might look like, in 1991, we found large numbers of community colleges and technical institutes engaging in a few practices – especially applied academics courses (described in greater detail below) – while many fewer colleges had developed the more thorough forms of curriculum integration (Grubb and Kraskouskas, 1992). Since then, there seems to have been a substantial increase in innovation, resulting in more examples of integration and a broader variety of practices. (See the Appendix for a description of our sources of information.) Even though the extent of integration is limited in most institutions, the idea of integration is clearly "in the air", and much better-established than it was five years ago.

The most important benefit of curriculum integration is, of course, the enhancement of academic and "higher-order" skills within occupational courses and programs. But the methods of combining academic and occupational content, particularly tandem courses and learning communities, also lend themselves to developmental education and English as a Second Language (ESL), creating more effective ways of teaching these important and difficult subjects. In addition, these changes generate greater attention to the quality of teaching, and thereby can become a vehicle for improving the methods of instruction. And most importantly, they become ways to think of community colleges in much more flexible ways, as institutions that provide a *range* of teaching practices to meet the *range* of competencies necessary in modern employment – in those institutions that pride themselves on being teaching institutions for non-traditional students.

Integration efforts have often arisen as solutions to particular problems raised by faculty or students. For example, one pairing of an English course with auto technology came about because the auto instructor realized that low reading levels compared to the difficulty of technical manuals were responsible for the failure of many students. Similarly, the understanding that a particular biology course was a barrier to health occupations students led to a cluster of biology, English, and math at LaGuardia Community College. Writing Across the Curriculum and specific applied courses (like Technical Math) have been developed to remedy specific weaknesses of students in particular academic

subjects. And several colleges have paired ESL with occupational courses when they determined that particular language groups were having special difficulty. Curriculum integration is quite a flexible innovation, able to resolve several different problems and to be implemented at different scales; it is therefore a flexible approach for community colleges as problem-solving institutions.

Before we describe some innovations associated with integration, we should mention two common practices that probably should not be considered integration. The course requirements for certificate and Associate degree programs in occupational fields often specify some related academic coursework and general education requirements, overwhelmingly drawn from academic subjects. These two practices often lead individuals to claim that occupational programs are "naturally integrated". However, such academic and gen ed requirements usually remain independent of vocational courses, and they require *students* to make the links to occupational concerns or the requirements of employment. As one committee proposing multidisciplinary learning communities commented, the existing core curriculum "does not encourage students to explore the relations between the disciplines and transfer their learning from one course to another". Indeed, all students have trouble with integrating and applying material from different disciplines, and there are particular reasons to think that community college students – whose prior academic records have often been weak, who may have been out of school for considerable periods of time, or who may be insecure about academic coursework – are likely to need substantial help with such integration.<sup>3</sup> Instructors often remark that occupational students take academic and general education courses only grudgingly, and that they often fail to see the relevance of general education to their occupational goals. Instead of requiring *students* to make the links among different subjects, the most promising approaches to curriculum integration place the responsibility for integration squarely on *instructors*, and create new courses and groups of courses that do so.

In this section we describe a number of successful practices in community colleges and technical institutes. There are many practices that are valuable forms of integration, and it is important to think flexibly about them. It's also difficult to make hard and fast distinctions among these, though we find it particularly useful to distinguish five kinds of efforts:

- combining academic and vocational content;
- multidisciplinary courses;

- tandem courses and clusters;
- capstone courses;
- developmental education and ESL taught as tandem courses.

In addition, a forthcoming monograph from the National Center for Research in Vocational Education by Norena Badway and Norton Grubb (1996) will provide an appendix with additional curriculum material including syllabuses and outlines of several of these promising courses.

### **Combining Academic and Vocational Content in Individual Courses: Infusion, Writing Across the Curriculum, and Applied Academic Courses**

The most pervasive approach to integration is the infusion of particular lessons or modules into an existing course. Often this takes the form of academic material incorporated into vocational courses; for example, instructors might provide a quick review of ratios for students learning Ohm's law in an automotive or electronics program, or review proportions when studying the laws of gases in respiration therapy. This kind of teaching or reinforcement of a particular concept is usually quick and informal.

A more extended and formalized approach to infusion is to incorporate longer modules taken from academic approaches. For example, the Introduction to Law Enforcement course at Southern Maine Vocational-Technical College added a component on the history of law enforcement; instructors at Moraine Valley Community College (Illinois) inserted modules on the history and philosophy of law enforcement into introductory courses in criminal justice. The inclusion of ethics – normally a topic within philosophy – in a variety of occupational programs is by now a standard recommendation. At Cape Cod Community College, a four-week module on "Making the connection between algebra and the real world" was developed to answer the frequent student question "What do I need algebra for?". The module used newspaper articles, advertisements, and various business situations to understand the applications of math, doing so in collaborative exercises designed to explore the benefits of learning math as a social rather than individual activity.

In some institutions, infusion has been used to incorporate the skills necessary for high-skills workplaces, sometimes referred to as "SCANS skills". For example, programs at Cape Cod Community College (Massachusetts) added new assignments related to "the efficient use of resources", a critical performance

skill identified by SCANS. The modules require students to use criterion-based assessment in selecting nursing equipment and flowcharts to identify productive and non-productive processes in hypothetical nursing situations, and they teach students to apply a systems approach to care-giving settings and to apply social audit techniques to resolve ethical dilemmas. As part of transforming the New Hampshire Technical Colleges into comprehensive community colleges, a state-wide group of faculty, administrators and business representatives used a DACUM-like process to establish core competencies, and now incorporate instruction for each of these competencies into every course.

In other cases infusion has been used for the purposes of career exploration. At Santa Barbara Community College (California), for example, career exploration activities are incorporated into a number of introductory courses, by including assignments that require research in the Career and Transfer Centers. Counselors assist students in completing interest inventories and computer-assisted labor market research. Following the Career Research Project guidelines, students gain not only research skills but also experience in using data for further clarification of career goals and the guidance services of career and transfer counselors (Friedlander, undated). Similar efforts have been developed in other colleges in related courses like "Career Development" and "Experiencing Technology".

Infusion is often highly informal, but there are ways to make sure that it is widely practiced. Fayetteville Technical Community College (Alabama) formed four teams of six faculty – from math, science, English, and social science as well as two occupational areas – that designed 50 curriculum integration activity guides for 16 technical courses. This approach allowed the college to get innovation underway quickly, initially relying on faculty predisposed toward interdisciplinary teaching, and involving more faculty than other ways of starting would have.

Still another systematic way to incorporate more academic skills into occupational programs has been to adopt cross-curriculum efforts in an entire institution. The best-known example is Writing Across the Curriculum (WAC), in which all instructors – both academic and occupational – are encouraged to incorporate more writing into their courses. Writing Across the Curriculum efforts have been implemented in several different ways. Florida has required WAC of all its community colleges, consistent with its active state role. In the majority of community colleges, however, much more informal methods are

used to motivate faculty to participate, including recruitment and outreach by members of the WAC staff (usually from the English department), seminars and staff development efforts to show instructors how to incorporate writing exercises into their courses, and availability of WAC staff to provide help to individual instructors. The best WAC efforts therefore provide instructors some resources to modify their course content, as well as the rationale and peer support to do so.

In a variant of WAC, also designed to enhance the teaching of writing, Kapiolani Community College (Hawaii) requires all students to take two writing-intensive courses. These are defined as courses that "emphasize writing as a way of learning. In a writing-intensive course, your instructor will guide you through the writing process in a specific discipline." Courses that count as writing-intensive include a variety of traditional general education courses as well as certain redesigned occupational courses like Business/Management Writing, Basic Nursing Concepts, Introduction to Physical Therapy, and Special Radiology Procedures.

Although Writing Across the Curriculum is by far the most common cross-curricular effort, there are a few others. Prince George's Community College initiated Communication Across the Curriculum, which developed materials to enable students and instructors to increase the amount and coherence of discussion – an attempt to shift to a pedagogy where students are more active and questioning. Nashville State Technical Institute has adopted what might be called Humanities Across the Technologies, incorporating some of the humanities in every course to improve student outcomes in communications, the arts, math, and writing. For example, a mechanical engineering technology course now includes components in the history, art, and ethics of the field and a unit on "solving problems related to balancing academics and beginning a technical career", while other technical courses include activities "designed to enhance [student] abilities in communication, critical thinking, and problem solving". A course in Mechanical Equipment provides a good example of how many different perspectives can be incorporated into a technical course. The instructor requires students to give oral presentations, with possible topics including whether the designer of the Tacoma Narrows Bridge (which collapsed in a high wind) should be criminally prosecuted, and whether the third little pig over-engineered his house. One paper requires students to clarify what steps technicians can do to "help preserve and/or protect the environment", and other

assignments require them to read Petroski's *To Err is Human: The Role of Failure in Successful Design* and then write about the development of Gothic structures, the ambivalence of William Wordsworth toward nineteenth century technology, and Galileo's error in calculating the yield stress of cantilever beams.

A still more formalized approach to infusion and curriculum integration is the development of applied academics courses, which typically take conventional academic subjects and infuse them with applications from occupational areas. This is clearly the most common form of integration, and a perusal of course catalogues suggests that virtually every community college and technical institute has several such courses. Examples include Technical Writing, or Writing for the Workplace, or Written Business Communication; Applied Math or Technical Math, sometimes further specialized as in the Technical Math for Nurses course at San Bernadino Community College (California), or Applied Math for Recording Technology (Cedar Valley Community College, Lancaster, Texas); and Agricultural Economics or Business Economics. These applied academics courses are usually locally developed; they are not the same as the Applied Academics courses – Applied Math, Applied Communications, and Principles of Technology – developed for high school students by the Council for Occupational Research and Development (CORD) and the Agency for Instructional Technology (AIT). We have found that most community college instructors are disdainful of these "off-the-shelf" courses, particularly Applied Math and Applied Communications: their academic content is too basic, the occupational applications are too trivial, and they fail to encourage initiative and collaboration among instructors.

An interesting version of this concept is illustrated by three colleges that offer foreign languages for particular occupational areas, to address specific language needs. Monterey Peninsula College (California) offers Spanish for Medical Assistants, and Southern Arkansas University Technical College has offered Japanese, German, and Spanish for students who need to develop conversational ability for international business communication. Dona Ana Branch Community College (New Mexico) links Introduction to International Business with Spanish for the Workplace, achieving the same goal by linking two courses (described more fully below).

Applied academic courses generally adapt the content from conventional academic subjects and use practical applications taken from occupations. In many cases, these courses have been developed as a way to serve the needs of



occupational students more precisely, sometimes because of the perception that standard academic courses in math or English are too general, too abstract, or too lacking in appropriate applications. Typically, applied academics courses are taught to occupational students only, reinforcing the ability of instructors to mold the content to a particular occupational area. Most such courses are locally developed, though in Alabama centrally-developed courses in Technical English and Technical Math are used for all non-degree occupational students; the state curricula occurred as a way of imposing some quality standards and consistency on local institutions.

These hybrid courses may be taught either by academic instructors or by occupational instructors; rarely, because of fiscal limitations, are they team-taught. Occasional battles over who is to teach the course reveal an unavoidable conflict: whether an applied academics course should stress the more abstract, theoretical, "academic" underpinnings of the subject, including disciplinary modes of thinking, or whether it should instead stress occupational examples, "practical" information (including institutional details), and a further socialization into the values of an occupation. Often, academic instructors take the first approach while vocational instructors take the second.

Applied courses have sometimes been criticized, particularly by academic faculty, for their lack of rigor. However, this need not be the case if the course is appropriately designed. For example, Illinois Central College offers a technical math course, Calculus for Engineers, jointly designed by math and engineering faculty; Northland Community College (Minnesota) has a technical trigonometry course, while many institutions have applied math courses at the level of intermediate college algebra. To avoid charges of developing courses that are too simple, some institutions have their applied courses taught by academic faculty; for example, the food sanitation courses at Holyoke Community College (Massachusetts) and San Francisco City College are taught by the biology departments.

Infusion takes many forms, therefore, from the quick and casual review of academic competencies to the more formalized approaches of Writing Across the Curriculum and applied academics courses. It is, therefore, a flexible approach to integrating the curriculum, adaptable to several purposes, and accommodating a variety of informal and formal changes.

### **Multi-disciplinary courses combining academic perspectives**

## and occupational concerns

A different approach to integrating academic and occupational education has been the development of multi-disciplinary courses. The common element in these courses is the application of academic subjects – history, literature, ethics and philosophy, the study of culture from sociology or anthropology – and their concepts and analytic methods to technological developments, to working and its consequences, or to other employment-related issues that are presumably more compelling for occupational students. The resulting hybrids are often courses that could be included in general education programs, though with subjects of special interest to occupational students. Like efforts at infusion, they emphasize such general skills as the ability to write clearly and to analyze problems. However, they differ from applied academic courses – which are in many ways interdisciplinary – largely in their purposes: applied academics courses generally reinforce the related academic competencies required for employment (see Table 1), while multidisciplinary courses tend to focus on the political and social aspects of work, not necessarily required for employment but part of a broader general education.

While there are many examples of multidisciplinary courses, most fall into one of several distinct groupings:

- Some courses emphasize literature concerning working life. "Working in America" (Kirkwood Community College, Cedar Rapids, Iowa) is a literature course, where fiction and non-fiction concerned with work are used to examine attitudes toward work, to understand the "past, present, and future of working", to "develop [student] abilities to communicate about basic human experiences such as work", to "become more competent in the interpretation of stories and other symbolic expressions". This course has also spawned a reader, *Working in America*, that provides students and instructors with readings from various fictional and non-fiction sources about work, with appropriate introductions (Sessions and Wortman, 1992).<sup>4</sup> "Culture and Technology", within the same institution, also includes a good deal of literature concerned with work, but also some reading about current ethical issues (like genetic engineering) and movies and music concerned with work.

Similarly, "Science and Technology as Themes of Literature" (Northeast State Technical Community College, Blountville, Tennessee) examines various literary works, including science fiction, to explore themes surrounding

technology like the hopes for technology, the sense of betrayal as technology fails to deliver on its promises, the problems of alienation in the workplace, the loss of the self as machines have replaced people in production, the effects of industrialization on leisure, and ethical issues. A course titled "Changes and Choices: Experiencing Living in the Workplace, the Home, and the Broader Community" (Muscatine Community College, Iowa) uses short stories, novels, poetry, essays, and some history to "assist occupational program students in using the humanities to make everyday decisions, to take on the challenges of change, to make major decisions, and to decide to effect change". (This course, initially for office technology students, was developed specifically because computers and work reorganization has changed these occupations substantially.) A more occupation-specific example is "Law Through Literacy", a course for legal assistants developed at New York City Technical College.

- Another group of courses examines the influences of technology on society. "History of Technology" (New Hampshire Vocational-Technical College, Nashua), "Discoveries, Investigations, and Explorations" (Northeast State Technical Community College), and "Technology and Civilization" (Community College of Morris, New Jersey) are all courses examining technical change in historical perspective, the effects on society, and the conflicts over technical change, allowing students to explore current issues surrounding technological developments. "Connecting Technology and Our Lives" at Sinclair Community College (Ohio), listed as a humanities and engineering course, examines the history of technology, focusing on technological changes in the Dayton area, to prepare citizens who can "influence and react to rapidly changing technology". Such courses are related in spirit, if not in their origins, to the courses in Science, Technology, and Society (STS) that have proliferated in secondary schools (Yagur, 1990).

- Still other courses use the perspectives of several of the humanities, including history, philosophy, and art in various forms, to explore the effects of technology and production. "Technology and Human Values" (Yavapai College, Arizona) examines the ethical issues generated by advancing technologies, as well as the influence of technology on individual and social values. "Ethical Dilemmas in Modern Society" (Southern Maine Vocational Technical Institute, Portland) is a general ethics course, but within a technical college; one of its themes is the "intellectual flexibility and tolerance necessary for the workplace". "The Machine in America" (DeAnza College, California) examines America's

romance with technology and the interrelationship of technology and social issues.

These courses can also serve as vehicles for introducing students to radically different ways of viewing the world. A business instructor teaching a course called “Wisdom for the Workplace” – using literature together with case studies from business to “teach students that the wisdom of great writers from the past is still pertinent to the solving of contemporary job-related problems” – described the process as follows (Smith, 1990):

I have also discovered why my business-career students generally falter when faced with complex problems in their business or technical core courses, especially those that deal with human issues. The juxtaposition between the humanities – which always ask questions about life, happiness, and freedom – and the courses that fill their career programs (always focusing on the absorption of accepted processes or pragmatic applications) is so strong. [My course] is a wild mix that asks students to question first, and then to justify their opinions convincingly, rather than to simply accept.

Most efforts to develop multidisciplinary courses have led to one or two such courses. However, a more systematic approach is also possible. At Salt Lake Community College, faculty and administrators were concerned that many students lacked any clear purpose, and treated general education requirements as something to “get out of the way”. In an effort to educate all students about their career and academic choices, the college obtained a Title III grant to revise general education. The faculty developed the view that all courses should relate to students' present and future lives, including careers, and established the following criteria for general education:

The general education program at Salt Lake Community College has as its fundamental purpose the integration of attitudes, skills and broad abstractions of knowledge. The program will encourage students to be active and creative agents in the life-long process of inquiry, evaluation and decision making. All general education courses will be non-major classes and will provide an introductory overview with no prerequisites. They must also meet six criteria of communication, creativity, critical thinking, esthetics, social web [diversity], and substance.

As a result, every existing general education course was evaluated, with the result that few continued in their previous form, and the college added a multidisciplinary requirement for graduation. The new courses have very different conceptions than conventional general education. "Understanding History" is subtitled "What history is and what historians do," and is a study of how to *do* (rather than merely read) history. "Electricity and Modern Living" is one of the most popular of the new general education courses, because students not only gain an historical perspective of the development and impact of electrical technology, they also conduct safety inspections, wire circuits, install GFCI receptacles and a host of other laboratory activities. Several of the general education courses have led to enrollment increases in vocational programs, as students have made historical and philosophical connections to occupations and gained personal experience in career-like activities.<sup>5</sup>

Most multi-disciplinary courses have come from the humanities rather than the social sciences. One reason is that many of these hybrid courses have been developed with special funding, from the National Endowment for the Humanities and from the NEH-supported project on "Integrating the Humanities into Occupational Programs" (Shared Vision Task Force, 1989, 1991). However, there are other obvious candidates for multidisciplinary courses related to various social sciences. These could include courses examining public policy and political issues related to technological change and employment issues (including unemployment, discrimination, the quality of work, and other unpleasant realities of capitalism); courses examining the sociology and the psychology of work<sup>6</sup> (including the psychology of occupational choice, for students unsure of their direction); and courses in business-government relations, to examine the ethical, political, and regulatory issues surrounding employment. Almost every area of the humanities and social sciences contains issues which are related to employment and which could form the basis for several courses (Koziol and Grubb, 1995).

The reliance of multi-disciplinary courses on special funding is testimony to the resources necessary to develop novel approaches. Every participant in multi-disciplinary courses has stressed the need for staff development, since faculty must have release time to develop new materials, and many hybrid courses have required the collaboration of faculty from several disciplines. However, there is a danger to reliance on special funding: when the funding disappears, the courses may disappear too. The challenge is to institutionalize

such courses, to have them become part of the normal offerings of community colleges and technical institutes from "regular" rather than special funds, and accepted as legitimate by students, faculty, and administrators alike.

Despite the difficulty institutions have had institutionalizing these courses, they present a promising vision. They represent a fresh approach to curriculum integration, one which creates new courses rather than modifying existing courses in minor ways. The best of them have required the collaboration of both occupational and academic faculty, providing new opportunities for faculty interaction. The difficulty institutions have had in institutionalizing them is distressing, to be sure, but the current round of courses is relatively new and – with the interest in broader forms of education and higher-order skills – they may be able to establish themselves as permanent parts of the community college.

### **Tandem Courses, Clusters, and Learning Communities**

The examples of integrated instruction given so far attempt to reshape *individual* courses. Another approach has been to develop a *series* of courses – including both academic and occupational courses – that students take simultaneously, with each course designed to complement the other. This kind of interaction among courses can happen at several different scales. Two subjects can be linked, creating tandem courses. For example, Chemeketa Community College (Oregon) has developed a Human Services Practicum coupled with Writing 121. The practicum introduces students to various human services placements and requires extensive writing from students about positions they might like, in effect forcing them to assess opportunities in human services; the writing course presents various styles of writing, and enables students to work more intensively on the papers they prepare for the practicum. Waukesha County Technical College (Wisconsin) pairs Workplace Psychology with Welding, to guide occupational students in understanding how race and ethnicity, safety, health, and interpersonal relationships affect the work environment. Several colleges link courses that are naturally related. Linn-Benton Community College (Oregon) pairs Business Quantitative Methods and Technical Report Writing. Similarly, physical science and engineering materials courses are linked at Southwestern Community College (Iowa), and medical terminology is linked with anatomy and physiology at the Community College

of Allegheny County (Pennsylvania). Business and English are common pairings, as are business and math, and engineering technologies and math.

At a larger scale, clusters of more than two courses can be related to one another. Clusters usually include courses with some natural relationship to one another; for example, at Butte College (California) Business Ethics, Business Law, and Introduction to Business have been linked. LaGuardia Community College (Long Island City, New York) has developed an umbrella called the Enterprise Center for cluster courses related to business. The Introductory Business Cluster includes Introduction to Business, Composition I, and Introduction to Economics. The Advanced Business Cluster includes Principles of Management; Philosophy, Values, and Business Ethics; and Writing Through Literature. The advanced cluster has also articulated four themes – the entrepreneur versus individual rights, the individual within the organization, cultural and corporate values, and the social cost of business – intended to cut across the three courses in the cluster. The choice of themes reveals purposes related both to general education – providing critical perspectives from the humanities, for example – and to broad vocational purposes like introducing students to the personal and social tensions within business.

In addition, basic math is paired with a course called “Computer Topics” – again at a relatively basic level – while the pairing of “Introduction to Business” and “Introduction to Computers” is designed “to explore the impact of computer technology on contemporary business”. Other clusters at LaGuardia include the Animal Health Technology Cluster, including “Introduction to Animal Health”, a chemistry course, and an English course, designed in part to clarify the need for good writing to students; and a pairing of ESL and keyboarding for students new to this country – what the instructors called a “sheltered pair” because it shelters students from the more rigorous pacing of a standard class.

Another systematic approach to clusters has emerged at San Diego City College, where a set of clusters called "City Blocks" are advertised as "courses that fit together and make sense." The college offers two very different forms of clusters. "History of Technology in the Workplace" combines transfer level history, English and computer information science to focus on the theme of historical changes wrought by technological advances. Two other clusters, "Workplace Ethics" and "Communications Skills", combine occupational perspectives with liberal arts studies in philosophy and with written and oral

communications. Workplace Ethics combines assignments, readings, cross-faculty discussions and joint assessments between an accounting course and a philosophy course. The final examination includes a case study to be analyzed for elements of fraudulent accounting practices, after which students discuss the advice that Mills or Kant would give to an employee involved in this ethical dilemma. College officials report that the linked courses have enticed vocational students to take more academic coursework, and have allowed academic students to gain knowledge of career pathways.

In several institutions, clusters have been developed to prepare students for specific careers. A new program, initiated at Macomb Community College (Michigan), addresses several components of manufacturing including internal and external communication, problem solving and scheduling techniques in manufacturing, and technical competencies in machining. A related approach to simulating workplace conditions has been implemented at the College of DuPage (Illinois), where a business professor designed a flow-of-work simulation to link seven business and marketing courses. Students enrolled in these courses attend class at a common location, and complete tasks which simulate the interdependence of information and production flow on the job, as well as learning the job-specific and generic technical skills necessary to operate business equipment, schedule output, and complete accounting and marketing tasks. Motivated by student complaints that there was no connection between physics courses and work requirements, faculty at Dutchess Community College (New York) developed an Integrated Production Cluster which meets daily at a local firm, linking courses in physics, chemistry, math, English, economics, reading and computer skills.

In clusters, students take all courses simultaneously (or, less often, over two semesters). Instructors report that students within clusters are engaged in deeper ways than are most community college students. They have stronger personal relationships with other students, since they see them more frequently; they tend to work more collaboratively, and to develop study groups and other support mechanisms. (Some instructors have capitalized on this development by having students work in small groups and using other collaborative teaching techniques.) Students can refer to material from other classes, and benefit from having connections among classes clarified both by the structure of the courses and by instructors. As one student mentioned,<sup>7</sup>



The topics were interrelated between Business and Economics, and English brought it together. Also, we were all in the same class and could exchange ideas among ourselves.

For their part, instructors can be more confident about what material students have already learned, and can therefore build on earlier material in other classes. The faculty at LaGuardia College report that their regular meetings include discussion of assessment and teaching and learning methods, suggesting another mechanism where teaching can improve. They also claim that students in pairs and clusters are more motivated, and less likely to drop out; while there is only a little evidence, the conclusion that students in clusters have closer ties to other students is consistent with the finding that dropout rates are lower among individuals whose social connections within postsecondary institutions are stronger.<sup>8</sup>

To be sure, there may be some drawbacks to clusters. Several instructors mentioned that they never had sufficient time for joint planning. While acknowledging the benefits of greater student interaction, several mentioned that students can form cliques and that discipline problems may develop – “familiarity can become too familiar”, in the words of one instructor. Several faculty members expressed the feeling that clusters were not worth the effort necessary to coordinate instructors and to cope with discipline problems, though one faculty member considering leaving a cluster still acknowledged the value of clusters: “When it works, it’s incredible.” Evidently, clusters represent substantial departures from conventional classroom practice, for instructors and students alike, and place novel demands on instructors; some may be unwilling to spend the time, and some may find themselves unprepared for the cooperation clusters require.

Of course, tandem courses and clusters can become larger groupings of courses, sometimes referred to as learning communities (e.g., Gabelnick, 1991; Gabelnick, MacGregor, Matthews, and Smith, 1990). Any number of disciplines can be linked within learning communities, of course, and many examples group conventional academic courses – economics and history, math and science, literature and art – rather than incorporating occupational fields. Whatever the specific disciplines, the most important aspects of self-conscious learning communities are the emphasis on multidisciplinary study, the development of institutional structures (like co-enrollment and team teaching) that overcome the

fragmentation of conventional educational institutions, the integration of skills from various disciplines and content areas, and the development of more active approaches to teaching, with seminars, discussion groups, and projects more common than conventional lectures.

### **Capstone Courses**

Capstone courses are in many ways hybrid courses, like applied academic or multidisciplinary courses, but they serve a different role in the curriculum and have taken on new value as both occupational and academic courses move toward more authentic assessment. Capstone courses require that students plan and execute a project, similar to one in a work setting, that includes planning, finance, technical, and production skills, as well as labor, safety, environmental and community issues. For example, Sinclair Community College (Ohio) has adopted senior projects in several technical fields, in one case requiring students to apply plant layout and material handling knowledge to a project designing manufacturing plants. At Columbus State Community College (Ohio), microcomputer operations students design and develop appropriate forms, presentations, and data entry, and retrieval procedures using various media for a typical small business system; they also evaluate the hardware and software that might be appropriate. At the same institution students in construction supervision track a project with a construction firm through all its phases, from start-up to move-out, as a way to "develop a broad understanding of the integration of the home office and field management functions." By drawing on material and competencies that arise in several different areas, capstone courses provide another way of integrating coursework from several disciplines; by focusing on a project, this approach provides a more natural and work-like context for such integration.<sup>9</sup>

### **Teaching Developmental Education and ESL in Occupational Contexts**

The forms of integrating academic and vocational education described so far respond to the demands of employers for a better mastery of academic competencies and for broader forms of occupational education. But two-year colleges face a very different problem because of their role as "second chance"

institutions, open to all who want to enroll without entrance requirements. A large and increasing fraction of students entering two-year colleges have left high school without mastering fundamental academic competencies, and need some form of remedial education – often termed developmental education to avoid the stigma associated with remediation, and to signal more student-centered pedagogical approaches. Virtually every community college and technical institute now offers some form of remediation, with conventional estimates of the fraction of entering students in need of basic instruction varying from twenty-five percent to fifty percent to seventy-eight percent in one state system (Grubb and Kalman, 1994); many colleges we examined reported 60 to 70 percent of their students needing remediation in either math or language. In addition, given the enormous waves of immigration in this country since the 1960s, increasing numbers of students enter community colleges without much knowledge of English, often specifically seeking instruction in English – particularly in English as a Second Language (ESL) courses. And if community colleges serve to link short-term job training and education (Grubb, 1996a), then the numbers of such students will only increase.

Students in need of remediation and ESL – who come to the community college like other students, seeking to enter the economic mainstream – often find themselves in remedial courses (and ESL) filling out worksheets, doing standard arithmetic problems, and making little visible progress toward their occupational goals. Many instructors report that students (and occupational students especially) are bored with remedial courses and fail to see their relevance to occupational goals. The result is that dropout rates in remedial courses are high; and students needing remediation but failing to complete the appropriate coursework are unlikely to persist or to complete their programs of study.<sup>10</sup>

One remedy to the problem of providing remedial instruction and ESL is to borrow the method of integrating academic and occupational content: that is, to develop remedial courses and ESL programs with an occupational emphasis, or to teach these subjects in tandem courses or clusters, with developmental English and math clustered with an occupational course. These approaches teach basic academic skills, or English, while introducing students to the concepts, tasks, and job-specific skills required in occupational areas. In addition to providing some sense that remedial courses are connected to occupational purposes, these approaches exemplify the position that learning in a particular

context is most effective (Collins, Brown, and Newman, 1989). Some examples include the following:

- "Introduction to Technology" at Yakima Community College (Washington) provides remediation in math, reading, and writing in the context of an introduction to various technical occupational specialties, including jobs in agriculture, engineering, and auto/diesel mechanics. The proposal for the course states the problem as the separation of remediation from subsequent coursework: "developmental students are physically remote from vocational/technological programs and faculty, [and] remain unaware of program opportunities available to them . . . this collaborative learning community will build bridges for faculty and students, and more clearly define a pathway from developmental education to vocational and technological programs."

- The Basic Technology Program at Schenectady Community College (New York), designed for "students with limited math/science backgrounds or weak basic skills", includes two courses titled "Introduction to Technologies" which describe technical careers, applied math (e.g., measurement and scales), some physical processes, and the equipment used in technical positions. Supporting courses include a remedial math sequence, freshman English, and introductions to chemistry and computers.

- At Chemeketa Community College (Salem, Oregon) a program in drafting and study skills has been devised with the collaboration of a drafting instructor and an instructor from developmental education.

- A somewhat more complex program, with a sequence of remedial courses connected to occupational instruction, is the Health Career Community developed at Springfield Technical Institute, for students needing remediation who are preparing for one of 12 health programs. A series of three courses focuses on reading skills with practical applications in medical settings (including a great deal of medical vocabulary); study skills (like note taking, outlining, and test-taking) using a specially-selected text on health; life skills (time management, stress management, nutrition, and self-confidence), again using examples drawn from health; and familiarization with career opportunities in health, with an attempt to convey what is required in different occupations – a kind of career exploration. Simultaneously, students can take the conventional developmental courses in reading, math, and science. When they have passed the introductory courses, they can begin the regular courses of the health occupation

they have chosen. The director claims higher retention rates than in the community college as a whole.

- LaGuardia Community College, where learning communities are probably better developed than at any other two-year college in the country, teaches all of its programs for welfare recipients through learning communities. Typically, a remedial English and a math course are combined with an introductory occupational course; one example combined English, math, and an introductory biology course that had previously been a barrier to those attempting to enter health occupations. Another example combined courses in reading, sociology, and Introduction to Social Services for students who wanted to enter various social work positions. In such clusters the content of the developmental courses can be changed to reinforce the specific reading, writing, and math skills necessary in a particular group of occupations; in turn, the instructor in the occupational course can count on certain prerequisites having been learned in the related developmental courses, and can have specific competencies – for example, a particular kind of writing – reinforced in the other courses. In addition, such clusters generate a support group among a group of students – in this case, welfare recipients – facing similar problems in making their way through the institution and into employment.

- Winning the award for best course title, a cluster at Palomar Community College (California) called "Reading, Writing, and Wrenches" combines developmental skills courses with an occupational course teaching basic approaches to tools, materials, and technology.

A similar approach has been taken in several ESL courses, sometimes labeled English for Special Purposes (ESP) or Vocational English as a Second Language (VESL):

- At Bunker Hill Community College (Massachusetts), an ESL program for Allied Health, preparing students to become nursing assistants, lab assistants, and pharmacy technicians, and one for Electronics have been developed, based on the belief that "language training is most effective when taught in the context of skill training". The courses aim to improve the English-language reading and writing of students, but they include reading and vocabulary drawn from the related occupation, develop writing assignments that mimic those that will be used on the job, and introduce students to the careers available and the basic tasks and capacities required.

- An approach called technology-specific ESL has been developed at the Applied Technology Center operated by Everett and Edmonds Community Colleges (Washington). ESL instructors are first taught about electronics; then they, in consultation with industry supervisors and managers from local high-tech firms, teach limited English-proficient employees of these firms “the reading, writing, and speaking skills necessary to participate in the problem-solving and collaboration required in high technology firms” and to pass the certification tests required by federal contracts.

- Black Hawk College (Moline, Illinois) has developed a machine tool curriculum for new Indochinese students, with vocational instructors and the Laotian and Vietnamese bilingual staff of the college collaborating.

- Concerned about attrition among students with limited English who were required to spend long amounts of time in learning labs, Mt. San Antonio College (California) and Massachusetts Bay Community College designed clusters to combine occupational content and language acquisition. At Mass Bay, an Introduction to Business course exploring career opportunities and skill requirements is combined with Contemporary Economics and an ESL course providing special attention to business-related terminology. At Mt. San Antonio, word processing and business vocabulary were added to the ESL course, along with an internship to provide some on-the-job experience. At Orange Coast Community College (California), faculty became aware of the difficulty Vietnamese students were having with workplace communications skills and the reading of technical manuals, and the college paired an ESL course with machine technology; subsequently this approach was extended to health occupations, computer information systems, and airline travel careers.

Bridge programs, designed to facilitate the return to formal education for particular groups – older adults, for example, or individuals from particular language groups like Hispanics, or those with inadequate preparation – often provide preparation in the form of clusters. Indian River Community College (Florida) offers a two-option bridge program, including one or two full semesters of linked courses in applied philosophy, principles of academic success, applied physics, applied math and applied communications. Students choose between occupational courses in manufacturing and in business technology. High school students who need academic reinforcement are "invited and recruited" to participate in the bridge program, and are organized into "production teams" for activities, group projects and attendance. In a few cases the same goals are met

within single courses; for example, "Worker Effectiveness Training" (Southwest Community College, Minnesota), "Workplace Readiness" (Broome Community College, New York), and "The World of Work" (Philadelphia Community College) offer oral and written communication, math, keyboarding, and career planning, all in some occupational context.

In these cases, then, the integration of academic instruction and occupational content involves teaching basic skills (or English) within courses that draw reading, vocabulary, writing exercises, and other applications from a broad occupational area. Each also provides what might be termed career exploration – an introduction to the specific jobs within the occupation and to the concepts, practices, and demands in these positions. These courses, or the longer sequence of the Health Career Community in Springfield Technical Community College, prepare students to enter "regular" occupational programs, and so their vocational purpose is clear – in contrast to most remedial programs, which prepare students to pass basic skills tests but fail to link remediation to any future ambitions of students. The claims that this approach increases retention – consistent with the complaints of instructors in conventional remedial programs that their students are unmotivated and fail to see the connection to vocational goals – suggest real promise for this particular form of "contextualized" instruction.

### **Organizational and Structural Changes**

A final kind of change is indirectly connected to integration. Several colleges have combined departments so that an academic and an occupational department report to one dean. In another case, the academic and occupational faculty were relocated so that they were physically closer to one another. These are obviously mechanisms intended to increase interaction, in the hope that more collaboration will follow; but they cannot force integration where there are no common purposes.

### **The Benefits of Curriculum Integration**

To be sure, the integration of academic and occupational education does not come without cost. Uniformly, the colleges that have reshaped their programs along these lines report that such efforts require release time for

instructors, in order to plan such innovations and to collaborate with their peers. When (rarely) such courses are team-taught, they obviously require increased staffing. And above all they require some leadership and commitment from administrators, to support instructors who want to engage in integration, to encourage (or even push) those who may initially be reluctant to innovate. Indeed, the colleges that have the greatest number of integration efforts – places like LaGuardia Community College with its commitment to clusters, or other institutions like Salt Lake City Community College with its wide array of applied courses – tend to have administrators who are particularly committed to these changes, and who use the institution's resources and staff development effort to encourage integration.

But the benefits are substantial too, and it is worth summarizing them to see the variety of benefits that are possible from integration. The most important is probably the effects integration can have on the fundamental academic competencies and higher-order capacities (or "SCANS skills") necessary for occupational preparation over the long run, especially in a world of changing requirements and escalating skill demands. These are capacities that can best taught with a mix of academic and occupational content, appropriately integrated so that students can see how general abilities are necessary in specific occupations.

Another benefit to students is related to career choice. Many integrated programs have incorporated modules that can be considered career exploration, sometimes as part of an applied communications course, sometimes in multidisciplinary courses, and sometimes in introductory courses like "Introduction to Business" or "Introduction to Health Careers" linked to developmental courses. As ways of responding to the uncertainty of many community college students about their occupational futures, incorporating career information into courses is a powerful approach since it integrates career information with job-specific skills and contextualizes information about occupational options.

Still another benefit stresses the non-vocational purposes of education. A persistent stream of commentary has urged that occupational programs include the moral and humanistic elements of a broad education. To cite the Commission on the Future of Community Colleges again (*Building Communities*, p. 20-21):



We also acknowledge that the utility of education and the dignity of vocation have important value, not just for those enrolled in general and transfer studies. Only by placing emphasis on both can all students help in the building of community . . . Students in technical studies should be helped to discover the meaning of work. They should put their special skills in historical, social, and ethical perspective. Those in traditional arts and sciences programs should, in turn, understand that work is the means by which we validate formal education.

Such a view lends particularly strong support to the multidisciplinary and linked courses described above.

Another, less obvious benefits – particularly important in teaching-oriented institutions like community colleges – is that efforts to integrate academic and occupational instruction can improve teaching practices. Integrated approaches provide examples of learning in context – in this case, the important context of an occupation – that can enhance motivation; they are more consistent with the project- and activity-based approaches of the best vocational instruction, and are more student-centered when they use issues and themes of interest to occupational students. Many integrated courses and programs include statements of purpose indicating that they are moving away from the straightforward transmission of facts and figures, towards a form of teaching in which students are more active in constructing meaning and interpreting issues of importance to them. For example, the cross-cutting themes used in LaGuardia’s Advanced Business Cluster, the greater use of collaborative teaching methods in pairs and clusters, and the introduction of occupational examples and projects in applied academics courses are all cases of more active teaching than is conventionally the case. In contrast to complaints among occupational students about the "irrelevance" of conventional academic courses, instructors in integrated approaches report higher levels of motivation, as students come to see the applicability of academic material. These approaches to teaching are consistent with the current view that learning in context is a superior method, compared to the conventional practice of teaching reading, writing, math, or science as abstract bodies of skills and facts disconnected from their applications – consistent both with good practice in adult education and the widely-cited recommendations of the Secretary’s Commission on Achieving Necessary Skills (SCANS, 1991) “that teachers and school must begin early to help students see the relationships between what they study and its applications

in real-world contexts”, that “the most effective way of teaching skills is ‘in context’” (p. 19).

One way to summarize these benefits for students is to see how the various forms of integrating academic and vocational education, work together to provide students with the *variety* of competencies they need. Table 1 lists these competencies, taken from the demands of employers, from the evident needs of students searching for meaningful careers, and from the desire to prepare responsible citizens. The *range* of competencies necessary is quite formidable, and goes well beyond the job-specific skills of occupational education and the academic skills of academic education. But in a community college that has adopted the innovative practices of curriculum integration, the *range* of instructional methods is formidable too. In this vision, the community college is not just a random collection of courses, where individuals mill around hoping that the courses they take will prepare them for the future. Instead, the community college becomes a more purposive institution in which a variety of institutional methods is used to help students develop in a variety of ways.

There are still other institutional benefits to the efforts to integrate academic and occupational education. One is the collaboration among faculty that integration encourages. As a dean responsible for a remedial learning community commented,

It has brought instructors together in a new way. They have to co-plan the program. Assignments are structured so that they build upon one another. The content has been developed to correspond with other work being done. That builds a synergy effect. We get more accomplished and make better progress. The instructors love it. It pulls them away from the isolation they’ve experienced. They didn’t all like it going into the planning, but all have ended up being real fans of the program.

A final institutional advantage of integrating academic and occupational education is its potential role in creating community *within* colleges. As the community college has developed, it has added new purposes: occupational education in addition to the early "academic" emphasis on transfer; remedial or developmental programs; community service courses of various kinds; customized training and other firm-specific instruction; non-credit adult education in some states and regions; and sometimes short-term training for JTPA clients and welfare recipients. Most community colleges have responded to

these responsibilities by adding new divisions, and communication among the various divisions is often quite poor.<sup>11</sup> As a result, the community college often appears to be *an archipelago of independent islands*, each serving one mission but with limited communication among them. But this obviously need not be the case. The examples of community colleges that regularly support curriculum integration, learning communities, and collaborative approaches to teaching indicate that a college can establish an atmosphere where faculty regularly work with one another. In this way curriculum integration can help bridge the distinct “islands” of activity within the community college – one of the most powerful ways of achieving a goal of the Commission on the Future of the Community College, which argued throughout its report on *Building Communities* that community colleges should be not only community-serving institutions but also internally-cohesive communities.

The benefits of curriculum integration are powerful, therefore, not only for students but also for community colleges themselves. They work not only by changing the curriculum and how it is taught, but also by improving collaboration among faculty and by changing the culture of an institution. The results are postsecondary institutions that are coherent learning communities, motivating students and teaching them in the most effective ways, that provide a broad education for occupational students, and that prepare flexible individuals able to change as employment and labor markets require.

### **III. Strengthening the Educational "System": The Community College Role in Tech Prep**

Of the many workforce innovations we mentioned in the introduction, few have generated as much interest as tech prep. Often linked to Dale Parnell's 1985 proposal to link high schools and community colleges for the "neglected majority" of students not bound for four-year colleges, tech prep has been supported by federal funding since 1990, with consortia of high schools and community colleges virtually blanketing the country.

But — like the integration of academic and occupational education, which has been used to describe everything from existing gen ed requirements to elaborate learning communities — the term "tech prep" has covered an incredibly wide range of practices. Some institutions use the term to describe their efforts to improve occupational preparation in any way, including bringing programs up to date. Others have made tech prep virtually synonymous with curriculum integration, ignoring any efforts to link secondary and postsecondary institutions. Still others have initiated planning processes involving secondary and postsecondary instructors and called them tech prep even in the absence of other changes. Some have instituted programs for students to begin planning their educational and occupational careers early in high school with the help of community college counselors, otherwise leaving both the secondary and the postsecondary curriculum unchanged. A variety of tech prep "models" have emerged including the tech prep Associate degree (TPAD) model stressing the completion of an Associate degree, integrated tech prep concentrating on curriculum integration, work-based tech prep stressing the work-based learning for school-to-work programs, the tech prep baccalaureate degree (or 2+2+2), pre-tech prep stressing articulation in middle and elementary schools, and adult tech prep or bridge programs (Bragg, 1995). With all these proposals, it is often difficult to remember what tech prep was supposed to accomplish.

When Dale Parnell (1985) proposed tech prep, he stressed the importance of creating a smoother transition between high school and community college, particularly for those individuals who would otherwise not think of postsecondary education. Similarly, the Perkins Amendments of 1990 emphasized articulation agreements between secondary and postsecondary institutions, a 2 + 2 curriculum bridging the two, and joint staff development for

secondary and postsecondary instructors. We take as the kernel of tech prep, therefore, the collaboration of secondary and postsecondary institutions around occupational preparation.

While most investigations of tech prep have started with the role of high schools — a logical starting point, after all, since students in tech prep programs do begin in high school — we concentrate in this section on what community colleges and technical institutes have done. Ours is a postsecondary view of what is often, as we shall see, a program emphasizing secondary-level reform. To do this we interviewed the community college tech prep coordinators of 34 tech prep consortia that, in various ways, had been nominated as relatively active or exemplary in some way. (Again, the details are contained in the appendix.) Our view of postsecondary developments in tech prep, then, has been formed by the *best* efforts around the country, not the *average* efforts.

We stress that our positive conclusions about tech prep programs are based on their characteristics and the links they forge between secondary and postsecondary institutions. These programs are too new to have generated much statistical evidence about their success at the local level — though a number of state evaluations are starting to appear (Bragg, forthcoming, 1996). And, as we stress below, the evaluation of tech prep programs is a potentially difficult task because their benefits may take so many different forms, difficult to capture in the usual procedure of tracking students.

From the 34 exemplary tech prep programs we examined, there is both bad news and good news. The bad news is that tech prep has so far stimulated very few changes in community colleges; most of the substantial reforms so far have taken place at the high school level. But the good news is that the changes that have taken place appear to be valuable, benefiting students and educational institutions in various ways — though often in ways that are diffuse and difficult to measure. And — *if* there can be stability in tech prep programs in the years ahead — the best of them may be just on the verge of making substantial changes at the postsecondary level. Tech prep programs also provide important roles for community colleges in improving the educational "system" as a whole, even though many of the benefits accrue to students who may not show up in community colleges and to high schools rather than postsecondary institutions. The implications for future policy and funding are, as we shall see, substantial.

### **The Activities of Community Colleges in Tech Prep:**

## The Changes in High Schools

As others have noted (Hershey, Silverberg, and Owen, 1994; Dornsife et al. 1993), the most substantial changes in most tech prep programs have been in high schools, partly because tech prep programs are so new that it has made sense to concentrate on the education level where students have been initially enrolled. This observation about the early emphasis extends to the participation of postsecondary personnel as well: most of the activities of postsecondary coordinators, instructors, and other administrators have so far concentrated on changes that most directly influence the high school component. In rough order of frequency in the 34 programs we examined, the activities of community college personnel have included the following:<sup>12</sup>

1. The most frequent collaboration between postsecondary and secondary instructors has been the process of specifying competencies necessary in postsecondary courses, laying the foundation for articulating secondary and postsecondary courses. Typically this had led to the upgrading of secondary courses. This collaboration allows community college faculty to play an active role in upgrading the content of high school courses, particularly the math courses required for technical occupations and the English courses emphasizing communication skills; less frequently, the content of science courses — for example, those required for health occupations, or applied physics courses appropriate for a variety of technical occupations — have been strengthened. In theory, these activities prepare students entering community colleges who are better able to do college-level work, or are less likely to need remedial (or developmental) education. (There have so far been so few tech prep students entering community colleges that it is difficult to be sure whether levels of preparation have improved.) These efforts are consistent with those elsewhere in secondary education to eliminate "general track" courses in favor of more rigorous alternatives, to suffuse vocational programs with more academic content, and to increase standards in general.

The collaboration of community college and secondary school faculty is similar to other efforts, stimulated by the American Association for Higher Education and other groups, to have schools and colleges collaborate (Wilbur and Lambert, 1995). While many of these collaborations provide specific programs and services for students, a large number involve postsecondary faculty in particular academic disciplines working with their secondary peers to

improve high school courses. These discipline-specific collaborative efforts, designed to prepare college-bound students for the kinds of analytic and interpretive approaches required in college, have sometimes reformed high school teaching to concentrate less on facts and formulas and more on deeper disciplinary perspectives. Analogously, the participation of community college faculty from occupational areas has the potential for clarifying to high school students and teachers the most common difficulties that students face as they enter community colleges and prepare for employment. In part, community college instructors serve to clarify the demands of workplaces and the importance of various competencies, both academic and non-academic. In addition, often there are changes in high school courses that stress occupational applications and contextualized instruction, a change that allows students to transfer knowledge from one course to another.

2. The most common activity (though one that is less time-consuming than faculty collaboration) is variously described as staff development, awareness, or marketing efforts: explaining what tech prep is and "selling" it to community college faculty — who have often been skeptical, for reasons we explore below — as well as to other potential participants like administrators and employers. The meetings, informal presentations, seminars, workshops, and planning sessions absorb the greatest efforts of tech prep coordinators especially; indeed, they seem to be never-ending, partly because there is always a round of new faculty, or individuals who have not yet been convinced, or changes in the conception of what tech prep is. Another way to explain the constant need for "selling" this innovation is that the most basic changes it envisions — the close linking of high schools and postsecondary institutions, the collaboration of faculty in several ways, and the creation of coherent *programs* instead of independent *courses* — are so different from the practices, common throughout the educational system, of independent institutions, independent faculty, and independent courses. Like curriculum integration, tech prep has the potential for truly substantial changes in how education operates, and this message is not quickly learned.

3. Articulation agreements have been at the heart of most exemplary tech prep programs, and often success is counted by the number of agreements with a variety of local high schools. Articulation agreements take many forms, and the benefits to students vary. Some community colleges give college credit for courses taken during high school, or courses taken at the community college during the high school year; this allows the period of time necessary for

completing a certificate or Associate degree to be shorter. Others give students advanced standing, or waive certain prerequisites, but insist that courses taken in tech prep programs not shorten the time to a credential. In still other cases students can move directly into college-level courses and avoid the need for remediation; for this group the benefits of tech prep may be substantial – since most community colleges find high proportions of recent high school graduates needing remedial education – but the benefits are especially difficult to measure because they take the form of remediation prevented rather than credits earned or advanced standing attained. All these forms of collaboration help define community college requirements to high schools, though they do so in ways that have less influence on the high school curriculum than do the collaborative efforts of faculty.

Much less often, some colleges offer financial incentives to students who move on to the community college, though only a few waive fees or provide scholarships to tech prep students. Because most tech prep programs have not been operating long enough for many students to enter community colleges, it is unclear how effective financial incentives are.

4. The curricular changes in tech prep programs have so far been confined largely to high schools, where a variety of new courses have been created – partly in response to the process of specifying the competencies necessary for entry into community colleges. The courses created range from the applied academics courses created by the Center for Occupational Research and Development and Research (CORD), a set of applied curriculum materials that teachers can use "off the shelf" that are widely used in high schools (but generally rejected by community college instructors as too low-level and poorly integrated with occupational content); to locally- developed courses that integrate academic and vocational content; to the development of career pathways or majors that generate coherent programs of both academic and vocational courses for high school students. The focus of these high school changes has been both to upgrade the content of high school programs, as well as to integrate academic and vocational education (see Grubb, 1995a for changes at the secondary level) and to move to teaching methods that are more applied, more project-centered and active.

5. A few tech prep programs have instituted other changes, suggesting the potential breadth of such efforts. A very few have started special counseling for tech prep students in high schools, to help them see the value of completing high



school and entering postsecondary education; one assigned a community college instructor to the high school as an advisor and instructor of a career assessment workshop. A very few have started elements that are forms of career exploration, to get students thinking earlier and more deeply about their occupational interests and goals; one program has even begun career workshops for seventh graders and courses about technical careers for ninth grades girls, as well as workshops on career decision-making for high school students. One added a curriculum in "job savvy", teaching students such capacities as punctuality, conflict resolution, and team-building, based on their observations that "when students went out into the workplace to learn, they didn't necessarily know what to do there". And a very few tech prep programs have implemented work-based components, like internships and co-op placements. This practice foreshadows the widespread belief that tech prep will be subsumed in school-to-work programs linking school-based learning with work-based learning as well as secondary and postsecondary education. It also reflects the tremendous potential of work-based learning and associated "connecting activities" like co-op seminars (Grubb and Badway, 1995) as vehicles for integrating academic content and clarifying the importance on the job of both basic and higher-order competencies. So far, however, tech prep coordinators acknowledge that they have had neither the time nor the funds to do much about work-based placements.

However rare they are, these efforts to begin incorporating linkages to other educational components aside from postsecondary education – in these examples, to earlier years of schooling, to guidance and counseling, and to work-based activities – illustrate the value of tech prep in getting schools and colleges to think hard about other connections that might be valuable./ What starts as an innovation to get more of the "neglected majority" or "forgotten half" of high school students to consider postsecondary options ends up as a process to rethink schooling more generally.

### **Explaining the Lack of Changes within Community Colleges**

In all these changes in high schools, the participation of community colleges is crucial. Access to postsecondary education provides the goal that motivates these changes; the participation of community college faculty in setting

competencies and upgrading courses provides the specific pressures to upgrade high school courses and programs.

But for all these changes encouraged by community college participation in tech prep programs, there have so far been almost no changes within community colleges themselves as a result of tech prep – in curriculum, in teaching methods, in the students who have entered, or in ancillary services like guidance and counseling. Tech prep coordinators uniformly report that "we have had very little curriculum change at the community college level", or "tech prep hasn't had any direct impact on the community college . . . we're not expecting much change". The reasons are varied, and understanding them is critical to defining what we might expect tech prep programs to accomplish within community colleges.

In the first place, most tech prep programs have not been in place long enough for any of their students to have moved into postsecondary institutions. Except for those institutions that started 2+2 programs in the 1980s, most states initiated their programs in late 1991. Most tech prep consortia received an initial planning grant for 1991-92, theoretically allowing them to enroll the first students in fall 1992. However, in practice it took much more time to put programs in place; in most cases the first students entered the eleventh grade of tech prep in fall 1993, and graduated from high school in spring 1995. This means that they enrolled in community colleges for the first time in fall 1995 – and information about their numbers and activities is still limited, particularly since we interviewed tech prep directors in October - December 1995. More frequently, tech prep grants were delayed, or planning took more than a year, or a tech prep program has taken a different direction after a few years. As a result only a small minority of tech prep programs – only four of the 34 we examined – now have students enrolled at the postsecondary level. It is simply too early for the community college portion of tech prep to be activated, and both faculty and administrators are reluctant to change their programs in advance of the need.

However, a number of tech prep coordinators report that they are on the cusp of important changes. As one coordinator described it, "Systemic change will take place once a critical mass of students hits the community college". The stimulus for these changes, they feel, will be a larger number of students better prepared for college work and more accustomed to active and applied approaches to learning, in place of conventional lectures and didactic methods. For example, one example of a new community college course – Technical

Physics, developed in one community college as an extension of Principles of Technology used in high schools – emerged precisely because of the need to develop curriculum better suited to a new wave of tech prep students. *If* tech prep programs remain stable, therefore – if funding for them is maintained and coordinators can continue the processes of marketing and staff development – then curriculum changes at the community college level may follow, analogous to those that have already started to take place in high schools.

A second and more troublesome barrier to changes in community colleges has been the resistance of faculty and the lack of understanding of applied teaching, despite the efforts at marketing and staff development. As one tech prep coordinator reported, "Community colleges appear more reluctant to change than high schools". The reform pressures have not been as insistent in community colleges as they have been in high schools, where there has been constant pressure for reform at least since 1983, with the publication of *A Nation at Risk*. Tech prep, as a vocationally-related reform, has low status in the eyes of academic faculty, and there is also some feeling that it is a fad, one of the "reforms du jour" that can be ignored because it will quickly pass. Some coordinators mentioned the dislike of creating courses especially for occupational and tech prep students:

It is very difficult to get postsecondary people interested in application issues. They say that by giving applied courses, we are essentially setting tech prep students aside from other students, and we shouldn't be doing that.

Community college instructors sometimes invoke "academic freedom" as a rationale for maintaining their old courses; while this may simply be a cover for reluctance to change, academic senate and union restrictions limit the ability of administrators to impose changes. And unfortunately, beyond their institution's requirement of 12 or 15 hours of classroom instruction, some community college faculty spend the remainder of their time on outside businesses, or avocational pursuits, or even full-time positions in other colleges. These faculty show little interest in spending any additional effort on innovation.

Where tech prep programs have been successful in getting faculty to work with them, two groups have been especially active. The first includes occupational instructors who, if they have close ties with business and industry, understand (better than academic faculty) the skills needed in the workplace and

the advantages of better preparation in a broad range of both "academic" and occupational skills. For them, tech prep is a reform that might directly enhance their programs, and they have been more active in defining competencies and structuring articulation agreements. The second group includes academic instructors interested in pedagogical innovations, including the more student-centered, project-based, and applied methods associated with curriculum integration. But this leaves a large number of faculty, including many academic faculty, unmoved by the potential of tech prep.

Similarly, the support of administrators has been uneven. While some tech prep coordinators describe terrific administrative leadership, others report indifference for some of the same reasons faculty are reluctant to participate: they see tech prep as irrelevant,<sup>13</sup> or low-status, or evanescent, or something more concerned with high schools than community colleges. Indeed, the institutional indifference is illustrated precisely by one simple fact: of the 34 exemplary tech prep programs we examined, only a very few have devoted institutional funds (as distinct from external grant funds) to tech prep. The lack of institutional fiscal support is crucial in part because many faculty will not budge without institutional commitment, and the lack of general-fund support is especially frightening to tech prep coordinators in a period of shifting federal policy.

A third and more systemic barrier to change in community colleges is the inability to define and to track tech prep students — to count them, to know what they do when they leave high school, to follow them into and through the community college. In part, this occurs simply because the information systems necessary to follow students from one institution to another are not yet in place; "we're still working on this" is a common response. The furthest some programs have gotten is that they have added a box on community college enrollment forms where students can identify if they have been through a tech prep program in high school — a process rife with error.

In some cases high schools have not established clear tech prep programs. Sometimes, students may be advised to take a particular combination of courses to prepare them for postsecondary options, but there are no counseling or tracking mechanisms to make sure that certain students do so. In these conditions it is impossible to say who is a tech prep student even in the high school component, and the idea of tracking students into postsecondary programs is pointless. In addition, some tech prep programs don't want to identify a group of students designated "tech prep" from those who are "college

prep" or bound for four-year colleges, or to distinguish tech prep students bound for community colleges from "pre-employment" students aiming for employment right after high school. Such distinctions, useful as they may be for developing coherent programs and following students, also smack of tracking and unequal access to educational resources. As a result many high school have changed their courses but not specified who takes them; as one coordinator reported,

There is no consistent definition of tech prep, no standard way to say, "I now apply [to the community college] as tech prep". There are tech prep *courses* but not tech prep *students*. The local schools want to avoid tracking in any way.

In practice, then, some programs identify tech prep students as those who enroll in any tech prep courses or any other tech prep activity (like career counseling). Only a few — the ones we describe below as following the "classic" model — have well-defined cohorts of tech prep students.

The inability to define and to track tech prep students is not merely an administrative inconvenience or a problem for would-be evaluators. If community colleges cannot point to substantial numbers of students who enter through tech prep, then it is hard to justify administrators allocating resources to tech prep, or faculty changing their courses, or counselors developing special services for tech prep students. In an institution like the community college, driven by enrollments and funded largely on a per pupil basis, the inability to count certain kinds of students may mean "there's no there there" — from the community college vantage, there's no evidence that tech prep has done anything for the institution. The benefits to the institution are completely unclear.

Furthermore, even if it is possible to identify and track tech prep students, they may pursue many different routes after high school, and a community college will "capture" only some of them. The experiences of the four colleges in our analysis that have enrolled their first identifiable tech prep students is illustrative. One of them, in Ohio, reported that 85 percent of the first group of tech prep graduates from high school enrolled in the community college, partly because the college had treated them as community college students since eleventh grade; two went to four-year colleges, one got married and started a family, and several went to work in tooling and machining. But two others reported that 50 percent and 23 percent of the first high school graduates

attended the community college. And, at the other extreme, only one of the first ten tech prep graduates in still another Ohio program entered the local technical college; seven went to a four-year college and two to the military. In other programs, tech prep coordinators report that students change their program areas:

What's happening is that students who choose tech prep might continue at the college, but in a program area different from the one they started in high school.

Given all the possibilities and the contingencies that high school graduates face — the choice of many different four-year and two-year colleges, even within a limited geographical area; the possibility of geographical mobility; the possibility of changing areas of interest; the options of entering the military or, for women, starting families; the increasing tendency to "stop out" and work or play before entering college — the likelihood that a community college will enroll a graduate from a tech prep program may be slim indeed.

But these alternatives — and the experiences of the programs with low fractions of students enrolling at the community college — are not necessarily failures. If these efforts have stimulated greater interest in schooling among students who would otherwise be turned off, if they have resulted in more active and more engaging teaching, if they have caused students to explore their occupational options more carefully and to understand the potential value of postsecondary education, if students enter postsecondary education less in need of remediation — then these tech prep programs have been successful even if the numbers enrolled in the participating community college are low. In this case the benefits to students and the educational "system" as a whole are substantial, even though there are few direct benefits to the community college itself and few community college enrollments. The disjunction between the benefits in general and the benefits that accrue directly to the community college creates problems, to be sure — among other things, it reduces the pressure to make changes in the postsecondary curriculum itself — but it should not be interpreted as a lack of benefit.

### **Three emerging models of tech prep**

While it is still too early to see many changes in community colleges, many coordinators think that larger numbers of tech prep students are likely to enter community colleges in the next few years, forcing additional changes at the postsecondary level. They are therefore planning certain kinds of changes; and in their efforts we can distinguish three models or approaches to tech prep that seem to dominate their thinking.<sup>14</sup> These "models" should be understood as rough descriptions of what programs are attempting; the practices in different programs overlap as great deal, and the distinctions among the three approaches are not hard and fast. Nonetheless, it is useful to articulate them because they clarify the varied ambitions of different programs. Roughly speaking, slightly more than one quarter of the 34 programs we examined followed what we will call the "classic" model, which includes changes at both the secondary and the postsecondary levels; about one third follow the model of upgrading secondary vocational education, and slightly more than one third followed the model of secondary curriculum reform. These figures illustrate that there are non-trivial numbers of programs in each approach, but the specific percentages should not be taken seriously because assigning a particular tech prep program to a particular "model" is uncertain and because our sample of programs was chosen to describe exemplary efforts.

1. *The "Classic" Model:* The approach we will call the "classic model" seems to be most consistent with the original vision of Dale Parnell (1985), with his emphasis on the middle quartiles of high school schools, the middle range of occupations, higher standards for both levels, and continuity of learning between the secondary and postsecondary levels. Many of the programs following this approach are in Ohio, because that state has adopted a statewide plan embracing many of these elements; it is also consistent with Oregon's state plans, which call for a two-track approach with a "college prep" track and several "tech prep" tracks emphasizing one of six different broad occupational areas. This approach concentrates more or less explicitly on the middle 50 percent of high school students, acknowledging that the top students will go to four-year colleges and the bottom quartile are unlikely to go to any postsecondary education at all – or are simply too difficult to motivate to higher levels of performance. Indeed, one coordinator stated that their initial efforts to include low-performing students foundered:

We did have one high school send us their highest-risk students, and we found we were just not set up deal with such a high risk population. We found that when the high-risk kids come in such a group they put too much pressure on each other to fail.

Many of these programs therefore have entrance requirements – for example, in one case, requiring that students have passed state proficiency tests, have a C average in algebra, a C average in biology (for health occupations students), and be computer-literate – and those that don't still target their recruitment efforts at the middle 50 percent. Because these programs are clear about which students they want to enroll, they tend to designate their students as tech prep students, distinguished from the rest of the high school population, and for this reason tracking and evaluation are easier than for other approaches.

The changes at the high school level include upgrading the curriculum, defining the courses most appropriate for students preparing for postsecondary occupational programs, and using more applied and integrated teaching – all with the cooperation of community college faculty, who specify the preparation appropriate for doing advanced work at the community college level. These programs contain an understanding, explicit or implied, that students will continue in a related program in a community college or some other postsecondary institution. Finally, because these programs anticipate a well-defined group of tech prep students will enter the community college as a cohort, there is a greater commitment to changing the curriculum and teaching at the postsecondary level as well, incorporating the various forms of integration mentioned earlier in this monograph. Typically, this approach does not designate other special services for tech prep students at the postsecondary level, because these students should be integrated into the mainstream of the community college; but there is a greater recognition that a tech prep or 2+2 programs requires reforms at both levels.

2. *Upgrading Secondary Vocational Education*: This approach, like the classic model, tends to exclude high school students likely to be bound for four-year colleges. It focuses on students in vocational areas only, and tries to raise the standards of such programs through greater demands, a different sequencing of courses, incorporating more math, and introducing more contextual or applied teaching. One of its effects may be to replace the general track, followed by students who are neither college-bound nor vocational, with a more rigorous



program of applied courses that have an occupational flavor or applications – even though such a program may not be vocational in the traditional sense of preparing for specific, entry-level jobs.

Unlike the classic model, there is no clear understanding that students will continue in a community college, and therefore less interest in tracking tech prep students – though high school students should be better prepared for postsecondary alternatives because the curriculum is more rigorous (especially when general track courses are eliminated) and courses more coherently sequenced. Because the emphasis of this model is on the improvement of postsecondary vocational education, there is much less emphasis on change in the community college, and less participation of community college faculty except in specifying competencies and standards.

3. *Reforming the Secondary Curriculum*: The third model, unlike the previous two, focuses on almost all students in a high school including those who might be considered college prep. The emphasis is on reforming the high school curriculum for all students, often by developing career majors or pathways that create more coherent sequences of courses, where every student elects one pathway or another. Because this approach intends to reform the high school for all students, there is generally a disinclination to track students, or to label some students "tech prep" while others remain "college prep" or "employment bound"; therefore designating and tracking tech prep students is difficult. The purpose of connections to postsecondary institutions is to stress that all students when they graduate have the options of continuing their education, going into employment, or combining further schooling and employment (as increasing fractions of students do anyway) – a broader set of goals than either college-prep or traditional vocational programs have had. This allows students to engage in "parallel career planning" where they can envision both postsecondary education and back-up employment (Heebner, 1995). As one student described this approach,

This is my last year, and I'm going to get my cosmetology license. After I get my license, I'll just go to college for business. If one doesn't work out, I'll go to the other.

Several of the programs that have been examples of the second model, improving secondary vocational education, appear to be shifting to the third model, stressing the reform of the entire high school. Such a development is

consistent with recommendations that an occupational focus and the integration of academic and occupational education can be the stimulus for general high school reform, even if it starts with vocational programs (e.g., Grubb, 1995a). But for community colleges the result is virtually the same: while students may be better prepared for postsecondary education, and more of them will be qualified for either employment or further education after high school, the emphasis is still on secondary reform.

In the model of reforming the secondary curriculum, the inability to identify certain students as tech prep makes it difficult to identify students entering a particular community college as tech prep students. For this reason, and because this approach emphasizes the reform of the high school curriculum, there is not much change at the community college level – and certainly little interest in curricular or pedagogical change. To be sure, as in the model of upgrading secondary vocational education, students entering community colleges should be better prepared and need less remediation, and some of them may be recruited to community colleges by articulation agreements between the career pathway they have chosen in high school and a particular community college occupational program. There are, then, benefits for community colleges. As one tech prep coordinator summarized the benefits of the program:

I have seen an increase in self-esteem and self-confidence. Tech prep students are more focused, have more concrete goals, their high school performance is improved – and it is much easier to transition to the community college if they decide to get an Associate's degree. I haven't seen as much dropout: our community college freshmen at least finish the term.

But the benefits to the community college are less direct, and they certainly are more difficult to evaluate because high school students are likely to end up in a large variety of institutions and jobs after high school.

One purpose of clarifying these three models, rough as they are, is to emphasize once again that many tech prep programs have important goals that have little to do with reform at the community college level. The models of upgrading secondary vocational education and of reforming the entire secondary curriculum may require the participation of community college instructors, but they may not see the need to reshape the community college itself. And the benefits for community colleges as a whole from improving the high school

curriculum and increasing the awareness of occupational choices and postsecondary alternatives may be substantial, but they may be indirect and diffuse: particularly given the inability or reluctance to label and track tech prep students, a participating community college may not see an increase in the numbers of identifiable tech prep students.

### **The Future of Tech Prep:**

#### **Assuming the Costs of System-Building**

Uniformly, tech prep coordinators are wildly enthusiastic about the potential of tech prep. That's practically a job requirement, of course, but still the potential benefits of tech prep appear to be substantial. To recap these benefits, as we did for curriculum integration:

- The collaboration between community college and secondary instructors has helped to increase the rigor of high school programs, and to ensure that high school students are better prepared for the kind of demands they will face in postsecondary education and the world of work.

- The development of applied courses and more active teaching methods in high schools has helped to engage a number of students – precisely those students (often, the middle fifty percent or the "forgotten half") who have been turned off by the conventional college prep curriculum and standard didactic teaching methods.

- Articulation agreements have smoothed the transition to community college, allowing some students to start at a more advanced level and some colleges to develop more sophisticated programs.

- Tech prep has been a vehicle for other components – for example, career exploration and work-based learning at the high school level – that provide other kinds of learning opportunities and may in the future lead to more community college students who have clear ideas about their goals – rather than coming to postsecondary programs unsure of themselves and needing to "experiment" to find some sense of direction (Grubb, 1996b, Ch. 2). This in turn should reduce the "milling around" that takes place while such students clarify their purposes.

- While few tech prep students have yet entered community colleges, many tech prep coordinators predict that a wave of students – better prepared,

accustomed to more active and student-centered teaching — will force postsecondary instructors to change their teaching methods.

- By reducing the need for remediation, serving to accelerate progress through the community college, and enhancing their sense of direction, these programs may increase the completion rates of incoming tech prep students — and such improvements should be particularly important for the "non-traditional" students (including minority students and those from lower-income families whose parents have never attended college) whose completion rates are especially low. Indeed, some tech prep programs — those following the "classic" approach and those following the tech prep Associate degree model (Bragg, 1995) — explicitly stress to students that *completion* of the Associate degree is the goal, not merely *enrollment* in postsecondary education. In turn, increased rates of completion will benefit students because the economic value of Associate degrees is substantially higher than either certificates or credits earned without any credential (Grubb, 1995; Grubb 1996b, Ch. 3).

- Tech prep has served as a vehicle for forcing institutions and faculty to think about the basic purposes of education. As one coordinator said,

I don't know that anything has really changed [at the community college], but I do know that through tech prep many issues that needed to be addressed are finally getting addressed, e.g., teaching and learning issues. We are also asking ourselves such questions as: What is "college ready"? What is integration?

Another reported, even though "we aren't making as much progress as I had hoped", that "some faculty are starting to think about more learning-centered ways of teaching — we're doing workshops on distance learning and encouraging faculty to adopt teaching strategies different from the traditional lecture". The most concrete form this kind of investigation has taken is the effort to develop coherent *programs* spanning the high school and postsecondary years, drawing on the collaboration of secondary and postsecondary faculty, in place of disconnected *courses*. As one coordinator commented, "We need to provide more opportunity for students to move through a planned educational experience", and another coordinator involved in delineating career pathways declared that "we must get students out of the process of just picking courses". And the larger issues — who does education now benefit, who should it benefit, what are the alternatives to the standard college prep "track", how might educational

institutions work together, what approaches to teaching are most effective — have also been a central part of many discussions initiated by tech prep.

At the same time, virtually all tech prep coordinators in community colleges are nervous about the futures of their programs. They rely heavily on external funding from the federal government, since their institutions have (with a few exceptions) not yet shouldered the costs of tech prep; therefore the elimination of tech prep funding in its current form, as Congress moves toward consolidation, threatens the very existence of these programs. Almost universally, community college coordinators envision that tech prep will be subsumed under school-to-work programs, but this too creates its own uncertainty: while some tech prep programs are part of local and state school-to-work planning groups, others are not. One coordinator reported that "the school-to-work people are a totally different group — the two groups don't talk". The tendency to see school-to-work as a new reform rather than an extension of curriculum integration and tech prep, the politics around a different decision-making group, and the battles over funds that arise from including proponents of work-based learning all make the transition to school-to-work quite precarious.

Moreover, because so few tech prep students have entered community colleges yet, the benefits are still invisible to faculty and administrators alike; there are very few tangible benefits to community colleges that tech prep coordinators can point to, even after five years of federal funding and endless amounts of publicity and "marketing", and the benefits to high schools and high school students are again all too invisible.

Over the long run an equally serious problem with tech prep, it seems to us, is the disjunction between the responsibilities of community colleges and the patterns of benefits. Crude as it may be, the evidence from a few institutions that only a few students entering a tech prep program in high school will continue in the same program in the local community college is consistent with everything else we know about the ways in which students change their minds, develop other plans as they progress, and move around geographically. And the large numbers of tech prep programs that cannot or will not identify students as "tech prep", or who have adopted models that stress high school improvement, exacerbates this problem. The participation of a particular community college is crucial to the success of each local tech prep program, obviously, but the benefits are diffuse: high school programs may become more coherent, and some high

school students are more likely to graduate and continue to postsecondary education, but some will end up in four-year colleges, or other community colleges, or employment or the military. It may never be in the interests of the local community college to fund its participation in tech prep, if it looks solely at the benefits to *its* students and *its* instructors.

The underlying problem is that the costs of *system-building* – of linking different educational institutions like high school and community colleges – have to be borne by the system itself, by state or federal governments with specific funding, rather than by individual institutions with their general-purpose funds. This has been, of course, the point of federal funding for tech prep under the Carl Perkins Amendments of 1990, and it will continue to be a legitimate function of state funding under consolidation. The future of tech prep may depend on recognizing this point, and persuading state governments that a critical responsibility is to continue funding the costs of system-building, in the interests of creating coherent occupational education and job training systems.

#### IV. REQUIREMENTS FOR THE FUTURE: STABILITY AND ADMINISTRATIVE LEADERSHIP

Both workforce innovations we have profiled — the integration of academic and occupational education, and tech prep programs linking community colleges with high schools — have now reached the point where some assessments are possible. Both have generated substantial amounts of change, though there is obviously variation in how much change has taken place. Some community colleges have been relatively active in promoting curriculum integration, adopting several different kinds of applied courses, or revamping their gen ed program to incorporate more work-related multidisciplinary courses, or adopting a series of tandem courses and learning communities. In other cases, such efforts remain idiosyncratic, the responsibility of one or two committed faculty. Tech prep programs have achieved widespread visibility and some real changes within high schools through the collaboration of community college faculty, though the changes within community colleges themselves are as yet limited.

Both these innovations prove to be multi-faceted, flexible enough to incorporate a variety of somewhat different goals. While improved preparation of a more sophisticated workforce remains the principal goal of both, the enhancement of remedial education (or its prevention, in the case of tech prep), the inclusion of different forms of career education, the incorporation of liberal education into occupational programs, and the inclusion of work-based learning are all possible as well. Both curriculum integration and tech prep are consistent with the larger vision of school-to-work programs incorporating work-based learning, and many participants look forward to the day when the "three integrations" envisioned in the School-to-Work Opportunities Act — of academic and vocational education, or secondary and postsecondary institutions, and of school-based and work-based learning — will replace the current non-system of isolated courses and independent practices.

At the same time, the initial development of these innovations has depended heavily on enthusiasts, on volunteers, on innovators, on those committed to reforming occupational education including those academic instructors interested in new ways of teaching. The innovations we have described may well have exhausted the stock of such supporters in community

colleges; progress from here on may depend on converting the uncommitted, encouraging the timid, and proselytizing those who would prefer to continue in old patterns.

The further development of both curriculum integration and tech prep will require institutionalizing support for these changes, in place of their current status as relatively peripheral innovations out of the mainstream of what community colleges do. By *institutionalizing* these reforms, we have in mind several changes that faculty and administrators involved in curriculum integration and tech prep referred to constantly:

- The vision underlying these practices – their basic purposes, potential benefits, and general methods – should be part of the culture of community colleges. The endless "marketing" and staff development that tech prep coordinators undertake, as faculty come and go and others need to be further persuaded, is testimony to the novelty of these ideas. (Our own workshops about curriculum integration, described briefly in the Appendix, are similar experiences, of continuously explaining the idea to faculty who have only the merest glimmer of what collaboration might accomplish, including some who are actively hostile to integration.) Moreover, *students* usually have to be educated about these novel practices: for example, institutions adopting tandem courses and learning communities usually have to work hard to get students to enroll, and applied and active instruction also requires some adjustment by students accustomed to lectures and passive learning. In contrast, those practices that are fully institutionalized – for example, the conception of what a "course" is, the basic structure and purposes of a community college, the role of departments and Senates – need not be explained over and over because all members of the institution understand them.

- The abilities to carry out these visions should be normal qualifications of faculty and administrators. Curriculum integration requires forms of collaboration with other faculty that are presently rare, and approaches to teaching that are also still uncommon. Tech prep requires working with high schools that have different cultures and practices, and is not one of the abilities that community college instructors have learned in their preparation, either in the academy or in business and industry. The appropriate preparation of faculty and administrators is particularly difficult in community colleges because in most states there are no specific teacher preparation programs, as there are in K-12 education, that might incorporate such abilities. However, we did discover



two examples where local schools of education teach courses in applied learning for community college and high school instructors; other opportunities for such preparation include the early period of teaching – sometimes referred to as "induction" – and staff development activities.

- The institutional commitment to these practices should be so widespread that community colleges look for further opportunities to practice them. In the community colleges that have embraced curriculum integration, for example, collaboration becomes quite common, and potential problems – for example, occupational areas with rapidly changing demands, or developmental education, or programs for welfare recipients – are routinely addressed through learning communities. When community colleges become entrepreneurial and problem-solving institutions, then these workplace innovations add to the repertoire of conventional solutions – rather than being exotic changes that continue to be unusual and irregular. In turn, such institutional commitment implies that the procedures of the institution – the scheduling of classes, the procedures for registration, the course and program approval processes, the methods for determining credit and transferability, the myriad organizational details that frustrate so many innovations – are changed to accommodate these practices.

- The funding of these innovations should come from the general funding of community colleges, rather than being external and categorical funding that is volatile, "outside", and subject to political whim. The difficulty that faculty report in getting funding for collaboration, despite the earmarking of federal funds for curriculum integration, and the worries among tech prep coordinators about the future of funding are cases where reliance on special-purpose grant funds undermines the widespread adoption of these practices. The tendency of multidisciplinary courses and tandem courses to disappear once special-purpose funding evaporates is a similar indication of how fragile changes are that are supported with external funds.

Paradoxically, these workforce innovations will be truly institutionalized when they are not viewed as innovations at all – when instead they are part of the normal practices of community colleges and technical institutes.

Now, some of these changes are not within the power of individual community colleges. In particular, the incorporation of funding for curriculum innovation into the "normal" resources of community colleges and the continued funding of "system-building" activities like tech prep are dependent in part on

state and federal legislatures. But there are at least two requirements for these workforce innovations to be adopted that are wholly within the control of individual institutions:

*Stability* is crucial to these innovations. As one tech prep coordinator remarked,

I view our efforts as a long-term cultural change activity. We can do all the articulation and integration we want, but we must do it for a very long time to see it actually benefit anyone. You must attack the basic skills issue from a lot of different levels.

The processes of getting faculty to understand the benefits of these innovations, of establishing relationships with high schools in the region, and of developing integrated curricula are all time-consuming. The reluctance that some tech prep coordinators report on the part of faculty who see tech prep and integration as passing fads, as the "reform du jour", comes from the feeling that these reforms will soon be abandoned. Similarly, the anxiety of tech prep coordinators about the future of their programs reflects the worry that long years of work, about to pay off as tech prep students begin entering community colleges, will be undone if funding is discontinued. The ability to get larger numbers of faculty to support these innovations in workforce preparation depends on community colleges sustaining their commitment to reform.

*Administrative leadership* is the other critical requirement. Only a few of these changes can be carried out by faculty working alone. For changes that affect more than a single course, coordination among faculty and institutional commitment that only administrators can provide are necessary — to encourage faculty to participate, to coordinate the schedules necessary for multidisciplinary courses and learning communities, to develop the teams of faculty and administrators necessary to work with high schools. Over and over, tech prep coordinators related the importance of administrative support. Lack of support, for example an instructional dean described as a "weak link", or turnover in administration was cited as a serious problem in some cases while others reported the benefits of administrative support. As one coordinator reported,

I've met with such problems as faculty opposition, getting the message out, and just a basic lack of involvement from others. So leadership in the college is very important; otherwise you just meet with brick walls.

Support from administrators includes financial support, of course, but the other crucial requirement is leadership in teaching innovation. Community colleges pride themselves on being teaching institutions, and the small classes (rather than lecture-size classes) and absence of research responsibilities allow instructors to concentrate on teaching. But coordinators for curriculum integration and tech prep also report that, left to themselves, a few faculty members will innovate but many more will not – since old patterns are hard to break, disciplinary allegiances are barriers to collaborative work (especially between academic and occupational faculty), and the institutional rewards for doing so are uncertain. The challenge is to create a *climate* in which teaching is encouraged, a *culture* in which instructors know that innovation is expected, encouraged, and rewarded. This takes more than financial support; it requires that administrators as instructional leaders cajole and even pressure faculty to innovate, in which they use all the mechanisms at their disposal – hiring procedures, promotion practices, staff development, discretionary funding, the bully pulpit of faculty meetings and institutional priorities – to create an institutional commitment to innovation in teaching.

The rewards can be substantial. The innovations we have described in this monograph promise to improve the preparation of the labor force, to respond to the demands of employers and others that prospective workers be well-prepared in academic as well as technical skills, in SCANS competencies as well as the three R's – and that is a worthy goal all by itself. But curriculum integration and tech prep are innovations that go beyond benefits to employers, prospective workers, and the vocational mission of the community college. They offer innovations in teaching that can benefit academic instruction and developmental education (and ESL) as well as occupational education. They provide methods of collaboration – among community college faculty, between community college instructors and high school teachers – that generate benefits of many different kinds, including that of "building community". They give the community college a greater role in the larger "system" of education, and in so doing they can help ensure that students coming to community colleges are better prepared and more certain of their goals. And they help community colleges fulfill their promise as innovative, teaching-oriented, non-traditional institutions, responding to their multiple missions with flexibility and foresight.

## FOOTNOTES

---

<sup>1</sup> These other forms of integration are due to Jim Jacobs of Macomb Community College. On the integration of occupational education and job training see Grubb (1996a).

<sup>2</sup> As of February 1996 the House and Senate versions of consolidation, with substantial differences in the ways funds would be allocated to states, had not yet been reconciled, though most observers expected passage of final legislation sometime during spring 1996.

<sup>3</sup> Cross (1976, Ch. 5) has argued that the non-traditional students in community colleges (including many occupational students) are more likely to be field-dependent, and therefore to have trouble applying a concept from one area to another. It is important to note that students in even the best four-year colleges are likely to need guidance in integrating material from different courses. The movement for interdisciplinary courses within four-year colleges, the efforts to teach from case studies, and the movement to adopt capstone courses reflect the difficulty all students have with fragmented courses.

<sup>4</sup> On sources for incorporating the literature about work, see also Koziol (1992), and Koziol and Grubb (1995).

<sup>5</sup> Personal communication, Elwood Zaugg, Dean of Vocational Education, Salt Lake Community College, July 13, 1995.

<sup>6</sup> South Seattle Community College (Washington) does offer a course in "The Psychology of the Workplace", described by the division chair as "not really integrated" but still more responsive to the needs of occupational students than is the conventional psychology course.

<sup>7</sup> This quote is taken from flyers advertising the business cluster to all students. The flyers promote the clusters in similar terms: "Clusters help you learn better by showing you how ideas connect across different courses. Students in clusters tend to do better in their courses."

<sup>8</sup> One ESL instructor reported that the pass rate in the ESL/keyboarding pair was 90 percent, compared to 70 percent in non-paired ESL. Those associated with clusters in LaGuardia Community College contend that the pass rate is higher for cluster students than for non-cluster students in the same English courses (85 percent versus 70 percent), and that students in the business cluster have higher retention rates by 10 to 24 percentage points from the first year to the second. (Of course, self-selection of highly-motivated students into clusters might be responsible.) In Tinto's (1987) model, which dominates the empirical literature on persistence, academic integration (essentially, academic success) and social integration — the participation of students in the social life of the institution — are crucial to decisions about continuing. Clusters facilitate social integration, which is otherwise difficult for students in community college because so many of them are part-time and have substantial non-educational demands.

---

<sup>9</sup> Capstone courses appear to be the community college equivalent of senior projects in high schools, described in Tsuzuki (1995).

<sup>10</sup> The data about remedial courses in community colleges are not very good, and so it is generally impossible to compare completion rates in remedial courses and "college-level" courses. However, instructors uniformly report completion rates in remedial courses to be low (Grubb and Kalman, 1994). Evidence from Miami-Dade Community College indicates that only 26 percent of students who tested below standard levels completed all the remedial courses appropriate, with the proportion falling as the number of subjects in which a student is deficient increases; see Losak and Morris (1985), reprinted in Grubb and Kalman (1994), and more recent results in Morris (1994).

<sup>11</sup> I know of no systematic analysis of the organizational independence of community college missions. However, in addition to the clear split between academic and occupational faculty, my colleagues and I have previously identified a split between the remedial or developmental faculty and the rest of the institution (Grubb, Kalman, Castellano, Brown, and Bradby, 1991), and between customized training and the rest of the institution (Lynch, Palmer, and Grubb, 1991). The programs serving JTPA and welfare clients are often distinct from regular courses (Grubb, Brown, Kaufman, and Lederer, 1990); and credit and non-credit courses are often organized in different divisions.

<sup>12</sup> These findings are consistent with the national survey of tech prep coordinators in Bragg, Layton, and Hammons, 1994.

<sup>13</sup> A frequently-mentioned source of resistance to tech prep comes from a basic misunderstanding of who community college students are. One mantra among community college administrators is "the average age of our students is 29", implying that tech prep programs concentrating on students entering from high school will provide only a trivial proportion of community college students. However, the average age of 29 masks two different populations: older students, who tend to be part-time, and full-time students who tend to be much younger. As a result the median age of all students is 25, the median age of full-time students is 21, and the modal age appears to be 19; see the 1992-93 NPSAS data in Tuma (1993) and Cohen and Brawer (1989, p. 32). These younger students, more or less right out of high school, are the targets of most tech prep programs, and they are crucial to overall enrollments, to the daytime programs that full-time faculty teach, and to the core programs of these institutions.

<sup>14</sup> These three are consistent with the three approaches described by Hershey, Silverberg, and Owens (1994), p. 135 ff.

## Appendix

### SOURCES OF INFORMATION

We began examining the integration of academic and vocational education in 1991, as part of the overall program of the National Center for Research in Vocational Education (NCRVE) to examine innovations in vocational education generally and those supported by the Carl Perkins Amendments of 1990 specifically. This work began with a postcard survey of Deans of Instruction at 295 community colleges, drawn at random from the list of the American Association of Community Colleges; 168 responded, and 121 claimed to be engaged in some form of integration. Eileen Kraskouskas then interviewed 45 of these institutions during 1991 and 1992, concentrating on those with initial or particularly interesting descriptions, and we visited four of them. This research resulted in an NCRVE monograph (Grubb and Kraskouskas, 1992) and a briefer article in the American Vocational Association's journal (Grubb and Kraskouskas, 1993). This work has also formed the basis for a series of presentations at meetings of groups like the National Council for Occupational Education, the AACC, and workshops at various community colleges.

Norton Grubb was asked to conduct the research on curriculum integration for the National Assessment of Vocational Education. This involved developing questionnaires for high schools and community colleges to report the kinds of integration activities they were engaged in during 1992. The resulting monograph (Grubb and Stasz, 1993, incorporated into Boesel, 1994a) clarified that there was increasing interest in curriculum integration, though it was still low, much lower than in secondary schools, and was principally confined to specifying general education requirements, the development of applied academics courses, and offering Writing Across the Curriculum. Curriculum integration was also more frequent in states that had developed specific initiatives and technical assistance, and in large and well-funded institutions. However, based on what we had learned from earlier research and from workshops, it also appeared that the answers to these questionnaires were often exaggerated: in many cases it looked like community colleges reported practices under development, or practices that they wanted to develop, rather than examples of curriculum integration already in place.

However, in 1994 interest in curriculum integration began to increase. Several additional states began to develop initiatives to require that local colleges use their Perkins funds for integration, leading to an increased demand on NCRVE for workshops related to curriculum integration. In response, Norena Badway together with Norton Grubb began investigating more recent developments. Initially she contacted 291 community colleges by mail, following the procedures that Eileen Kraskouskas had used in 1991-92; 82 percent of these (244 colleges) responded. Of those responding, 98 percent reported some form of integration, including 49 percent that mentioned applied academic courses. Subsequently she interviewed curriculum deans and instructors from 115 colleges – the ones that, based on their responses to questionnaires, seemed to be more active in this area. She also collected curriculum materials, and visited three colleges. Like the earlier work by Kraskouskas, this process results not in a census of curriculum integration – that is often quite useless, as the NAVE questionnaires reveal – but in a relatively thorough collection of the range of practices that exist, together with better information about the content of such efforts and supporting material like course descriptions, reading lists, and project descriptions. A subsequent NCRVE monograph will describe the results of this survey in more detail, and will include a compendium of supporting materials (Badway and Grubb, 1996).

A final source of information about curriculum integration comes from the workshops and presentations carried out for community colleges by Grubb, Kraskouskas, and Badway. Within the past two years we have presented about 35 such workshops, to individual community colleges and consortia of colleges in particular regions. These are, of course, primarily forms of technical assistance, not mechanisms of information gathering; but the comments of participants often reveal the kinds of efforts community colleges are making and what problems they face most often. They have therefore helped us develop a sense of what is going on around the country – often difficult to do given the range and variety of community colleges, and the lack of systematic channels of information.

From its inception NCRVE has emphasized research on tech prep, partly because of requirements that the Center examine the kinds of practices funded by federal resources. An early publication by Bragg (1992) provided a guide to implementing tech prep, stressing the need for developing high quality programs; similarly Dornsife (1992) stressed the many possibilities for tech prep beyond simply articulating secondary and postsecondary programs, based on

information about what programs were then doing. As was true for the integration of academic and vocational education, NCRVE was asked to analyze the development of tech prep for the National Assessment of Vocational education, based on evidence as of 1992; the resulting monograph (Dornsife et al., 1992, incorporated in Boesel, 1994b), clarified (not surprisingly) that while there growing numbers of tech prep programs, most were in the very early stages; postsecondary institutions in particular were still in the midst of planning, marketing, and other process-oriented activities. Subsequent publications by Bragg and her colleagues (Bragg, Layton, and Hammons, 1994; Bragg, Kirby, Puckett, Trinkle, and Watkins, 1994) further examined developing tech prep practices, including "best practice" programs, and Bragg and Layton (1995) stress the roles that community colleges can play in tech prep. Finally, Mathematica Policy Research has undertaken the official evaluation of tech prep sponsored by the U.S. Department of Education, and has completed several descriptive reports (e.g., Hershey, Silverberg, and Owens, 1994; Silverberg and Hershey, 1994).

However, many of these reports emphasized the activities in high schools – because that was where the most activity has taken place – or the processes and procedures that tech prep programs initiated. It's difficult in this literature to find much analysis of what community colleges themselves have done (or not done), and why, and what benefits might flow from their efforts. Therefore Kraskouskas and Bell began to undertake a survey specifically for the purpose of determining the community college role in tech prep, and the changes within community colleges. In order to avoid the problems caused by surveying large numbers of institutions with relatively little change, they initially assembled recommendations of community colleges that were relatively advanced in their tech prep programs, from several sources: the Mathematica group; Debra Bragg, Carolyn Dornsife, Gerry Hayward, and Darryl Clowes, reflecting their extensive research for NCRVE; Tom Owens of the Northwest Laboratory for Research and Development, who was not only a member of the Mathematica research team but is also knowledgeable about the many tech prep programs in the northwest region; Jim McKenney of the American Association of Community Colleges, who has taken a special interest in workforce developments; the U.S. Department of Education, which has had a program of awards for exemplary tech prep sites; and an advisory committee for this project, consisting of occupational deans and tech prep coordinators from various colleges of the League for Innovation in the



Community College and the National Council on Occupational Education. The result was a list of 50 specific community colleges nominated by one or more of these sources.

Kraskouskas and Bell then interviewed the tech prep coordinator at the community colleges during September - December 1995, specifically about the role of community college faculty and administrators and about the changes within community colleges. In all they were able to collect information from 34 of these 50; some were difficult to contact, and because there were many nominations in Illinois and Ohio we interviewed only some of the colleges nominated in those states. We stress that – unlike the surveys undertaken for NAVE and NCRVE – these results therefore reflect *exemplary* rather than *average* practice. If there have been relatively few changes at the community colleges in our sample, there are much fewer in the average community college.

## REFERENCES

- Badway, N., and Grubb, W.N. (1996, forthcoming). *Reshaping the community college: Curriculum integration and the multiple competencies for career preparation*. Berkeley: National Center for Research in Vocational Education.
- Boesel, D. (1994a, July). Integration of academic and vocational curricula. Ch. 4 of *Final Report to Congress. Vol. III. Program Improvement: Education Reform*. Washington D.C.: National Assessment of Vocational Education, Office of Educational Research and Improvement, U.S. Department of Education.
- Boesel, D. (1994b, July). Tech-prep programs. Ch. 5 of *Final Report to Congress. Vol. III. Program Improvement: Education Reform*. Washington D.C.: National Assessment of Vocational Education, Office of Educational Research and Improvement, U.S. Department of Education.
- Bragg, D. (1992). *Implementing Tech Prep: A Guide to Planning a Quality Initiative*. Berkeley: National Center for Research in Vocational Education, University of California.
- Bragg, D. (1995). Linking high school to postsecondary institutions: The role of tech prep. In W. N. Grubb, ed., *Education Through Occupations in American High Schools. Vol. II: The Challenges of Implementing Curriculum Integration*. New York: Teachers College Press.
- Bragg, D. (forthcoming, 1996). *Perspectives of Urban Educators, Students, and Employers Toward Tech Prep Student Outcomes*. Berkeley: National Center for Research in Vocational Education.
- Bragg, D., and Layton, J. (1995, Spring). Tech Prep implementation in the United States: The once and future roles of community college. *Community College Review* 22(4):3 - 16.
- Bragg, D., Layton, J., and Hammons, F. (1994, September). *Tech Prep Implementation in the United States: Promising Trends and Lingering Challenges*. Berkeley: National Center for Research in Vocational Education, University of California.
- Bragg, D., Kirby, C., Puckett, P., Trinkle, K., and Watkins, L. (1994, October). *Building a Preferred Future with Tech Prep Systems*. Berkeley: National Center for Research in Vocational Education, University of California.
- Cohen, A. M., & Brawer, F. B. (1989). *The American community college* (2nd ed.). San Francisco: Jossey-Bass Publishers.
- Collins, A., Brown, J., & Newman, S. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Erlbaum.
- Commission on the Future of Community Colleges (1988). *Building communities: A vision for a new century*. Washington, DC: American Association of Community and Junior Colleges.

- Commission on the Skills of the American Workforce (CSAW). (1990). *America's choice: High skills or low wages!* Rochester, NY: National Center on Education and the Economy.
- Dornsife, C. (1992, April). *Beyond Articulation: The Development of Tech Prep Programs*. Berkeley: National Center for Research in Vocational Education, University of California.
- Dornsife, C. et al. (1993, April). *The NAVE-Sponsored Survey: Tech Prep Results*. Berkeley: National Center for Research in Vocational Education, University of California, for the National Assessment of Vocational Education, U.S. Department of Education.
- Doucette, D., and Hughes, B. (1990). *Assessing Institutional Effectiveness in Community Colleges*. Mission Viejo, CA: League for Innovation in the Community College.
- Gabelnick, F. G. (1990). *Learning Communities: Creating Connections Among Students, Faculty, and Disciplines*. New Directions for Community Colleges. San Francisco: Jossey-Bass.
- Gabelnick, F., MacGregor, J., Matthews, R., & Smith, B. (1990, Spring). Learning communities: Creating connections among students, faculty, and disciplines. In R. Young (Ed.), *New Directions for Teaching and Learning*, No. 41. San Francisco: Jossey-Bass.
- Grubb, W. N. (1995a). *Education Through Occupations in American High Schools*. Vol. I: *Approaches to Integrating Academic and Vocational Education*. Vol. II: *The Challenges of Implementing Curriculum Integration*. New York: Teachers College Press.
- Grubb, W. N. (1995b, May). *The Returns to Education and Training in the Sub-Baccalaureate Labor Market: Evidence from the Survey of Income and Program Participation, 1984 - 1990*. Berkeley: National Center for Research in Vocational Education, University of California.
- Grubb, W.N. (1996a). *Learning to Work: The Case for Re-integrating Education and Job Training*. New York: Russell Sage Foundation.
- Grubb, W.N. (1996b). *Working in the Middle: Strengthening Education and Training for the Mid-Skilled Labor Force*. San Francisco: Jossey-Bass Publishers.
- Grubb, W. N., Brown, C., Kaufman, P., & Lederer, J. (1990). *Order amidst complexity: The status of coordination among vocational education, Job Training Partnership Act, and welfare-to-work programs*. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.
- Grubb, W. N., Kalman, J., Castellano, M., Brown, C., & Bradby, D. (1991). *Readin', writin', and 'rithmetic one more time: The role of remediation in vocational education and job training programs*. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.
- Grubb, W. N., & Kalman, J. (1994, November). Relearning to earn: The role of remediation in vocational education and job training. *American Journal of Education*, 103(1) 54 - 93.

- Grubb, W. N., & Kraskouskas, E. (1992). *A time to every purpose: Integrating academic and occupational education in community colleges and technical institutes*. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.
- Grubb, W.N., and Kraskouskas, E. (1993, February). Building bridges. *Vocational Education Journal* 68(2):24-25,50.
- Grubb, W. N., & Stasz, C. (1993). *Integrating academic and vocational education: Progress under the Carl Perkins Amendments of 1990*. Berkeley, CA: National Center for Research in Vocational Education, for the National Assessment of Vocational Education, U. S. Department of Education.
- Heebner, A. (1995). The voices of students at magnet school. In W.N. Grubb, ed., *Education Through Occupations in American High Schools*. Vol. I: *Approaches to Integrating Academic and Vocational Education*. New York: Teachers College Press.
- Hershey, A., Silverberg, M., and Owens, T. (1994, October). *The Diverse Forms of Tech Prep: Implementation Approaches in Ten Local Consortia*. Princeton: Mathematica Policy Research, for the U.S. Department of Education.
- Koziol, K. (1992). *Novels and short stories about work: An annotated bibliography*. Berkeley, CA: National Center for Research in Vocational Education.
- Koziol, K., and Grubb, W.N. (1995). Paths not taken: Curriculum integration and the political and moral purposes of schooling. In W.N.Grubb, ed., *Education Through Occupations in American High Schools*. Vol. II: *The Challenges of Implementing Curriculum Integration*. New York: Teachers College Press.
- Lynch, R., Palmer, J. C., & Grubb, W. N. (1991). *Community college involvement in contract training and other economic development activities*. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.
- Parnell, D. (1985). *The Neglected Majority*. Washington D.C.: Community College Press.
- Putting American Back to Work : The Kellogg Leadership Initiative* (1984, March). Washington D.C.: American Association of Community and Junior Colleges.
- Secretary's Commission on Achieving Necessary Skills (SCANS). (1991, June). *What work requires of schools: A SCANS report for America 2000*. Washington, DC: U.S. Department of Labor.
- Silverberg, M. and Hershey, A. (1994, September). *The Emergence of Tech Prep at the State and Local Levels*. Princeton: Mathematica Policy Research, for the U.S. Department of Education.
- Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.
- Tsuzuki, M. (1995). Senior projects: Flexible opportunities for integration. In W.N. Grubb (ed.), *Education Through Occupations in American High Schools*.

- Vol. I: *Approaches to Integrating Academic and Vocational Education*. New York: Teachers College Press.
- Tuma, J. (1993, April). *Patterns of enrollment in postsecondary vocational and academic education*. Prepared for the National Assessment of Vocational Education. Berkeley, CA: MPR Associates, Inc.
- Wilbur, F. and Lambert, L. (1995). *Linking America's Schools and Colleges: Guide to Partnerships and National Directory*, Second edition. Bolton, MA: Anker Publishing Co., for the American Association for Higher Education.

Table 1

**The Educational Content of Occupational Preparation**

<u>Competency</u>	<u>Description</u>	<u>Methods of Instruction</u>
Job-specific skills	Production skills used in particular work tasks	Traditional occupation-specific courses; work-based learning including co-op education, on-the-job training; short-term job training programs.
General occupational competencies	Skills used in a variety of occupations: computer applications, business procedures, diagram/blueprint reading, quality assurance techniques.	Occupational courses with infusion; linked courses; broadly work-related activities and materials.
Generic skills for modern work places	"SCANS skills": Decision making, problem-solving, communications skills, independent learning, understanding systems, organizing resources.	Integrated instruction of all kinds, especially infusion/WAC; linked courses; occupational applications and teaching in context; work-based learning and co-op education.
Related academic competencies	"Foundation skills": Reading, writing, and other communications skills; appropriate mathematics, including problem-solving; appropriate science and social science, including workplace applications.	Applied academic courses; infusion and WAC; linked courses and learning communities.
Career exploration and decision-making	Determining career interests and abilities; learning about labor markets; decision-making abilities.	Introductory occupational courses; bridge programs; infusion; work-based learning, co-op education, and co-op seminars; guidance and counseling.

Economic, political, and social aspects of work

Understanding broad economic and political issues; historical perspectives; responsibilities of citizens and community members; traditional goals of liberal education.

Infusion; multidisciplinary courses; linked courses and learning communities; revised general education programs.

Source: Adapted from Badway and Grubb (forthcoming, 1996).