DOCUMENT RESUME

ED 371 192 CE 066 676

AUTHOR	Boesel, David; And Others
TITLE	National Assessment of Vocational Education. Final Report to Congress. Volume II. Participation in and Quality of Vocational Education.
INSTITUTION	National Assessment of Vocational Education (ED), Washington, DC.; Office of Educational Research and Improvement (ED), Washington, DC. Office of Research.
REPORT NO	ISBN-0-16-045242-2; OR-94-3502-II
PUB DATE	Jul 94
NOTE	216p.; For the interim report, see ED 369 929; for other volumes in this series, see CE 066 675-679.
AVAILABLE FROM	U.S. Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328 (Stock No. 065-000-00692-8, 5 volume set, $41).
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	*Educational Assessment; Educational Change; Educational Development; Educational Legislation; *Educational Quality; Employer Attitudes; Employment Patterns; *Federal Legislation; *Outcomes of Education; Postsecondary Education; Program Effectiveness; Program Evaluation; Role of Education; School Business Relationship; Secondary Education; *Student Participation; Teacher Education; Teacher Qualifications; *Vocational Education; Vocational Education Teachers
IDENTIFIERS	*Carl D Perkins Voc and Appl Techn Educ Act 1990

ABSTRACT

This document, the second of five volumes that comprise the final report of the National Assessment of Vocational Education examines some major features of contemporary vocational education: students, teachers, classes, and educational and employment outcomes. The first two chapters address student participation and program quality, as measured by a number of indicators. Chapter 1 examines participation and access in public secondary vocational education; postsecondary participation and access are addressed in chapter 2. Chapter 3 discusses qualifications of teachers in secondary and postsecondary institutions, assesses teacher preparation, and considers shortages of secondary vocational teachers. Chapter 4 examines program requirements and courses in secondary vocational education to assess their consistency with Perkins goals, role in preparing students for work, and role in secondary education. Chapter 5 focuses on the relation between vocational education and academic coursetaking, student achievement, high school completion, and educational attainment. Chapter 6 investigates the connection between vocational training and employment outcomes for students who received vocational training in high school and in subbaccalaureate postsecondary institutions. Chapter 7 examines employers' opinions of vocational programs and some ways employers interact with them. Endnotes follow each chapter; data tables and a figure are appended. (YLB)

ED 371 192

FINAL REPORT TO CONGRESS

VOLUME II

PARTICIPATION IN AND QUALITY OF VOCATIONAL EDUCATION

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ISBN 0-16-045242-2

ISBN 0-16-045242-2

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NATIONAL ASSESSMENT
OF VOCATIONAL EDUCATION

FINAL REPORT TO CONGRESS

VOLUME II

PARTICIPATION IN AND QUALITY OF VOCATIONAL EDUCATION

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Lisa Hudson
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Office of Research

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U.S. Department of Education

July 1994

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PREFACE

This is the second of five volumes in the Final Report of the National Assessment of Vocational Education, mandated by Congress in the 1990 Perkins Act and prepared in the Office of Research, Office of Educational Research and Improvement (OERI). The Final Report substantially expands and updates the Assessment's Interim Report, presented to Congress in January, 1994.

This volume contains seven chapters. Each has a principal author (or authors), but may also incorporate the work and views of other researchers. The chapters and their principal authors are as follows:

Part I. Student Participation and Access

Chapter 1. Participation in Secondary Vocational Education — Lisa Hudson

Chapter 2. Participation in Postsecondary Vocational Education — Lisa Hudson

Part II. Quality of Vocational Education

Chapter 3. Teachers in Vocational Education — David Boesel

Chapter 4. Program Requirements and Courses in Secondary Vocational Education — David Boesel

Chapter 5. Educational Outcomes of Vocational Coursetaking — David Boesel

Chapter 6. Employment Outcomes — Sharon Deich (Pelavin Associates) and Charles Masten

Chapter 7. Employer Involvement and Satisfaction — Sharon Deich (Pelavin Associates) and Charles Masten

Chapters 5 and 7 are new. The other chapters, earlier versions of which were included in the Interim Report, also contain new material, including survey data collected in 1993.

While conducted within OERI, this assessment is an independent study and does not necessarily reflect the views of OERI or the U.S. Department of Education.

David Boesel
Director, National Assessment
of Vocational Education

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INTRODUCTION

This volume examines some of the major features of contemporary vocational education, including student participation and program quality, as measured by a number of indicators: the preparation and qualifications of teachers; characteristics of vocational programs and courses; and educational and employment outcomes.

In the final analysis, the quality and appeal of vocational education are determined by how well it provides students with the skills they need to enter and succeed in the workplace. Those skill requirements are changing as a result of economic changes over the last several decades. Before discussing vocational education, therefore, it will be useful to examine the context within which it now functions.

THE ECONOMIC CONTEXT

The skills required of workers have been affected by three major developments since the early 1970s — the emergence of a global economy; more recently, the growth of high-performance workplaces; and the continuing impact of new technology. This section of the introduction examines these topics.

A Global Economy

The emergence of the global economy brought with it a decline in America's competitive position and made improved competitiveness a major goal of federal policy. For more than 20 years after World War II, the United States faced only limited foreign competition, in part because the war had weakened many economically developed nations and in part because many other countries, or colonies, were underdeveloped. However, the recovery of industrialized European and Asian nations, together with the decolonization and economic development of others, greatly intensified global competition. By the 1970s America's share of the world market had begun to shrink, and its economic position continued to decline through the 1980s. Although there have been recent improvements in some sectors of the economy, the nation's competitiveness remains an issue of critical importance.

Our competitors include high-skill manufacturing economies with well-educated workforces, often employing new technology and new forms of work organization to produce high-quality products. Japan's export-oriented manufacturing sector is an example of this kind of economy. Our competitors also include nations with less well educated but disciplined workforces able to perform the sort of semi-skilled work that has been the backbone of American manufacturing, and willing to do so for lower wages. Thus, many American

manufacturing jobs have migrated to countries such as Taiwan, China, Korea, and Mexico.

In many areas of manufacturing, America's unskilled and semi-skilled workers cannot compete with workers in countries such as these, and could not do so without a dramatic reduction in wages. Therefore non-transportable sales and service jobs such as cashier, restaurant worker, janitor, and beautician are slowly becoming the mainstay of unskilled and semi-skilled labor in this country. They remain viable in part because they are not subject to foreign competition.

America has much greater actual and potential competitive strength in skilled labor and sophisticated capital equipment. To exploit this strength, a number of influential reports have recommended, and the federal government has adopted as a policy goal, substantially increasing the skills of the American workforce, especially of those who in the past would have been classified as unskilled or semi-skilled workers. The students most likely to leave American high schools with these relatively low skill levels are the non-college-bound students, who have been called "the forgotten half" and "the neglected majority."

Improving American competitiveness by increasing the skills of its workforce is the principal goal of the Perkins Act:

> It is the purpose of this Act to make the United States more competitive in the world economy by developing more fully the academic and occupational skills of all segments of the population. This purpose will principally be achieved through concentrating resources on improving educational programs leading to academic and occupational skill competencies needed to work in a technologically advanced society.

New Forms of Work Organization

Increased competition, both foreign and domestic, is leading American companies to adopt new forms of work organization, the second factor affecting the skills required of the workforce. Organizational principles that worked well for over a half century are being reexamined and, with increasing frequency, replaced.

In the early part of the century, Henry Ford pioneered, and Frederick Taylor rationalized, a system of industrial production based on extensive division of labor, specialization, routine repetition of tasks, and authoritative top-down management. This system casts the worker as a cog in a machine, and it requires reliable, responsible behavior more than thinking skills and flexibility from front-line workers. Management is primarily responsible for supervision, higher-order thinking, and leadership.

The Ford/Taylor model of industrial production served America well, at least into the 1960s. However, in the 1970s, third world countries were beginning to appropriate this form of production, drawing on vast reserves of semi-skilled and unskilled labor. Other countries, and especially Japan's export economy, began moving in the opposite direction, emphasizing high skills and sophisticated capital equipment, combined in new forms of work organization.

The reorganization of work pioneered in Japan by W. Edwards Deming was key to this transformation. The new system eliminates layers of management and assigns front-line workers more responsibility for supervisory functions such as improving operations, solving problems, and assuring quality control throughout the process. Teamwork and job rotation are often key elements in the new model. Customer needs and demands are integrated into the production process.

This system requires more complex thinking, communication, and collaboration among workers than the old one, and greater adaptability to a variety of tasks. Hence, it requires more highly skilled, socially adept, and flexible workers. Integrated academic/vocational education holds promise for providing such workers.

Adoption of high-performance workplace methods in the United States has been fairly recent, sometimes the result of traumatic change forced by international competition. In the late 1980s, the proportion of firms using high-performance work methods seems to have been very small — around 5 percent, by one estimate.[1] However, a 1992 survey by Osterman[2] found evidence of substantial use of high-performance work methods in 37 percent of firms with more than 50 employees.

Results from the 1993 Survey of Employers conducted for the National Assessment of Vocational Education are similar to Osterman's findings. The survey asked business establishments whether they were engaged in any of eight different activities that are often part of the high-performance model:

Total Quality Management (TQM)
Just-in-Time (JIT) or synchronous production
Self-managed teams
Quality control integrated into production (SPC)
Increased responsibility for all workers
Employee profit sharing
Reduction of middle management
Mentoring/apprenticeship

If a business reported being engaged in one of these activities, the respondent was asked how active the establishment's involvement was, on a scale from 1 (not very active) to 5 (very active). The percentage of establishments engaged in

these activities at any level (1-5), at a moderate level (3-5), and at a high level (4-5) is shown in Tables A.1 and A.2 in the Appendix for this introduction.

Thirty-eight percent of business establishments with 50 or more employees are engaged in at least four of these eight workplace transformation activities at some level; 31 percent are engaged at a moderate level; and 18 percent are engaged at a high level.

Large and mid-sized firms (those with 250 or more employees) are the most likely to report restructuring activities, as are manufacturing firms. Smaller, service-oriented firms are the least likely to be involved in this transformation.

Together, these data suggest that high-performance workplaces have become more prevalent since the late 1980s and that they now comprise a significant portion of American businesses. Still, a note of caution is in order. Surveys are a good way to generate national estimates, but they cannot capture the depth of detail and complexity that characterize specific organizations (or people, for that matter). To understand what the survey data represent, it is useful to complement them with case studies or other qualitative approaches. Until we have data from research that combines quantitative and qualitative methods, conclusions about the prevalence of the high-performance workplace must remain tentative.

Technological Change

The third, but by no means least important, factor affecting the skill requirements of the workplace is technological change. While the introduction of new technology is an old story, today's technology is becoming ever more pervasive and sophisticated. Especially dramatic has been the proliferation of computers and telecommunications equipment.

As McCormick and Holmes[3] observe, many industries have been transformed by the infusion of computer technology into their production and services. In some cases this has led to dramatic increases in productivity. For example, the use of computer-assisted design (CAD) technology is estimated to have increased productivity in drafting at least six-fold as compared to traditional methods. In one manufacturing firm, the combination of CAD, numerically controlled machine tools, robotics, and automated delivery and transport systems reduced the production cycle for locomotives from 16 days to 16 hours.

The insurance industry now routinely uses computerized underwriting software. Auto mechanics use computerized diagnostic equipment. In agriculture, computers assist with herd management, crop rotation, and pest control. In many businesses and offices, of course, computers are now essential for word processing, financial management, sales information, and a wide range of other applications.

Occupations requiring computer literacy have been among the fastest growing in the last several decades, though they still comprise a minority of all jobs. In 1989 the Current Population Survey (CPS) found that 36 percent of workers used computers on the job.[4] Women were more likely to use them than men (42%, 31%), and computer use increased with education level.

There is evidence that employees with computer skills receive higher wages than similar employees who lack such skills. In a recent analysis of CPS data, Krueger found that — controlling for background characteristics, education, training, and occupation — employees who use computers at work earn higher wages than other comparable workers.[5]

The Debate Over Skills

The extent to which economic changes such as these have affected and will affect skill requirements has been a subject of debate. Vergun and Klein have examined this issue in a review of the literature for the National Assessment.[6] Much of the information in this section is drawn from their review.

Some analysts have argued that the skills required of workers are growing rapidly, outstripping the ability of education and training systems to provide them. Noting the rapid growth of professional, technical, and managerial jobs, analysts such as Johnston and Packer[7] warn that the country should be prepared for an explosion in the demand for skills by the turn of the century. On the other hand, critics of this view, such as Mishel and Texeira,[8] observe that the fastest growing occupations comprise only a small part of the workforce, and that less skilled, less highly paid occupations, though decreasing slowly, will continue to be the norm.

Bureau of Labor Statistics (BLS) projections from 1990 to 2005 shed some light on the debate (Table A).

Combining occupations, we see that the highly skilled professional, technical, and managerial jobs are projected to increase from 26.5 to 28.9 percent of all jobs in this period. Less skilled sales and service jobs are also expected to grow, in this case from 27.2 to 28.8 percent of the workforce. Together, these highly skilled and less skilled jobs are projected to increase by 4 percentage points, from 53.7 to 57.7 percent of the workforce. Other occupations will make up a declining share of the workforce. These include clerical and other administrative support; crafts and precision production; operators, fabricators, and laborers; and agricultural workers. Jobs in these categories are projected to decrease by 4 percent, from 46.4 to 42.4 percent of the workforce.

These data show a modest increase in the demand for skills, much of it in professional and managerial jobs requiring at least four years of college. However, Bishop and Carter[9] argue that BLS projections have historically

Table A
Employment by Major Occupational Group, 1990 and Projected 2005

	1990		2005	
Occupation	Number	Percent	Number	Percent
Total, all occupations	122,573	100.00	147,191	100.00
Executive, administrative, and managerial	12,451	10.2	15,866	10.8
Professional specialty	15,800	26.5 / 12.9	20,907	28.9 / 14.2
Technicians and related support	4,204	3.4	5,754	3.9
Marketing and sales	14,088	11.5	17,489	11.9
Service occupations	19,024	27.2 / 15.7	24,806	28.8 / 16.9
Administrative support occupations, including clerical	21,951	17.9	24,835	16.9
Precision production, craft, and repair	14,124	11.5	15,909	10.8
Operators, fabricators, and laborers	17,245	14.1	17,961	12.2
Agricultural, forestry, fishing, and related occupations	3,506	2.9	3,665	2.5

Source: Silvestri & Lukasiewicz

underestimated growth in skill requirements, because of conservative biases in their methods. Bishop and Carter estimate that professional, technical, and managerial jobs will increase from 27 percent in 1990 not to 29 percent, as BLS estimates, but to 34 percent.

In addition to these changes across occupations, technology and new forms of work organization are changing skill requirements **within** occupations. As Vergun and Klein point out, though computers are deskilling many traditional occupations such as bookkeeping and precision machining, skill requirements in most occupations are likely to remain constant or increase slightly.

Moreover, regardless of skill level, technological changes such as the proliferation of computers require constantly learning **new** skills. In the opinion of Drake and Niewenhuysen, "adaption to technological change is aided by a better skilled and educated workforce."[10] Similarly, Vergun and Klein observe that "technological innovation typically requires a responsible, flexible work force with problem-solving and social skills."[11]

In view of the small but definite upskilling in the BLS projections, the Bishop and Carter argument that BLS projections consistently underestimate future skill requirements, the modest anticipated increase in skills within occupations, and the need for **new** technical skills, we can conclude that the next decade will see **at least** a modest growth in the demand for skilled workers.

Further, the demand for skills is already high. Over the last two decades, growth in this demand has been evident in the earnings of individuals with different levels of education. A number of studies have observed that the earnings of workers with 12 years of education or less are falling, while those with college degrees are increasing. For example, the report of the Commission on the Skills of the American Workforce[12] found that in the 1980s earnings of college-educated males age 24 to 34 increased by 10 percent, while those of high school graduates declined by 9 percent and those of high school dropouts, by 12 percent. The *Interim Report*[13] also found that those with some college were better off than those with high school diplomas only. In short, every additional year of education pays off, and the payoff is increasing.

ISSUES ADDRESSED IN THIS VOLUME

Who enrolls in vocational education, what is taught in vocational programs, and the occupational success of vocational students are all at least partly determined by this larger economic context. This economic context also provides a criterion by which to evaluate the current structure and condition of vocational education. This volume examines many salient features of current vocational programs, including vocational students, teachers, and classes, and the educational and employment outcomes of vocational education. These topics are organized in terms of participation and quality.

Part I. Student Participation and Access

Enrollments in vocational education programs are in part a measure of demand for the skills they provide, which depends on the labor market. The composition of vocational programs tells us about the characteristics of students who receive vocational education and who bring vocational skills into the labor force.

> What are the enrollment trends in vocational education at the secondary and postsecondary levels? What is the student

composition of vocational programs, and how has it changed in recent years?

Of particular concern in the Perkins Act is access for special population students[14] to vocational skill training. In earlier years, special populations were reported to be underrepresented in vocational education. To ensure equitable participation, the Perkins Act requires states to provide assurances that special population students have equal access to vocational education and that localities ensure their full participation in Perkins-funded programs:

What are the patterns of access and participation for special population students at the secondary and postsecondary levels?

Chapter 1 addresses these questions for secondary students; Chapter 2 does so for postsecondary students.

Part II. Quality of Vocational Education

A. Program Quality

Conceptually, program quality can be assessed by examining the inputs, processes, and outcomes of vocational education. Among the inputs, the Perkins Act calls for inquiry into the preparation and qualifications of vocational teachers and their academic counterparts. Today's vocational teachers must be able to prepare students for an economy in which the better jobs require cognitive ability, flexibility, and interpersonal skills. They must be able to teach the integrated academic/vocational curricula that Perkins requires of the institutions it funds.

How well qualified are vocational teachers to prepare students for high-skill jobs and to teach in integrated contexts?

Chapter 3, on the preparation and qualifications of vocational teachers, addresses these questions.

Quality can also be assessed by examining the processes of vocational programs — the programs, courses, and teaching procedures. Consistent with its emphasis on integrated curricula, the Perkins Act requires vocational programs to provide coherent sequences of academic and vocational courses. Also consistent with this emphasis is cross-curricular content — academic knowledge and skills reinforced in vocational courses and occupational applications taught in academic classes. More generally, the subject matter, teaching methods, and class requirements of vocational education all affect the way students are prepared for the workforce.

> How many vocational programs require coherent sequences of courses and provide cross-curricular content? How challenging are vocational classes? How well do vocational students think they are being prepared for work?

Chapter 4, on the program requirements and courses in secondary vocational education, examines these issues.

Although secondary vocational programs are designed to prepare students for work, they do not necessarily prepare them for jobs immediately after high school, or to the exclusion of postsecondary education. Given the substantial and growing income advantage derived from postsecondary education, many vocational students enroll in community colleges and proprietary schools, and a smaller number, in four-year colleges. The Perkins Act recognizes the relevance of academic achievement and postsecondary attainment in calling for an examination of academic outcomes of vocational education. The Assessment looks more broadly at several educational outcomes.

> What are the effects of secondary vocational coursetaking on student retention, academic achievement, and postsecondary attainment? Does taking vocational courses affect secondary students' dropout rate? What are the effects on students' performance on academic achievement tests? How does it affect their postsecondary chances?

These questions are addressed in Chapter 5, on the educational outcomes of vocational coursetaking.

The bottom line in assessing the quality of vocational programs is whether they help vocational students get better jobs than comparable students pursuing other courses of study. Hence, the Perkins Act calls for an assessment of the employment outcomes of vocational education. It also requires an examination of employer involvement in, and satisfaction with, vocational education programs.

> What effects do vocational coursetaking and program completion have on students' employment outcomes? How satisfied are employers with these programs?

Chapter 6 examines employment outcomes; Chapter 7 assesses employer involvement in, and satisfaction with, vocational education.

ENDNOTES

1 National Center on Education and the Economy (1990), *America's Choice: High Skills or Low Wages*, Commission on the Skills of the American Workforce.

2 Osterman, P. (1993), *How Common is Workplace Transformation and How Can We Explain Who Adopts It?* Massachusetts Institute of Technology, Sloan School.

3 McCormick, A., & Holmes, P. (1994), *Computers and Vocational/Technical Education*, draft report prepared for the National Assessment of Vocational Education, MPR Associates.

4 Ibid., p. 4.

5 Krueger, A.B. How computers have changed the wage structure: Evidence from Microdata, 1984-1989, *The Quarterly Journal of Economics*, 432, 33-59. Cited in McCormick & Holmes (1994).

6 Vergun, R., & Klein, S. (1994), *Workplace Skill Requirements: The Upskilling-Deskilling Debate*, draft report prepared for the National Assessment of Vocational Education, MPR Associates.

7 Johnston, W., & Packer, A. (1987). *Workforce 2000: Work and Workers for the 21st Century*, Hudson Institute.

8 Mishel, L., & Texeira, R.A. (1991), *The Myth of the Coming Labor Shortage: Jobs, Skills, and Incomes of America's Workforce 2000*, Economic Policy Institute.

9 Bishop, J., & Carter, S. (1990), *The Deskilling Versus Upskilling Debate: The Role of BLS Projections* (Working Paper 90-14), Center for Advanced Human Resource Studies.

10 Drake, P., & Niewenhuysen, J. (1988), *Economic Growth for Australia: Agenda for Action*, Committee for Economic Development in Australia Monograph M88, p. 2, Oxford University Press.

11 Vergun & Klein (1994), p. 33.

12 National Center on Education and the Economy (1990).

13 U.S. Department of Education (1994), *National Assessment of Vocational Education: Interim Report to Congress.*

14 Special populations include the economically and educationally disadvantaged, the disabled, the limited-English-proficient, single parents, and students in programs non-traditional for their sex, among others.

APPENDIX FOR INTRODUCTION

Table A.1
Prevalence and Intensity of High-Performance Workplace Firms With More Than 50 Employees, by Size of Firm

	Total Employees			
	50–249	250–999	1,000+	All
Counting steps done with any intensity (1–5)	%	%	%	%
No steps	17	5	3	15
1–3 steps	49	38	40	47
4+ steps	35	56	57	38
Counting only steps done with moderate or high intensity (3–5)				
No steps	21	8	13	19
1–3 steps	52	45	41	50
4+ steps	27	47	46	31
Counting only steps done with high intensity (4–5)				
No steps	33	19	25	31
1–3 steps	51	47	47	51
4+ steps	15	34	27	18
Number of firms				
Weighted	229,364	38,089	6,642	274,096
Unweighted	909	618	377	1,898

NOTE: Percentages may not add to 100 because of rounding.

Source: 1993 Employer Survey

Table A.2
Prevalence and Intensity of High-Performance Workplace Firms With More Than 50 Employees, by Type of Industry

	Type of Industry				
	Manu-facturing	Ware-house/ Retail Trade	Service	Other	All
Percent of firms, counting steps done with any intensity (1–5)	%	%	%	%	%
No steps	7	12	21	21	15
1–3 steps	36	53	55	46	47
4+ steps	57	35	24	33	38
Percent of firms, counting only steps done with moderate or high intensity (3–5)					
No steps	11	18	25	25	19
1–3 steps	46	51	57	48	50
4+ steps	44	31	18	28	31
Percent of firms, counting only steps done with high intensity (4–5)					
No steps	25	26	40	36	31
1–3 steps	53	52	51	46	51
4+ steps	23	22	9	19	18
Number of firms					
Weighted	73,631	65,940	70,109	58,416	274,096
Unweighted	694	303	637	264	1,898

NOTE: Percentages may not add to 100 because of rounding.

Source: 1993 Employer Survey

PART I

STUDENT PARTICIPATION AND ACCESS

CHAPTER 1

PARTICIPATION IN SECONDARY VOCATIONAL EDUCATION

INTRODUCTION

The Perkins Act mandate for the National Assessment includes an evaluation of "participation in vocational education programs, including in particular, access of individuals who are members of special populations to high-quality vocational education programs."[1] This chapter examines participation and access in public secondary vocational education. Postsecondary participation and access are addressed in the following chapter, and the availability of supplemental services, one requirement for equal access for special needs students, is discussed in Chapter 1 of Volume IV.

This chapter first reviews the participation of students in general and then examines the access and participation of those defined as special population students in the 1990 Perkins Act. We find that special population students, particularly the disabled, take more vocational education than other students. Vocational participation has declined for all student groups, but has declined less for educationally disadvantaged and disabled students, with a resulting concentration of these special populations in vocational programs. The chapter ends with an examination of student placement into vocational education, which suggests that secondary vocational education programs and students are becoming increasingly isolated and stigmatized.

Overview of Secondary Vocational Education[2]

Most secondary vocational education is provided in the nation's 15,200 comprehensive high schools. Vocational schools, which enroll about 10 percent of secondary students, are also important providers, accounting for roughly 12 percent of vocational coursetaking. These vocational schools are mainly of two types — vocational high schools and area (or regional) vocational schools (AVSs). Vocational high schools, of which there are approximately 250, focus on vocational instruction while also providing a full complement of academic instruction. AVSs, which number about 1,100, are usually located in vocational districts and provide exclusively vocational instruction; students typically attend part-time and return to their home high school for academic instruction. For occupational training, vocational schools are often considered superior to comprehensive high schools because of their specialized facilities, greater depth and breadth of training, and greater emphasis on vocational education reform.

In 1991–92, about 74 percent of comprehensive high schools offered vocational education programs, and almost all, about 93 percent, offered at least introductory vocational courses such as career exploration or technology

education. Virtually all comprehensive high schools (98%) either offered vocational education courses or provided access to area vocational schools. Among schools with access to an AVS, less than one-third of vocational coursetaking (29%) occurs at the AVS. This percentage is relatively low because some schools do not send any students to the AVS, often because distance is a problem. Among the 72 percent that do utilize AVSs, 40 percent of vocational credits are earned at these schools.

In spite of its widespread availability, vocational education makes up a relatively small part of the high school curriculum. On average, about 20 percent of grade 9–12 teachers are vocational education teachers, 16 percent of the credits high school students earn are in vocational education, and about 24 percent of high school students are vocational students (as defined in the following section).

CURRENT ENROLLMENTS

To assess participation in secondary vocational education, we use teacher and administrator reports on student enrollment patterns from the National Assessment's Omnibus Surveys, Follow-up Surveys, and Community Case Studies. We also use student high school transcript records, which provide more detailed and precise information on course enrollments. (All of these data collections are described in more detail in the Technical Appendix.)

The Transcript Data

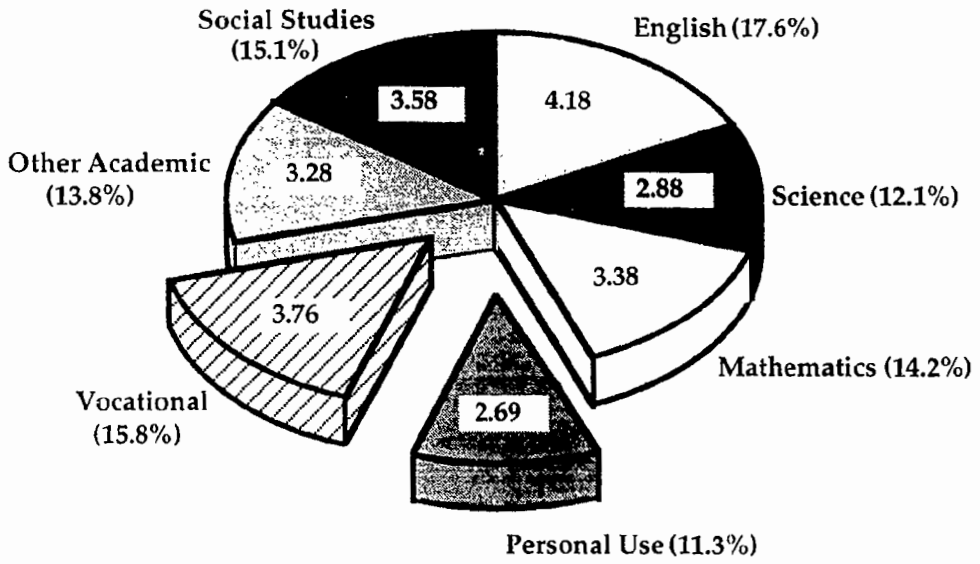
The transcript data are derived from a series of studies conducted by the U.S. Department of Education. As used here, the studies provide records of students' enrollments in grades 9–12 for the public high school graduating classes of 1982 (in the High School and Beyond survey, or HSB), 1987 and 1990 (the National Assessment of Educational Progress, or NAEP), and 1992 (the National Education Longitudinal Study, or NELS). Coursetaking in the transcript data is counted in Carnegie units, each of which is equivalent to a one-hour course that meets daily for a full school year. For the sake of simplicity, we will refer to a Carnegie unit as a course or credit.

We use the transcript data to define vocational students (or concentrators) and vocational specialists. Vocational students are those who earn at least three credits in a specific vocational program area, such as agriculture or business. Vocational specialists are those who earn at least four credits in a vocational program area, with at least two of those credits at an advanced or upper level. We use the terms vocational student and vocational concentrator interchangeably.

Overall Enrollments

Among high school graduates in 1992, the average student earned almost 25 credits, with 3.8 credits (16%) in vocational education. The distribution of student credits in different course areas is shown in Figure 1.1.

Figure 1.1
Average Number and Percent of Credits 1992 Graduates Earned in Different Course Areas



NOTE: "Other Academic" includes foreign languages, art, and music, among others. "Personal Use" includes physical education, driver's education, and community service, among others.

Source: 1992 NELS

While the vast majority of students (97%) earned at least some credits in vocational education, only one in four (24%) are vocational concentrators, and 8 percent are vocational specialists. One-third of the students (32%) appear to be college bound,[3] and almost one-half (46%) have an undefined or general education program. Only 4 percent of students, or 17 percent of vocational students, are both vocational and college prep. (The coursetaking patterns of these student groups are discussed in Chapter 5.)

Types of Vocational Enrollments

Vocational courses can be divided into three types, depending on the skills which they impart.

- General labor market preparation — courses related to preparation for a wide range of occupational areas, such as typing, technology education, career education, and academic courses designed for vocational students.

- Specific labor market preparation — courses related to preparation for occupations in specific program areas: agriculture, business, marketing, health, occupational home economics, trade and industrial (T&I or "the trades"), and technical education (including communications).

- Consumer and homemaking — Nonoccupational courses in consumer and home economics.

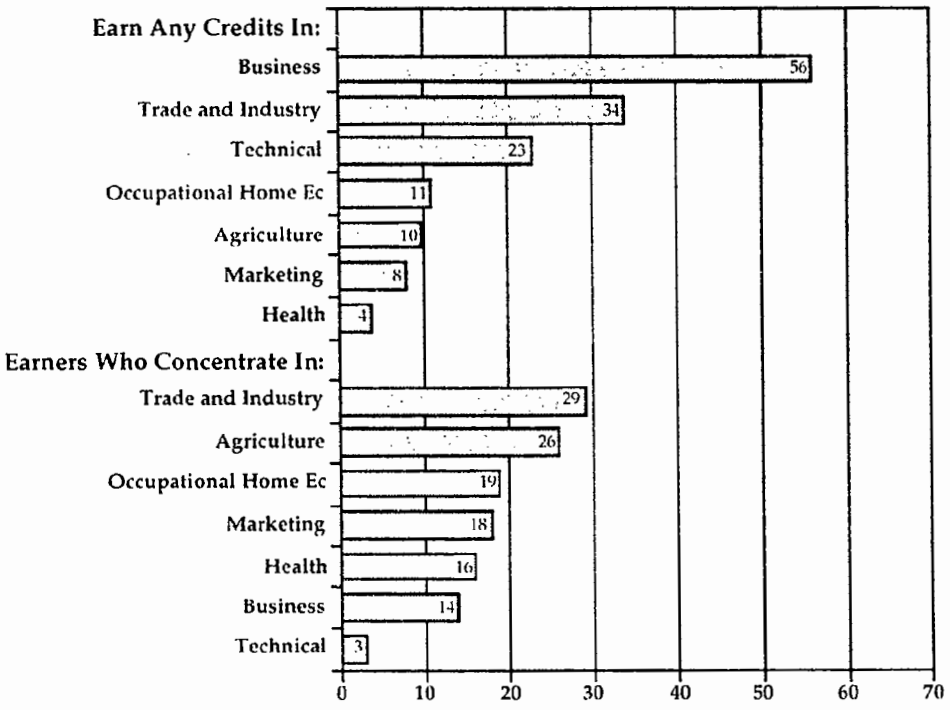
Not surprisingly, most vocational credits (67%) are earned in specific labor market courses. Another 18 percent are earned in general labor market courses and 14 percent in consumer and homemaking courses. Within the specific labor preparation area, business and trades courses are the most popular by far, with each accounting for one-third of the credits earned. Agriculture, marketing, health, occupational home economics, and technical education each account for less than 10 percent of specific labor market credits (see Table 1.2 in the following section).

Obviously, not every student who earns credits in a vocational program area is preparing for a career in that area. In fact, two of the most popular areas — business and technical education — also have the fewest vocational concentrators (see Figure 1.2). Evidence from the Community Case Studies suggests that these program areas attract many non-vocational students who are interested in learning about computer programming and computer applications. (Chapter 4 shows that computer use is most prevalent in these courses.)

Vocational Enrollments in Urban, Suburban, and Rural Areas

Vocational education appears to be somewhat more popular in rural areas than in suburban or urban areas. Rural students earn more vocational education credits than those in other areas, and are more likely to meet our definition of a vocational concentrator. As Table 1.1 shows, 21 percent of urban and suburban students are vocational concentrators, compared to 30 percent of rural students. This difference in coursetaking probably reflects differences in labor markets, and in the college expectations of high school graduates.

Figure 1.2
Percent of 1992 Graduates Earning Credits in Each Vocational Program Area, and Percent of Earners Who Concentrate in That Program Area



Source: 1992 NELS

Table 1.1
Vocational Coursetaking of 1992 Graduates in Urban, Suburban, and Rural Areas

Measures of Vocational Coursetaking	School Locale		
	Urban	Suburban	Rural
Number of vocational credits earned	3.47	3.34	4.43
Percent of credits earned in vocational education	15	14	19
Percent of students who are vocational concentrators	21	21	30
Percent of concentrators who are vocational specialists	35	31	31

Source: 1992 NELS

Local labor market effects also seem to be reflected in students' choices of vocational programs. Rural students are the most likely to earn credits in agriculture, business, and the trades, while urban students are the most likely to earn credits in technical fields. (See Figure A-1.1 in the Appendix.)

ENROLLMENT TRENDS

The current distribution of course credits represents a continuation of enrollment trends throughout the 1980s (see Figure 1.3). As we saw in the *Interim Report*, students' overall coursetaking and academic coursetaking has increased, while their vocational coursetaking decreased during the 1980s.[4] As this trend continued with the class of 1992, vocational enrollments became a smaller proportion of the total credits earned (16%) than they have been for any year for which data are available.

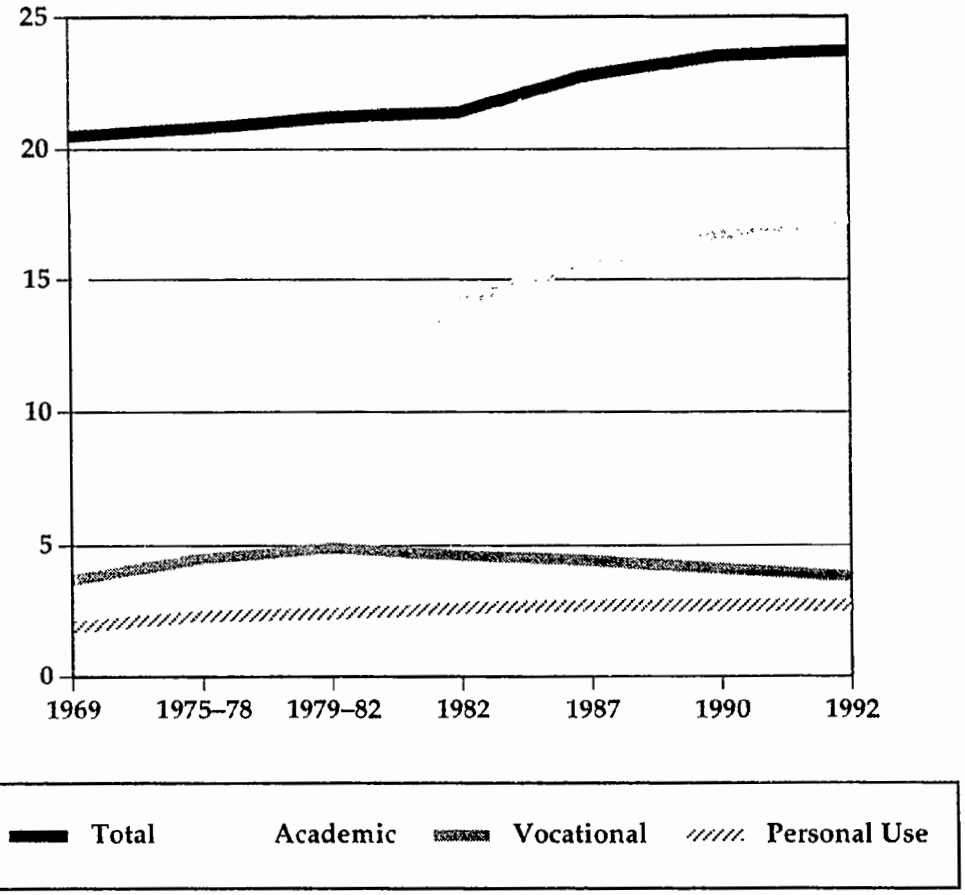
This change in coursetaking reflects a decline in interest in pursuing vocational programs as well as a decline in casual vocational coursetaking. For example, while there was a 19 percent decline in the percentage of vocational credits earned from 1982 to 1992, there was a 28 percent decline in the percentage of students who concentrated in a vocational program area, and a 39 percent decline in the percentage who specialized.

Combined with a declining cohort of high school aged students, these enrollment patterns have had marked effects on the demand for vocational teachers and courses. If coursetaking had not changed from 1982 to 1992, the demand for all teachers and courses would have dropped 17 percent, since there were 17 percent fewer students in 1992. However, since the average student's credit load increased, the overall demand for secondary school courses declined only 8 percent from 1982 to 1992. There was no decline in the demand for academic courses, as the increase in academic coursetaking was large enough to counteract the cohort decline.

But reduced vocational coursetaking combined with the cohort decline led to a 33 percent decline in the demand for vocational courses. This large drop in vocational course demand helps explain the shrinkage seen in other areas of the vocational education enterprise, such as in vocational teacher education programs (see Chapter 3). We can anticipate that as the cohort size increases in the late 1990s, the rate of decline in vocational demand will attenuate somewhat.

The increase in academic coursetaking is clearly related to high school graduation requirements, which increased through the 1980s and into the 1990s. Many vocational educators also feel that graduation requirement increases have led directly to the decline in vocational enrollments, by making it more difficult for students to fit vocational courses into their schedules. However, the decline in vocational coursetaking began before the education reform movement prompted

Figure 1.3
Average Number of Credits Earned by High School Graduates, Overall and in Academic, Vocational, and Personal Use Courses, 1969 to 1992



Sources: Muraskin (1993), 1990 NAEP, and 1992 NELS

large-scale changes in graduation requirements in the mid-1980s, so factors other than academic reform seem to be involved (see Chapter 1 in Volume III for further discussion of this issue).

Enrollment Trends Within Vocational Education

Vocational enrollments have declined in all three types of vocational courses — general and specific labor market and consumer and homemaking courses (see Appendix Figure A-1.2). In the early 1980s, the decline was largest for general labor market courses, but recent declines have been larger among specific labor market courses.

Within the specific labor market curriculum, enrollment declines seem to follow labor market trends. Business and trades programs, while still the most popular, have had the largest enrollment declines (see Table 1.2). In fact, 90 percent of the decline in specific labor market credits has occurred in these two program areas. Other programs have had relatively steady enrollments, with one exception: Enrollments in technical programs increased sharply from the early to mid-1980s, but have leveled off since then.

The nature of these program enrollment trends is revealing. Although more students are earning business credits, fewer students are concentrating in business. Similarly, more students are earning technical education credits, but the number concentrating in this area is not increasing. These coursetaking patterns seem to reflect the growth of computer-related courses, which (as mentioned above) appeal to many non-vocational students as well as vocational students.

Changes in Coherence of Coursetaking

The Perkins Act requires grant recipients to provide coherent sequences of vocational and academic courses. A coherent sequence of vocational courses includes a concentration of courses within a program area and the presence of upper level as well as lower level courses. Table 1.3 shows what has happened to coherent vocational coursetaking between 1982 and 1992.

Students who take vocational courses are now less likely to concentrate their courses within a given program area, or to take advanced courses **within** their area of concentration. For example, in 1982, 76 percent of those earning at least three credits in the specific labor market curriculum met our definition of a vocational concentrator, but by 1992 only 65 percent met this definition. Likewise, the percentage of vocational students who earned at least one upper-level credit in their area of concentration dropped from 72 percent to 66 percent. In short, not only were there fewer vocational students in 1992 than there were in 1982, but among those who remained, fewer were taking coherent sequences of vocational courses.

This decline in "coherent coursetaking" could partially reflect the effects of more students taking vocational courses for avocational reasons (such as college-bound students taking courses in computer applications). This type of change does not present a problem. However, vocational coursetaking for avocational purposes does not explain the decline in advanced coursetaking among vocational concentrators.

It is also possible that vocational students are anticipating more complex job demands; vocational students may be moving toward an interdisciplinary type of "all aspects of the industry" training. For example, automotive students may be taking computer programming courses in order to better understand computer diagnostic systems, and occupational home economics students may

Table 1.2
Percent of Graduates Earning Vocational Credits, and Average Number of Credits Earned, by Vocational Program Areas, 1982 to 1992

	Agriculture	Business	Marketing	Health	Occup. Home Ec.	Trade and Industry	Technical
Percent of students earning any credits							
1982	10	53	9	5	11	40	13
1987	8	54	9	5	11	38	25
1990	9	55	9	3	10	36	26
1992	10	56	8	4	11	35	23
Percent of students earning at least 3 credits							
1982	3	12	1	2	2	15	<1
1987	3	11	1	2	2	13	1
1990	3	9	1	2	2	12	<1
1992	3	8	2	1	2	10	1
Average number of credits earned							
1982	.21	1.03	.16	.05	.17	1.06	.11
1987	.19	.97	.16	.07	.19	.96	.24
1990	.20	.90	.16	.04	.17	.87	.22
1992	.19	.85	.13	.06	.18	.79	.22

Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

Table 1.3
Percent of Graduates Meeting Different Definitions of "A Coherent Sequence of Courses," 1982 to 1992

	1982	1987	1990	1992
Percent of graduates earning at least 3 credits in specific labor market courses who earned at least 3 of those credits in **one** labor market area (concentrators)	76	72	70	65
Percent of concentrators earning at least one upper-level credit in their area of concentration	72	75	60	66
Percent of graduates earning at least 4 credits in specific labor market courses who earned at least 4 of those credits in **one** labor market area (advanced concentrators)	70	63	60	58
Percent of advanced concentrators earning at least two upper-level credits in their area of concentration (specialists)	41	42	29	13

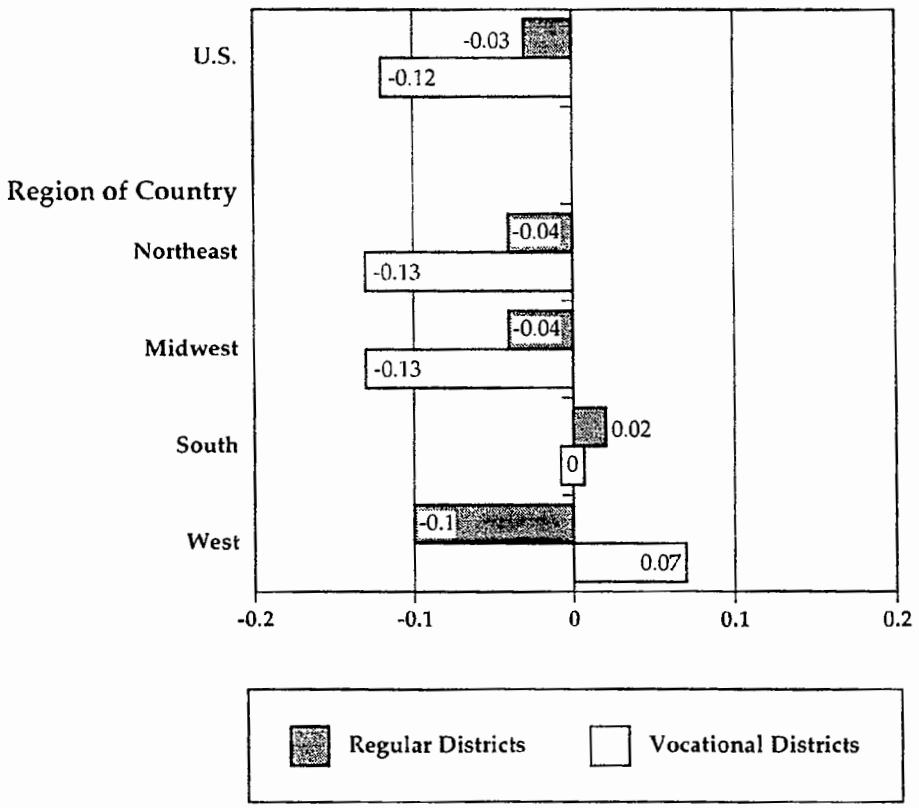
Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

be taking business courses to better prepare for working in industry. Assuming some of these are upper-level courses, this coursetaking pattern could account for the fact that vocational students are still taking the same relative proportion of upper-level courses, while fewer students take upper-level courses within their program area. This interpretation is speculative; school staff did not note such trends in the case studies, but they were not explicitly asked about this issue. It is also possible that vocational students are simply less focused than they were a decade ago, that fewer courses are available, or that completion requirements for vocational programs have changed.

Enrollment Trends by Institution Type and Location

According to district administrators, vocational enrollments have declined more in vocational districts than in regular districts (see Figure 1.4).[5] However, this pattern varies by region of the country. The national pattern characterizes enrollment trends in the Northeast and Midwest, but in the South, vocational enrollments have held their own in both types of districts, while in the West, vocational enrollments have declined in regular districts and increased in

Figure 1.4
Change in Vocational Enrollments Relative to Total Enrollments, by District Type and Region of the Country, 1987 to 1991



NOTE: See endnote 5 for details of change calculations.

Source: Omnibus District Surveys

vocational districts. Most of these western vocational districts are in California, so these data largely reflect enrollment growth in vocational districts in that state.

Small schools and districts — which are mainly in rural areas — have experienced smaller vocational enrollment declines than larger schools and districts. Likewise, rural areas have experienced smaller declines than suburban areas, and possibly smaller declines than urban areas (see Appendix Figures A-1.3 and A-1.4). The enrollment declines in small, rural schools may have been less severe because the labor market in rural areas continues to rely more on the jobs for which secondary vocational education prepares students (such as those

in the traditional trades, agriculture, and small businesses); the same may also be true in the South.

The Effects of Local Economies

The Community Case Studies provide further evidence of how local labor markets affect the success of vocational programs. In sites where well-paying technical jobs are available, vocational programs were typically seen as the path to those jobs and were doing well. In sites where the labor market did not provide jobs, or provided only low-paying, lower skill service jobs, vocational programs appeared to be in trouble. Some examples follow.

In an eastern state that has lost its manufacturing base:

> Vocational education in this community seemed to be characterized by a check-and-balance system, related to program demand and employer input . . . . Students in this community had seen their fathers' jobs swept out from under their feet, so they and their parents tended to take their vocational education very seriously. Programs that didn't have positive effects for students in the job market were not in great demand.

In one northeastern city with a troubled economy it was reported that

> the school used to have a job fair each year, but last year they changed the name of the activity because there were no jobs available. As placement officials retired, they were not replaced. Sometimes teachers are able to place a few students in jobs . . . but it is the exception rather the rule.

In a midwestern state:

> A depressed economy and lower enrollments in the area vocational schools . . . have prompted the once-selective school to recruit heavily for almost "any and all" students.

The health of state and local economies also affects education budgets, which in turn affect educational offerings. Vocational programs seem to be especially vulnerable to budget cutbacks. In districts where funds follow the students, comprehensive high schools become less willing to send students to area vocational schools because doing so involves a loss of funds — although they may still be willing to send high-cost students with special needs to the AVS. Further, because vocational courses tend to be expensive and often have small class sizes, it is tempting for schools to cancel them first. Or courses will remain, but equipment will not be modernized, which makes vocational courses less appealing and less practical. Finally, community support tends to fall on the side

of academic rather than vocational education, as the most active and vocal parents are usually concerned with preparing their children for college. These situations were evident in Community Case Study sites.

In a small city and county district in an eastern state:

> The relationship between the local comprehensive high school and the [area vocational school] is strained, at best . . . . When a student decides to enroll in the half-day program at the [AVS], the home district loses half of its state aid money for that student. For a district as poor as this one, any loss in funds is something to be avoided.

In an eastern state:

> The two primary reasons given for the decrease in vocational enrollments were: (a) no student interest, and (b) the equipment needed to modernize some programs is far too expensive.

In an upper-middle class district in a western state:

> The high school had offered such vocational courses as electronics and auto body in the past, but in response to a strong feeling among parents . . . that their children will attend college, accompanied by a general budget crunch, the vocational courses and program offerings at the high school (with the exception of keyboarding, marketing, and drafting) have been virtually eliminated.

In a western city:

> In combination with downsizing and budget cuts, [increased university entrance requirements and the districts' corresponding increase in graduation requirements] have left vocational programs and career exploration vulnerable. Indeed, many vocational and career exploration programs, such as work-study credits, have been eliminated.

In short, vocational programs appear to be more vulnerable than other secondary education programs to local economic conditions, including both the loss of jobs for which programs train students and the loss of educational funding that often results from a faltering economy. The recession of the early 1990s thus probably has contributed to recent vocational enrollment declines. If so, the end of the recession, combined with educational restructuring reforms, may have positive effects on vocational enrollments (see Chapter 1 in Volume III for a discussion of education reforms).

ACCESS AND PARTICIPATION OF SPECIAL POPULATION STUDENTS

In this section we examine the access and participation of special population students in secondary vocational education. As defined in the Perkins Act, these students include disabled students (special education students on the NELS, students with Individualized Education Plans (IEPs) on the NAEP); educationally disadvantaged students (defined variously as those with low GPAs or low test scores, or those who have taken remedial courses); economically disadvantaged students (based on a composite measure of parents' income, education, and occupation or on eligibility for federal lunch program); and limited English proficient (LEP) students (as identified by eighth grade teachers). We also include single parents (including pregnant teens) in some analyses.

We first analyze data from the Omnibus Survey and 1993 Follow-up Survey to assess access; then we examine transcript and other data to describe participation in vocational education. The transcript studies differ in the categories of special needs students they permit us to identify; disabled students were defined in a consistent manner (based on IEPs) only in the 1987 and 1990 NAEP studies, and LEP students are appropriately defined only in the 1992 NELS. These special population student categories are discussed in more detail in the Technical Appendix.

Access to Vocational Schools

Although vocational education is widely available, vocational schools are not. The *Interim Report* noted that only 64 percent of public school districts offer access to vocational schools, with suburban schools having slightly more access overall (65% versus 50% for rural and urban schools).[6] Because suburban schools enroll smaller proportions of special population students than do rural and urban schools, specialized vocational schools tend to be less accessible to special needs students. However, these students tend to take more vocational coursework and to enroll in vocational schools at higher rates than other students, so that most special population groups are overrepresented in vocational schools in spite of their lower levels of access (see Figure 1.7 in the section on "Dumping").

Special Schools

In Chapter 1 of Volume V, we note that under the new Act, Perkins funds have become more concentrated in districts with large numbers of special population students. This concentration of funds reflects Congressional interest in serving the most needy students. However, as the new Perkins Act was being implemented, we heard from a number of schools that serve special needs students exclusively — such as schools for the disabled, alternative schools for dropouts or potential dropouts — that they were excluded from receiving Perkins funds.

This exclusion appears to be a long-standing characteristic of Perkins funding. According to state administrators, in 1990–91 special schools (or special districts) were ineligible for Perkins funds in 19 states. Since the implementation of the 1990 Perkins Act, slightly more states have considered these schools ineligible for funds (23 in 1991–92, 21 in 1992–93). This relatively widespread ineligibility for schools that serve special population students exclusively seems inconsistent with the Perkins Act's emphasis on improving access to vocational education and serving those with special needs.

Participation in Secondary Vocational Education

Vocational education participation for different types of students, including special population students, is summarized in Table 1.4. As discussed below, these data show that special population students take more vocational education than other students. As a result, while 34 percent of the graduating class of 1992 were special population students (disabled, disadvantaged, or LEP), 43 percent of the vocational credits earned by this class were earned by special population students.

Enrollments by Sex and Race. Boys earn slightly more vocational credits than girls do, but because girls earn more of their vocational credits in consumer and homemaking education, boys earn notably more occupational credits. This difference is only partially explained by girls' slightly greater enrollment in the college-prep track. Evidently girls do not prepare for labor market work to the same extent as boys do.

The pattern of vocational coursetaking also varies among racial/ethnic groups. Black and Native American students earn more vocational credits than other student groups; whites and Hispanics earn average amounts of vocational credits; and Asian students earn fewer vocational credits than other students. (Black students' higher level of coursetaking is confined mainly to the non-occupational consumer and homemaking courses.) Again, the college orientation of each of these groups explains some, but not all, of these differences.

Enrollments by Special Population Status. In general, special population students earn more vocational credits than their "non-special" peers. LEP students' greater vocational coursetaking is mainly confined to occupational courses, and reflects to some extent the provision of work preparation courses specifically designed for these students. In contrast, disabled and disadvantaged students, while earning more occupational credits than non-disabled and non-disadvantaged students, also earn more credits in consumer and homemaking courses. Disabled and disadvantaged students may be referred to these courses in an effort to improve their general life skills, but this emphasis may come at the expense of academic or advanced occupational coursetaking.

Table 1.4
Average Number of Credits Earned in Different Areas of Vocational Education, and Percent of Credits Earned in Vocational Education, by Student Type, 1992

Student Type	Average Number of Credits Earned in:			Vocational Credits as a Percent of Total
	Consumer and Home-making	General and Specific Labor Market	All Vocational Education	
All students	.54	3.22	3.76	16
Sex and single parent status				
Males	.36	3.55	3.91	17
Females	.70	2.87	3.57	15
Single parents	1.01	3.82	4.83	21
Race				
White	.53	3.19	3.73	16
Hispanic	.46	3.32	3.79	16
Black	.68	3.24	3.92	17
Asian	.36	2.82	3.18	13
Native American	.50	4.02	4.53	19
Disability status				
Not disabled	.53	3.17	3.70	16
Disabled	.82	4.76	5.58	24
LEP status				
Not LEP	.54	3.14	3.69	16
LEP	.55	3.67	4.22	18
SES status				
Highest 25%	.36	2.06	2.41	10
50–75%	.47	3.07	3.54	15
25–50%	.65	3.74	4.39	19
Lowest 25%	.72	4.03	4.74	20
Grade point average (GPA)				
Mostly As	.32	2.12	2.44	10
Mostly Bs	.51	2.99	3.49	14
Mostly Cs	.62	3.70	4.32	19
Mostly below C	.69	4.05	4.74	22
Remedial credits				
0	.50	3.03	3.54	15
.01–1.99	.65	3.74	4.39	19
2 or more	.78	4.58	5.36	23
Test quartile				
Top 25%	.26	2.05	2.30	9
50–75%	.46	2.95	3.42	14
25–50%	.66	3.70	4.37	19
Bottom 25%	.82	4.23	5.06	22

Source: 1992 NELS

Single parents (and pregnant teens) also take relatively many vocational courses, including both occupational courses and consumer/homemaking courses. In this case, the greater emphasis on consumer and homemaking courses most likely results from enrollments in parenting and child development courses, which are of obvious relevance to these students. These courses are often designed not only to improve single parents' child-raising skills, but also to help keep young mothers in school.

The overrepresentation of special population students in vocational education is also evident in data from other sources. In its Perkins-mandated study of special population students, the General Accounting Office (GAO) found higher vocational participation rates for disadvantaged and disabled students (but not LEP students) than for non-special-population students.[7] Vocational programs in the Community Case Studies were also often characterized by higher enrollments of lower ability and disabled students.[8]

Course Concentration. Data on the average number of credits does not tell us to what extent special population students qualify as "vocational" students. Are special population students also more likely to take concentrated vocational courses? In most cases, the answer is yes (see Table 1.5).

Given the value of concentrated vocational coursetaking for students' employment outcomes (as discussed in Chapter 6), it is encouraging to see that special needs students take concentrated courses at relatively high rates. Compared to students in general, equal or greater proportions of special population students are vocational concentrators, even when their higher levels of vocational coursework are taken into account. Further, among those who concentrate in vocational education, special population students are also as likely or more likely than students in general to be vocational specialists (earn at least four specific labor market credits, with at least two at an advanced level). This is also encouraging, as it suggests that special population students are not being unduly relegated to lower-level vocational courses.

Special Population Enrollments by Program Area

Anecdotal evidence, as well as findings from the previous National Assessment, suggests that special population students, particularly disabled and educationally disadvantaged students, may be overly represented in low-skill, lower paying areas within occupational home economics and trade and industrial education.[9] In this subsection, we examine the extent to which special population students are concentrated in particular vocational program areas.

For these comparisons, we calculated the following ratio: the percentage of all vocational education credits that are earned in a program area by each special population group to the percentage earned by that group's non-special-population peers. To illustrate, the ratio for disabled students in agriculture is

Table 1.5
Percent of 1992 High School Graduates Who Are Vocational Concentrators, and Percent of Those Who Are Vocational Specialists, by Student Type

Student Type	Vocational Concentrators, of: All Students in Group	Those Earning at Least 3 Vocational Credits	Concentrators Who Are Specialists
All students	24.4	42.0	32.0
Disabled	45.1	56.6	34.5
Educationally disadvantaged			
Lowest test quartile	35.5	45.6	36.6
GPA less than C	34.8	45.0	32.5
Earned remedial credits	52.8	46.0	35.4
Economically disadvantaged (lowest SES quartile)	33.6	45.2	31.5
LEP	33.7	49.8	37.4
Single parent	30.7	42.5	29.6

Source: 1992 NELS

2.10, indicating that disabled students earn 2.10 times as many of their vocational credits in agriculture as do non-disabled students. These ratios (listed in Table 1.6) show the extent to which each special population group is more or less likely than other students to earn credits in each program area, irrespective of the total vocational credits earned by each group.

In general, special population students appear to concentrate their vocational coursework in agriculture, occupational home economics, and the trades, and to take relatively few courses in business, marketing, health, and, most notably, technical education. These patterns are clearest for disabled students, educationally disadvantaged students, and single parents. The patterns are less clear for economically disadvantaged students, who are well-represented in business, marketing and health, and not overrepresented in the trades. LEP students take a disproportionate share of technical courses; we hypothesize that this occurs because of the high proportion of LEP students who are Asian, a group that tends to be strongly represented in technical fields at all levels.

Table 1.6
Ratio of Share of Vocational Credits Earned in Each Vocational Program Area by Special Population Students to That Earned by Non-Special Population Students

Student Type	Agriculture	Business	Marketing	Health	Occup Home Ec	Trade and Industry	Technical
Disabled	2.10	.48	.31	.66	1.87	1.40	.36
Educationally Disadvantaged							
Lowest test quartile	1.46	.60	.94	.93	1.74	1.25	.52
GPA less than C	.98	.74	1.25	.64	1.08	1.31	.42
Earned remedial credits	1.26	.66	.82	.89	1.86	1.34	.48
Economically Disadvantaged							
Lowest SES quartile	1.32	.94	1.03	1.46	1.36	.95	.63
LEP	1.33	.83	.47	.44	1.15	1.06	1.67
Single parent[a]	1.20	.70	.68	.59	1.82	1.93	.47

[a] The ratios for single parents compare the credits earned by these students to those earned by all female students.

Source: 1992 NELS

Based on these data, we cannot tell to what extent special population students are being inappropriately channeled into the "low-tech" programs typical of occupational home economics and the trades — or to what extent their overrepresentation in these areas represents realistic matches between student abilities and vocational programs. However, we believe that the underenrollment of special population students in business and technical courses poses a problem, as these courses provide much of the computer training that is of growing importance in the workplace.[10]

Nontraditional Enrollments

To improve the vocational education opportunities of all students and to maximize workforce competitiveness, the Perkins Act fosters the enrollment of students in vocational programs that are nontraditional for their gender (e.g., auto mechanics for girls, secretarial for boys). Monitoring nontraditional enrollments allows us to determine the extent to which progress is being made in this area. These data do not, however, indicate the effectiveness of schools' Perkins (or other) sex equity efforts, as we do not specifically examine these schools or their programs. (Perkins sex equity and single parent programs are examined in Chapter 2 of Volume IV of this report.)

Three interesting features of vocational enrollments are revealed in Table 1.7, which lists vocational program areas in order from those with the heaviest concentration of male students to those with the heaviest concentration of female students. First, most vocational program areas have sex-stereotyped enrollments. Agriculture and the trades have predominantly male enrollments, while health and occupational home economics have predominantly female enrollments. Business, marketing, and technical programs have relatively balanced enrollments.

Table 1.7
Percent of Graduates Who Are Male, and Percent of Those Earning at Least Three Credits Who Are Male, by Program Area, 1982 to 1992

	All Graduates in Area				Those Earning at Least 3 Credits			
Program Area	1982	1987	1990	1992	1982	1987	1990	1992
Trade and Industry	79	79	78	77	94	91	91	91
Agriculture	71	76	72	72	88	83	77	82
Technical	57	55	53	54	72	76	66	72
Marketing	45	41	40	49	42	38	40	44
Business	35	38	41	42	9	16	18	22
Health	34	27	34	30	13	7	13	7
Occupational home ec.	19	24	21	24	15	20	18	20

Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

Second, sex stereotyping is greater among students who concentrate in an area (and are thus more likely to be preparing for jobs in that area) than it is among all

students taking courses in an area. For example, while technical education enrollments in general are relatively balanced, with 54 percent of enrollees being male, technical concentrators are 72 percent male.

Third, from 1982 to 1992, there was little consistent change in nontraditional enrollments, measured both by general enrollments and by those who concentrate in an area. Business programs show the largest and most consistent shift, with enrollments increasing from 35 to 42 percent male and concentrators increasing from 9 to 22 percent male. Concentrators in occupational home economics have also shifted to become more male and those in agriculture are more female, but these changes are smaller and less consistent over time.[11]

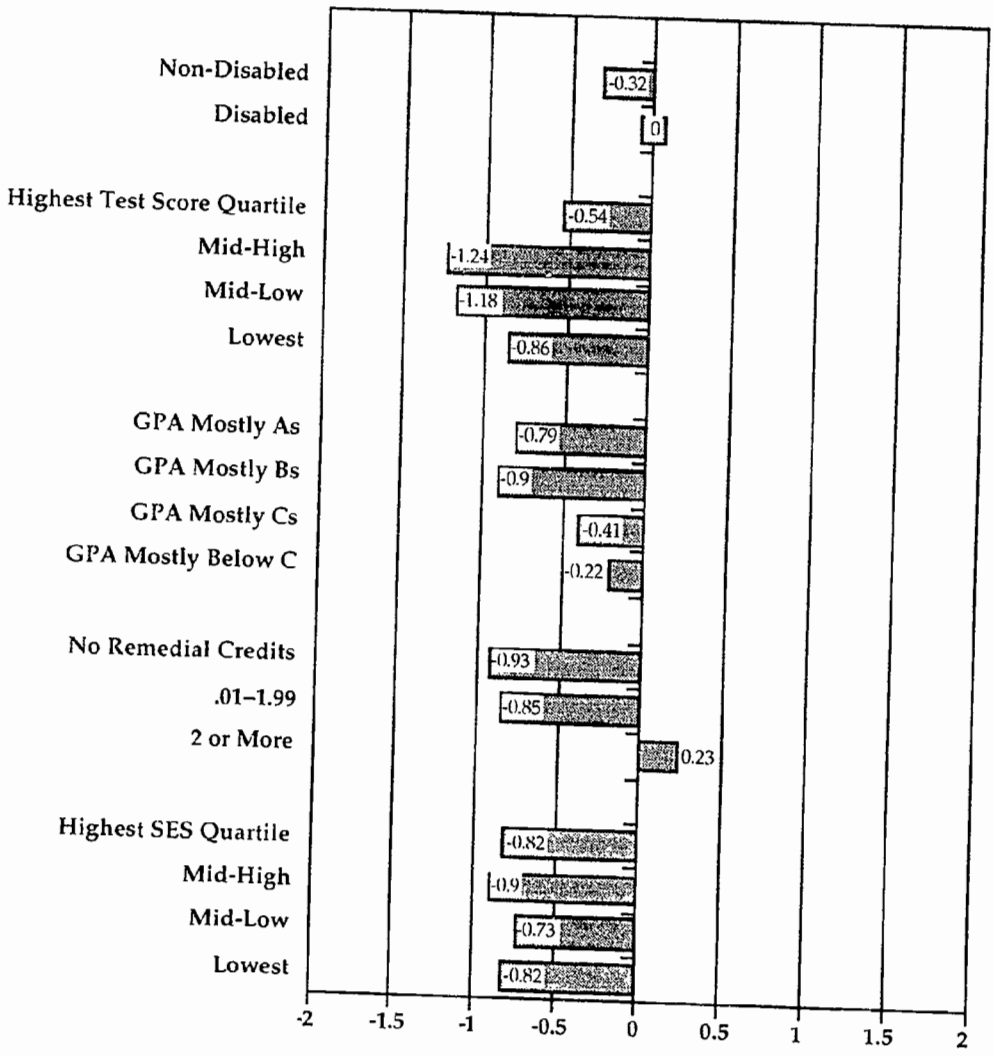
This limited change in nontraditional enrollments is somewhat discouraging, although perhaps not surprising, given the traditionally sex-typed nature of the jobs for which vocational programs train students, and the strong effects of peer pressure among secondary school students. Also, as noted in Chapter 2, nontraditional enrollment trends may be tempered by changes in the labor market which make many traditionally female jobs (health care, service jobs) more sought after than many traditionally male jobs (some trades jobs). This does not explain, however, the shift of male students into business, an area of declining job demand. The reason for this shift is unclear, but we surmise that it has something to do with the value of the computer experience gained in many business courses.

CHANGES IN WHO PARTICIPATES IN VOCATIONAL EDUCATION

We know that students in general are taking fewer vocational courses. But are all students "leaving" vocational education at the same rate, or are some types of students leaving at a greater rate than others? For which students has vocational education most lost its appeal? In this section, we answer these questions by examining the coursetaking trends of different groups of students. Data are available to examine these trends for students with educational and economic disadvantages from 1982 to 1992, and for disabled students from 1987 to 1990. (Trend data are not available for LEP students or single parents.)

As Figure 1.5 shows, disabled and educationally disadvantaged students have decreased their vocational coursetaking less — or not at all — while their "non-special" peers have had larger decreases. For example, disabled students did not reduce their vocational coursetaking from 1987 to 1990, while non-disabled students reduced their coursetaking by .32 credit.[12] From 1982 to 1992, students earning relatively large numbers of remedial credits increased their vocational coursetaking, while other students decreased their coursetaking, and those with lower grades and lower test scores had smaller declines in coursetaking than those with higher grades and test scores. (The small decline for students in the highest test quartile probably reflects the fact that in 1982 these

Figure 1.5
Change in Average Number of Credits Earned in Vocational Education, by Student Type, 1982 to 1992
(Disability Data for 1987 to 1990)



Sources: 1982 NELS, 1987 and 1990 NAEP, 1992 NELS

students earned very few vocational credits, so there was little room for decline; see Appendix Table A-1.1.)

On the other hand, economically disadvantaged students do not show smaller vocational course reductions than other students. Instead, students at all levels of economic status reduced their vocational coursetaking about the same amount.

As a result of the differential decline in vocational coursetaking, the overrepresentation of special population students in vocational education has increased. For example, in 1982, 26 percent of vocational students were educationally disadvantaged (based on test scores), but in 1992, 30 percent were. Other measures of educational disadvantage show the same trend: The percentage of vocational students who had a GPA below C increased from 6 to 9 percent, and the percentage who were remedial education students increased from 23 to 27 percent. Economically disadvantaged (low SES) students also increased from 25 to 28 percent of all vocational education students.[13]

Omnibus Survey data suggest that these changes in vocational student composition are greatest in vocational schools and districts, and among disabled and disadvantaged students. In vocational districts, the increases in disabled and disadvantaged vocational students are at least double what they are in regular districts (see Figure 1.6).[14] The increase in vocational enrollments is smaller for LEP students, however, and enrollments of these students are not increasing more in vocational districts than in regular districts.

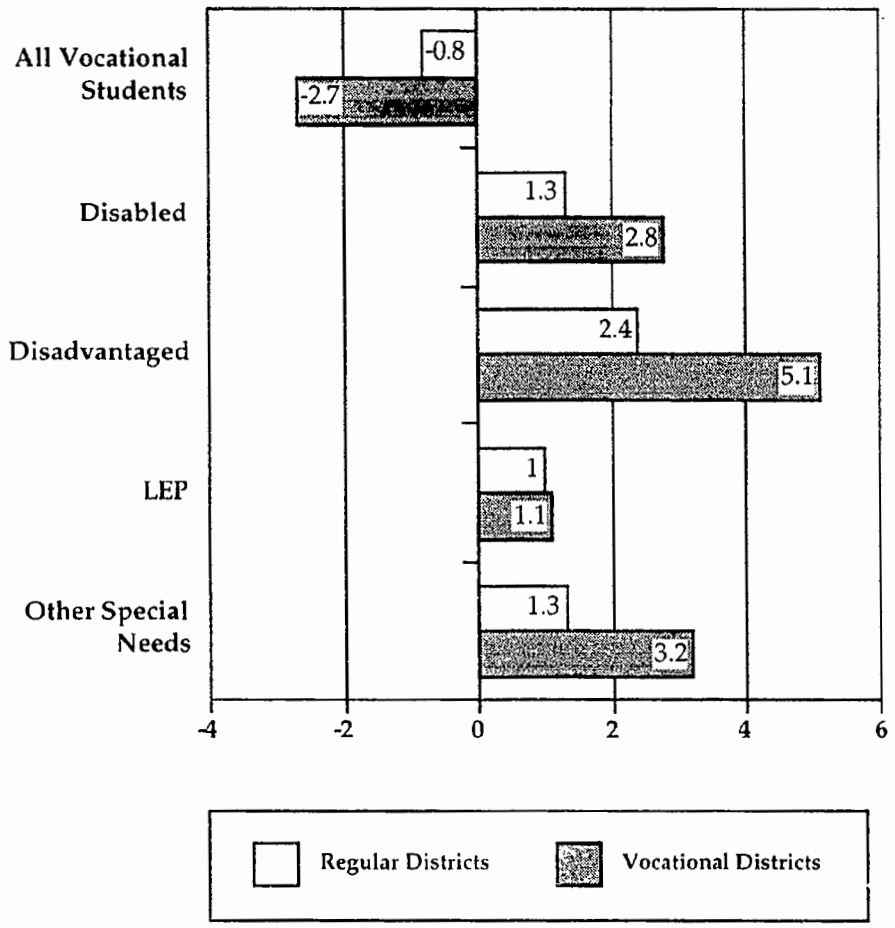
This change in the composition of vocational enrollments is reflected in the concerns of some vocational teachers and administrators, who feel that vocational education is increasingly used as a "dumping ground" for special needs and problem students. We turn now to this issue.

"DUMPING" AND THE STATUS OF VOCATIONAL EDUCATION

The inappropriate placement of students into vocational education is commonly called "dumping." It is not a new practice, but seems to be increasing — more so in area vocational schools than in others. A number of factors contribute to "dumping." For example, as vocational enrollments decline, schools that want to preserve vocational staff, funding, and programs must actively recruit students to vocational education. Special population students are often easier to recruit, in part because regular programs are more willing to let them go. Comprehensive high schools, often reluctant to send students to area vocational schools because they may lose funds by doing so, are more willing to send more costly, hard-to-educate students to AVSs.

The Perkins Act also encourages districts to maximize the participation of special population students in vocational education. The incentives for AVSs to increase special population enrollments is particularly strong, as they are eligible for

Figure 1.6
Average Percent of Change in Vocational Enrollments, by District Type and Student Type, 1987 to 1991



NOTE: See endnote 14 for details on calculating percentage change.

Source: Omnibus District Surveys

Perkins funds only if they enroll proportions of special population students equal to or higher than their sending districts. In addition, local and state education budget cut-backs make schools more reliant on federal funds for supporting costly programs and services, so students with special needs may be increasingly encouraged to enroll in vocational programs in order to receive services available through Perkins funding.

We do not know how often students are placed in vocational education for reasons other than their best educational interests. However, many school administrators view this as a problem in their schools. In the Omnibus Survey, almost half of all school administrators (44%) and over half of all **vocational** school administrators (55%) rated "placing problem students into vocational education programs, regardless of appropriateness" as a moderate to serious problem in their schools. In addition, 37 percent of school administrators agreed that "vocational education is viewed as a dumping ground for educationally disadvantaged or other special needs students." This issue is ranked as one of the most serious problems in vocational education by both administrators and teachers (see Chapter 4).

The notion of "inappropriate placement" implies that school personnel influence students' curricular decisions. Again, we cannot say for sure how often this happens, but there does appear to be ample room for school personnel to influence student decisions. In the 1992 NELS survey, almost two-thirds of vocational students reported that school personnel were involved in their decision to enroll in their current program of study — that is, the students were assigned to their current program or made the decision with the assistance of a teacher or counselor. School staff are likely to have even more influence in cases where students attend AVSs or vocational high schools, as counselors or other school personnel must typically sign off on a student transfer to these schools.

Evidence of inappropriate student placement, particularly in vocational schools, was common in the Community Case Studies[15]:

> Interviews . . . reveal a clearly adversarial position, with the academic high school appearing to be hanging on to good students as tightly as possible and the vocational center teachers believing that the "dumping" is getting worse every year. Turf has become a concern in a small central/midwestern community where the local districts do not want the half-day area school to teach academics but do want to "dump" their poorest students there. (p. 23)
>
> A small midwest city uses tests to "dump" less-prepared students into the area vocational school, and counsels better students and class leaders into other electives. (p. 35)
>
> In a small eastern community, the area vocational school complains that the comprehensive school counselors will not direct business students their way because this competes with the business courses given by the comprehensive; on the other hand, they say, all the disruptive students are directed to the vocational school. (p. 35)
>
> [At one college-oriented site, we] gained the impression that vocational education was seen by some students and staff as being

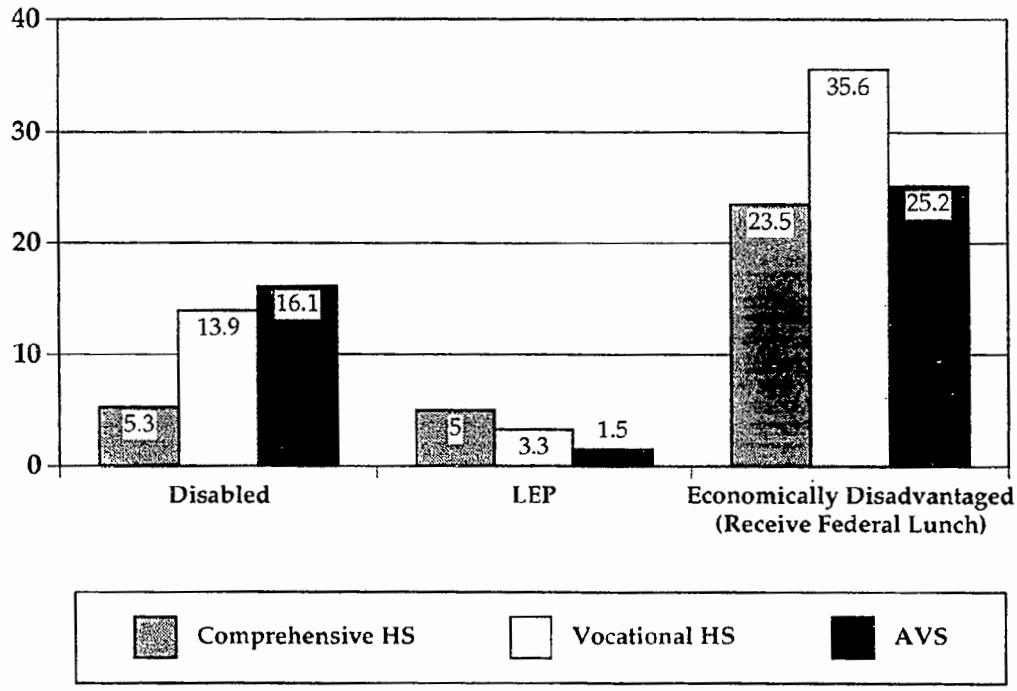
> for special needs students, especially those on IEPs . . . . The perspective of the district is that generally only special needs students are going to participate actively in [vocational education]. This perspective is echoed by the [vocational education] department chair, who agreed strongly that [vocational education] is seen as a dumping ground for special needs students.
>
> The great push by these communities and their states is for upgrading academic studies and preparing the maximum number of students for college admission. Thus, it is not surprising that overloaded counselors on the one hand give short shrift to vocational skill needs, and on the other subtly push the less able students out of comprehensive schools that compete for record percentages of graduates and college acceptances. (p. 35)

Survey data also show that disabled and disadvantaged students are overrepresented in vocational schools, although LEP students are underrepresented (see Figure 1.7). Disabled students are particularly overrepresented; while only 5 percent of students in comprehensive high schools are disabled, 14 percent of vocational high school students and 16 percent of AVS students are disabled. Further, one-third of vocational schools have student enrollments that are at least 20 percent disabled, compared to less than 2 percent of comprehensive high schools.

The overrepresentation of disabled and disadvantaged students may be acceptable as long as vocational programs benefit these students. The evidence on this issue is mixed. We saw earlier that special population students are more likely than others to concentrate their vocational coursetaking, which Chapter 6 shows results in higher earnings, especially if a training-related job is found. Chapter 6 also shows that disabled students who take vocational courses have better labor market outcomes than those who do not. Chapter 5 shows that vocational coursetaking probably reduces dropout rates, thus keeping some educationally disadvantaged students in school. However, this benefit may be offset in that vocational courses' easier coursework and less homework, which seem to help reduce dropout rates, also make courses less challenging (thereby making students less knowledgeable and competitive).

Thus, the disproportionate and growing participation of disabled and disadvantaged students in vocational education raises a number of important questions: First and most basic, to what extent does it benefit individual special needs students? To what extent does it represent an increase in student access to quality vocational programs? On the other hand, to what extent does it represent a shirking of responsibility to educate special needs students within comprehensive high schools or non-vocational programs? Also, what are the likely long-term effects of this change?

Figure 1.7
Percent of Students Who are Disabled, LEP, or Economically Disadvantaged, by School Type



Source: Omnibus School Survey

The Effects of Dumping on Vocational Programs

Vocational teachers and administrators are concerned that the "dumping" of students into vocational education harms the reputation and quality of these programs, which in turn lowers the value of this educational alternative for all students. The concern is that the overrepresentation of disabled and educationally disadvantaged students makes it more difficult for vocational schools or programs to attract the mid-level students needed to maintain program rigor, quality, and appeal. Again, evidence (or at least perceptions) of this effect abounds in the Community Case Studies:

> In the vocational magnet in a midsize southern district, health, data processing, and computer programming are seen as good programs, but the classes . . . at the comprehensives are seen as

> better because the students are better: "If they can't read we send them to the vocational school." (p. 32)
>
> The current situation, in which the vocational center staff believe they are getting poorer and poorer students and becoming a dumping ground, is in their view causing fewer and fewer prerequisites to be applied; rather the courses are restructured to fit the clientele, students are steered into courses the counselors and teachers feel they can handle, and a significant percentage of students must go through pre-vocational and remedial training prior to vocational assignment.
>
> It was also noted in many districts that classes that attract large numbers of at-risk students, particularly the disabled, come to be seen as both lower quality and lower status . . . . It is ironic that these [vocational] classes, because of the federal presence, are often among the better equipped and better staffed classes . . . . Nonetheless, it was noted in a number of districts that classes have "tipping points," points at which the better students refuse to come because of a perceived mass of at-risk students. (pp. 32–33)
>
> Students will not select vocational courses or schools with negative stigmas . . . In one district, students will attend the vocational school but will not take the bus to get there because the mentally handicapped who attend are required to ride the bus. (p. 36)
>
> Classes are viewed as being lower quality if they attract less able students, or heavy proportions of disabled students, with students being described as less able if they take the less technical courses. In part, these are self-fulfilling prophecies, so the more capable staff are aware of this danger and work hard to counter the stigma. However, teachers note that classes full of the less able students must be "dumbed down" or "taught down" in order to make any progress at all. (p. 30)

In the Omnibus Survey, these issues also figure prominently in secondary teachers' and administrators' views on current problems in vocational education. For example, we asked academic and vocational teachers for their opinions about problems confronting vocational education in their schools. The percentages saying that a given issue was a serious problem are shown in Appendix Table A-1.2. The problems are rank-ordered from 1 to 14, according to the percentage of teachers who consider them serious.

The rankings are roughly similar for vocational and academic teachers, except in a few areas.[16] The rankings reveal a complex of problems in vocational education

that revolve around dumping and its effects; with a single exception, the following are among the top six problems listed by both kinds of teachers:

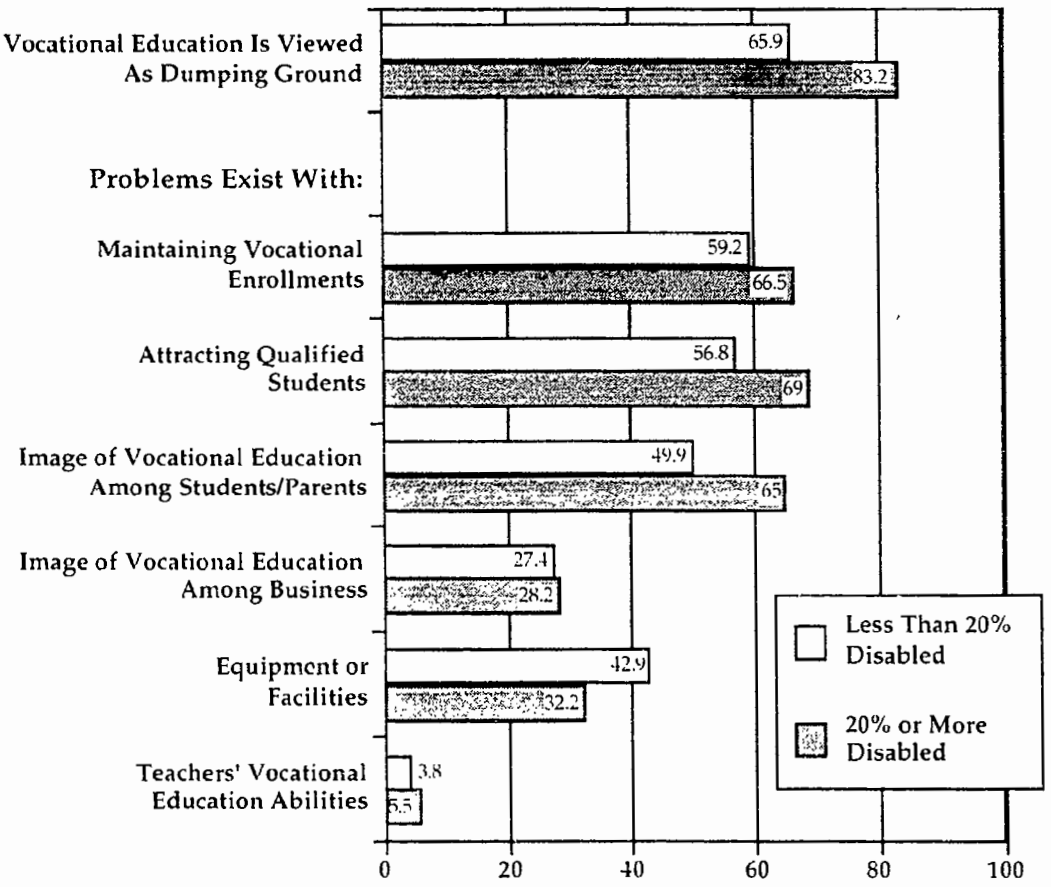
1. Inappropriate placement of problem students in vocational education.
2. The status of vocational education in relation to academic subjects.
3. Student motivation.
4. Maintaining vocational enrollments (vocational teachers only).
5. Coordinating vocational and academic instruction.
6. Student absenteeism.

Omnibus Survey data from administrators are largely consistent with these views (see Appendix Table A-1.3). Finding teachers trained to instruct special needs students; maintaining vocational enrollments; and the image of vocational education among students and parents are among the problems most often cited by administrators. Recruiting special needs students to vocational education is **least** likely to be regarded as a problem.

Vocational schools serving relatively high proportions of disabled students are also more likely to show the characteristics of schools with a "dumping ground" reputation (see Figure 1.8). Administrators in these schools are more likely to report that their school is viewed as a dumping ground, and that they have problems maintaining vocational enrollments, attracting qualified students, and with their programs' image among students and parents. These differences could reflect lower program quality at these schools; however, high-disabled vocational schools compare favorably to low-disabled schools on other available quality indicators, such as their image among the business community, their equipment and facilities, and the perceived teaching ability of their staffs (see Figure 1.8). While not conclusive, these administrators' views are consistent with the notion that vocational schools with relatively high enrollments of disabled students are more likely to develop a stigma as a result of those enrollments.

In sum, the substantial overrepresentation of disabled and disadvantaged students in vocational education, and the gradual increase in their participation, especially in separate vocational schools, may slowly increase the isolation and stigmatization of these programs and students. Lowering standards in response to the advent of more special population students may further aggravate the problem. In these cases rational decisions may complement prejudice in motivating more able students to avoid vocational programs. Even if the programs are well supplied with staff, equipment, and materials, increasing isolation from the mainstream and an inappropriate level of instruction would pose significant risks for vocational special population students.

Figure 1.8
Percent of Vocational Schools in Which Vocational Education Is Viewed as a "Dumping Ground," and in Which Each Issue Is Rated as a Moderate to Severe Problem, by Schools' Disabled Enrollments



Source: Omnibus School Survey

We do not believe this problem represents an immediate crisis. Special population students have long been overrepresented in vocational programs, and the change in the student composition of these programs is occurring slowly, not rapidly. However, we do believe it is an issue to be considered in deciding the future direction for vocational education. The current path makes vocational education maximally accessible to special needs students, but may in the long run be of less value to these students (and to all students) than other more rigorous and inclusive paths that could be taken.

CONCLUSION

Almost every high school student earns at least some credits in vocational education courses, but only one in four graduates as a vocational student — that is, earns at least three credits within one vocational program area. Among the 24 percent of students who do concentrate their vocational coursetaking, business and trade and industry ("the trades") are by far the two most popular program areas. Technical education courses are also relatively popular, although very few students concentrate in this area. Opportunities for computer experience seem to motivate much of the interest in business and technical education courses.

Vocational enrollments have been declining since the early 1980s, and as of 1992 this decline shows no signs of abating. The decline has occurred throughout the vocational curriculum, but has been most pronounced in business and trades courses. Other program areas (agriculture, marketing, health, occupational home economics, and technical education) show only small enrollment declines or — for technical education — an increase. These enrollment trends seem to follow labor market trends, suggesting at least some degree of responsiveness to labor market conditions. Other factors, such as academic reforms and economic recession, may also be contributing to vocational enrollment declines.

Declines in vocational enrollments have been larger in vocational schools than in other schools, and smaller in rural areas and the South than elsewhere. The relative strength of vocational education in rural areas and the South may reflect a greater reliance on jobs in traditional vocational fields in these areas. The greater declines in vocational schools probably reflect a variety of conditions, including expanding turf battles as school budgets decline, the growing stigmatization of vocational schools as they increasingly focus on serving at-risk students, and students' having less time to travel to AVSs as they attempt to meet higher graduation requirements.

Students' vocational coursetaking has also become slightly less "coherent," in the sense that it is not as concentrated within an individual program area as it was a decade ago. Since concentrated vocational coursetaking leads to better employment outcomes, this shift may be problematic. On the other hand, it could represent a more interdisciplinary pattern of coursetaking occurring in response to changes within the labor market. It is also possible that as enrollments and budgets drop, schools are less able to maintain small upper-level vocational courses, so that students' opportunities for coherent coursetaking may have been reduced.

Secondary vocational enrollments continue to be highly sex-typed. Only marketing has fairly balanced vocational student enrollments, with vocational concentrators in trade and industry, agriculture, and technical programs being mostly boys, and vocational concentrators in business, health, and occupational home economics being mostly girls. Over time, boys have increased their

participation in business courses, but girls have not increased their enrollments in traditionally male fields.

We hypothesize that this lack of movement of girls into male vocational areas might result from labor market growth in some traditionally female fields, such as health care, child care, food service, and other service industries, leading females to move into these areas, rather than into male fields (many of which are experiencing labor market declines). Boys' movement into business may also result more from their interest in computer wordprocessing skills than from interest in secretarial skills. As discussed in Chapter 2 of Volume IV, to help maximize students' vocational program choices, we recommend that the Perkins Act consolidate sex equity efforts at the state level.

Special population students (disabled, disadvantaged, and LEP) have less access to vocational schools than do other students (because most such schools are in suburban areas), and schools that serve exclusively special needs students have less access to Perkins funds, at least in 40 percent of the states. These are both long-standing problems, and are unlikely to change without federal intervention. The best recourse to address these problems is, we believe, to increase the quality of vocational offerings in the schools and districts in which special population students are found. **The Perkins Act should maintain its focus on allocating funds to schools and districts that serve special population students, with efforts within those sites focused on substantially improving program quality. The Act should also require that states include public schools that serve exclusively special population students in their Perkins funding allocations, even if these schools do not meet the minimum grant requirements.**

In spite of these constraints on access, special population students earn more credits in vocational education than do other students, and are overrepresented in vocational schools. This overrepresentation applies mainly to disabled and disadvantaged students; LEP students are slightly overrepresented in vocational education, but are underrepresented in vocational schools.

Special population students are also as likely or more likely than other students to concentrate their vocational coursework, a prerequisite for labor market payoffs after graduation, and to be vocational "specialists" (advanced concentrators who also take upper-level vocational courses). Thus, special needs students do not appear to take less coherent or valuable combinations of vocational courses than other students.

On the other hand, disabled and disadvantaged students tend to concentrate their vocational coursetaking in certain program areas — agriculture, occupational home economics and the trades — while taking relatively few courses in other areas — business, health, and, most notably, technical education. It is unclear to what extent these enrollment patterns represent appropriate matches with students' interests and abilities, or an inappropriate channeling of

disabled and disadvantaged students into more limited vocational areas. But given the growing importance of computer literacy in the workplace,[17] it seems problematic that these students are less likely to enroll in business and technical education courses, which tend to provide the most computer experience.

The Perkins requirement to target local grant funds on *programs* that enroll high concentrations of special population students, while infrequently used (see Chapter 1 in Volume V), may encourage the segregation of special population students in a limited number of vocational program areas. To increase special population students' access to the full range of vocational programs, Perkins local grant funds should be targeted on *sites* that serve high concentrations of special population students, but not on *programs* that serve high concentrations of these students.

Because the decline in vocational coursetaking over the past decade has been greater for non-special population students than for their special population peers, vocational students are now slightly more likely to have special needs students than they were in the past. (This is true for disabled and disadvantaged students; data are not available for LEP students.) This change is larger in vocational schools (especially area vocational schools), where the "dumping" of special needs students appears to be a particularly serious problem.

The overrepresentation of disabled and disadvantaged students in vocational education, and the increase in this overrepresentation have mixed outcomes. On the positive side, vocational education tends to have educational and labor market benefits for some of these students. Disabled students tend to do better in the labor market if they have taken vocational education, and educationally disadvantaged students are more likely to stay in school when they enroll in vocational courses. However, the decision to place a student in a vocational program or school is not always made with the student's best educational interests in mind. Too often, bureaucratic and funding concerns — the pressure to maintain enrollment levels, turf battles, and so on — drive these decisions.

In addition, the increasing overrepresentation of special needs students in vocational education is resulting in a growing isolation and segregation from the educational mainstream, and in pressures to lower program standards and rigor — trends that run counter to the Perkins Act goals of increasing vocational-academic integration and vocational program quality. Left unchecked, these trends can only be detrimental to vocational education, and by extension, to all students who could or should benefit from high-quality vocational education programs. Rather than following a path of increasing isolation, stigmatization, and lowering of standards, vocational education can best serve all students — special population as well as others — by becoming part of a broader, more rigorous, integrated, and inclusive program to prepare students for workforce success.

To minimize the growing stigma attached to vocational education, the Perkins Act should maintain strong requirements for equal access, but should not otherwise encourage schools to enroll special population students in vocational programs. Instead, the Act should focus on reforming vocational education programs, increasing their quality, and ensuring that special population students exit these programs with the same skills and abilities as other students (to the extent possible). This focus on quality and outcomes will best serve both special population and other students preparing to enter the workforce.

ENDNOTES

1 ction 403 (b) (4).

2 This discussion does not include schools for special student populations (e.g., special education, adult education, and alternative schools).

3 College-bound (or college prep) students are defined as those meeting typical 4-year college entry criteria: at least four credits in English; at least three credits in mathematics with at least one credit in algebra or higher mathematics; at least three credits in science with at least one in physical science; and at least two credits in a foreign language.

4 U. S. Department of Education (1994), *National Assessment of Vocational Education: Interim Report to Congress*, pp. 89–94.

5 The change measure was calculated by dividing the average change in vocational enrollments by the average change in total enrollments (where change was measured on a 5-point scale). This ratio was then reduced by 1, yielding negative values for district categories where vocational enrollments have declined more than (or increased less than) total enrollments, and positive values where vocational enrollments have declined less than (or increased more than) total enrollments.

6 *Interim Report*, pp. 81–82.

7 General Accounting Office (1993b), *Vocational Education: Status in School Year 1990–91 and Early Signs of Change at Secondary Level* (GAO/HRD-93-71).

8 Milne, A., Martindale, M., & Michie, J. (1993, September), *Vocational Education in Communities*, draft report prepared for the National Assessment of Vocational Education, Westat.

9 Hayward, B.J., & Wirt, J.G. (1989), *National Assessment of Vocational Education, Final Report, Vol. V, Handicapped and Disadvantaged Students: Access to Quality Vocational Education*, U.S. Department of Education.

10 McCormick, A.C., & Holmes, P. (1994, April), *Computers and Vocational/Technical Education*, draft report prepared for the National Assessment of Vocational Education, MPR Associates.

11 The *Interim Report* noted significant declines in the percentage of male concentrators in agriculture and technical programs from 1982 to 1990. Unfortunately, these trends did not continue in 1992.

12 The reported **increase** in vocational coursetaking by disabled students, discussed in the *Interim Report*, appears to be an artifact of differing measures of disability in the 1982 HSB and 1992 NELS samples. The data reported here use consistent measures from the 1987 and 1990 NAEP samples.

13 These percentages hold constant the total proportion of students in each special population category in 1982 and 1992 (at 1992 levels). Thus, the 1982 figures reflect adjusted, not actual, percentages for that year. The adjustments were quite small; the largest adjustment reduced

the 1982 proportion of low SES students by .74. The percentages of non-vocational students in these categories did not change from 1982 to 1992.

14 The percentages in Figure 1.6 are computed from administrators' responses to Omnibus Survey questions that ask them to rate enrollment changes on a 5-point scale. The scale included categories for enrollment increases of greater than 10%, increases of 6–10%, increases or decreases of 5%, decreases of 6–10%, and decreases of greater than 10%. For each type of district, we calculated an overall percentage change by taking the weighted average of category frequencies, using midpoints for the closed-ended categories, and 15% for the open-ended (greater than 10%) categories. Using other reasonable values for these open-ended categories did not change the pattern of results. Appendix Figure A-1.5 shows the values obtained when 12% and 20% are used instead of 15%.

15 Quotes without page numbers are from unpublished individual case study reports; all others are from Milne et al. (1993).

16 The rankings are disparate in three areas: (a) the placement of problem students in vocational education is the problem most likely to be considered serious by vocational teachers while it ranks sixth among academic teachers; (b) maintaining vocational enrollments is ranked fourth among vocational teachers and tenth among academic teachers; and (c) vocational student absenteeism is ranked second among academic teachers but sixth among vocational teachers.

17 McCormick & Holmes (1994).

CHAPTER 2

PARTICIPATION IN POSTSECONDARY VOCATIONAL EDUCATION

INTRODUCTION

This chapter examines access to and participation in vocational education at the postsecondary level. As in the preceding chapter, we focus on who chooses to enroll in vocational education, the health of the system as indicated by enrollment trends, and the nature of movements in and out of postsecondary vocational education. We also examine determinants of student access to postsecondary education, and postsecondary completion rates.

The chapter begins with an overview of the postsecondary delivery system, then reviews changes in access to postsecondary education over time. We find that access trends are mixed, with access increasing on some measures (e.g., institution availability) but decreasing on others (e.g., costs). The chapter then reviews postsecondary vocational enrollments, including the students who major in vocational education, the vocational fields studied, and the institutions in which vocational students enroll. We find that disabled and disadvantaged students, but not limited English proficient (LEP) students, are overrepresented in postsecondary vocational education, and that these enrollments differ by type of institution.

We also find that overall participation in postsecondary education has increased, with vocational education remaining a constant proportion of all postsecondary enrollments. Business, health, and technical fields have the largest postsecondary vocational enrollments, and shifts in these enrollments seem to reflect labor market trends. Vocational enrollments are also growing in proprietary and four-year institutions.

The chapter reveals that students complete vocational programs at rates that are low, but that are comparable to those for academic programs. Indications of lower completion rates for (former) secondary vocational students, and of declining completion rates within some institutions, suggest potential problems.

Data Sources

The main source of data for this chapter is an analysis of student characteristics and program enrollments based on the 1986 and 1989 National Postsecondary Student Aid Studies (NPSAS). Additional sources include enrollment data from the U.S. Bureau of the Census and U.S. Department of Education and from the National Assessment's Omnibus and 1993 Follow-up Surveys and Community

Case Studies.[1] The NPSAS and the National Assessment data collection efforts are described in the Technical Appendix.

OVERVIEW OF POSTSECONDARY VOCATIONAL EDUCATION

Delivery System

The postsecondary delivery system consists of six major providers: public two-year to three-year institutions (primarily community colleges, and termed so here); public less-than-four-year institutions (vocational-technical institutes); for-profit less-than-four-year (proprietary); private two- to three-year (private two-year); and public and private four-year institutions. We will refer to the less-than-four-year schools as sub-baccalaureate institutions.

Postsecondary Enrollments

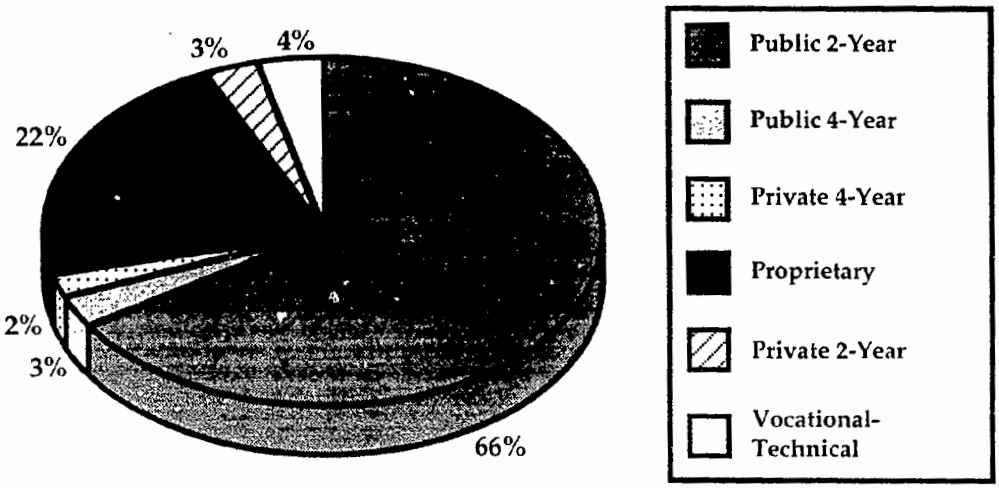
Approximately 5.8 million students were enrolled in postsecondary vocational education in 1989–90 (the most recent year for which data are available), comprising 35 percent of postsecondary enrollments. Almost all of these students (95%) were in sub-baccalaureate institutions; within these institutions, vocational students make up 67 percent of all students. Like others in these institutions, vocational students are older than college students in general and more likely to be attending part-time.

Community colleges, which enroll 66 percent of vocational students, are the single largest provider of vocational training. Proprietary institutions are the second largest provider, enrolling 22 percent. The remaining institutions collectively enroll only 12 percent of vocational students. (See Figure 2.1.)

The major providers of vocational education are institutions with fairly open access. Community colleges were originally developed in response to federal and state efforts to maximize student access to higher education. To this end, their entrance requirements are minimal, tuition costs are low, and convenient locations and flexible scheduling allow students to work while in school. Proprietary schools, the other major provider, also typically have minimal entrance requirements, but high tuition costs. However, they often offer short programs (of one year or less), which make them appealing to individuals in search of training that will allow them to enter the labor market quickly.

We now look more closely at student access to postsecondary education.

Figure 2.1
Proportion of Vocational Students Enrolled in Each Type of Postsecondary Institution, 1989–90



Source: Tuma (1993)

ACCESS TO POSTSECONDARY VOCATIONAL EDUCATION

Access to postsecondary education depends largely on three factors: physical access (the number and location of institutions), intellectual access (prior preparation), and financial access (affordability). For students with special needs, access is also affected by the availability of the supplemental services or programs they require.

Access to Institutions

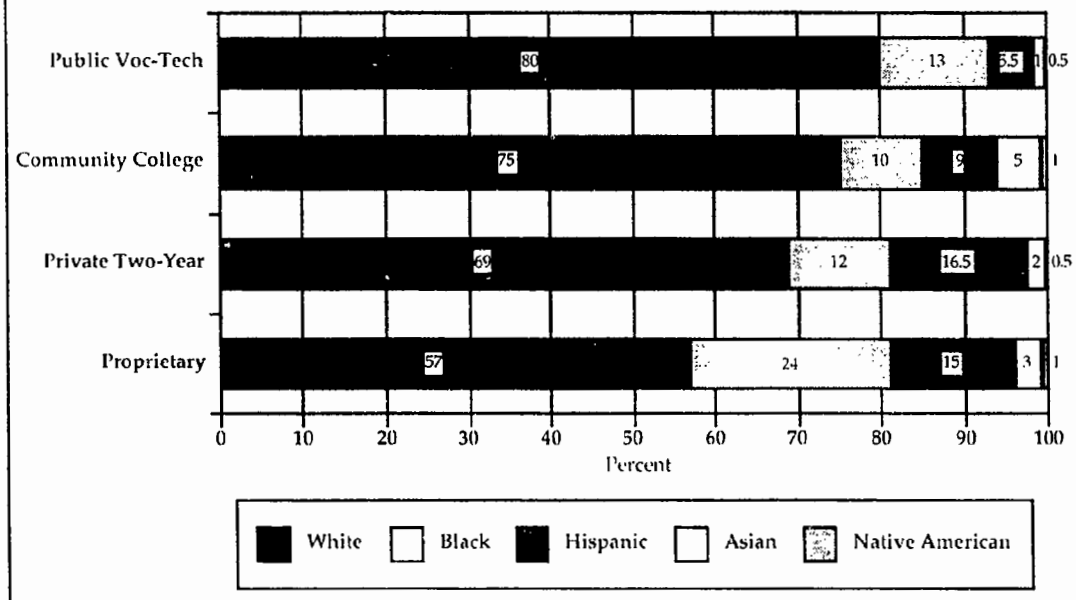
Since most postsecondary vocational education occurs in sub-baccalaureate institutions, the availability of these institutions largely determines students' physical access to it. In 1989, there were 1,408 sub-baccalaureate institutions (including branch campuses). This is a 5 percent increase from the 1,336 institutions that existed in 1986.[2]

Although more institutions imply increased access, postsecondary enrollments increased even more over the same period. This means that institutions must be expanding program sizes and offerings. It is difficult to say to what extent these expansions are keeping pace with demand, but the Community Case Studies suggest that postsecondary institutions are quite flexible in their response to student demand — with one exception. There is some evidence that the growing

immigrant populations in many communities have outpaced postsecondary institutions' capacity to offer needed courses and services. (See discussion in the *Interim Report*.[3] For these students, access may be increasingly limited, at least until their numbers stabilize or institutions' resources increase.

Different types of postsecondary institutions are found in different areas, with private and for-profit institutions concentrated in urban areas. For example, only 37 percent of public sub-baccalaureate institutions are in urban areas, compared to 70 percent of proprietary schools and 54 percent of private institutions.[4] So it is not surprising that minority students are more likely than white students to enroll in private and proprietary institutions. Blacks are particularly likely to enroll in proprietary institutions and Hispanics in private schools (see Figure 2.2). Although the distribution of institutions contributes to this enrollment pattern, institutions' recruitment strategies and entry requirements, as well as the existence of private Hispanic colleges, are also likely contributing factors.

Figure 2.2
Race/Ethnicity of Students Enrolled in Sub-baccalaureate Institutions, by Institution Type, 1989–90



Source: 1989 NPSAS

In sum, while sub-baccalaureate institutions are growing in number, their growth is not keeping pace with enrollment increases. This leaves it to existing institutions to increase their program offerings as demand increases. Our impression is that institutions respond well to these demands in general, but have a harder time meeting the demand for the special language services and courses required by increasing numbers of LEP students seeking postsecondary education. In addition, because urban areas tend to have a broader mix of postsecondary institutions, including many private and for-profit institutions, individuals who are most likely to be low-income (those in inner cities) may be the least likely to enroll in the relatively low-cost public institutions. This factor is undoubtedly related to their reliance on Pell Grants.

Prior Preparation

Many sub-baccalaureate institutions will accept students who have not completed high school, but will not enroll these students in a postsecondary-level program until they have completed remedial education courses. Because high school equivalency is required before taking most postsecondary coursework, we use high school graduation as a measure of prior preparation for postsecondary education.

High school graduation rates have changed little in the past two decades except among minority students, for whom rates have increased. For example, from 1973 to 1990, graduation rates for all students inched up from 82 percent to 83 percent, while for black students they increased from 68 percent to 78 percent, and for Hispanics from 55 to 60 percent.[5]

In spite of constant graduation rates, increasing numbers of students have needed remedial education before enrolling in postsecondary-level courses.[6] Part of this growing need for remedial education may be due to expanded assessment programs and improved identification of student deficiencies. However, the increasing proportion of high school graduates who enroll in postsecondary education is another likely cause, as postsecondary institutions must now serve more lower achieving high school graduates. Remedial programs are currently needed to assure that all high school completers have equal access to postsecondary education. A better alternative is to ensure that all high school graduates—other than the mentally disabled—have the cognitive skills necessary to enroll in postsecondary programs without the need for remediation. We will return to this issue later, in the section on "Supplemental Service Availability."

Affordability

Postsecondary education involves financial costs; only those who can cover these costs have full access to these institutions. For each student, affordability is determined by the balance between income, education costs, and available financial aid.

In the 1960s and 1970s, affordability improved as tuition costs rose more slowly than family income, and financial aid programs grew. Since 1980, however, college costs have risen faster than inflation, family income, and financial aid. In addition, shifts in financial aid from grants to loans have further increased the financial burden of college attendance.[7]

From 1980 to 1990, tuition increased at all types of postsecondary institutions, with the largest increases at four-year institutions, and the smallest increases at public two-year institutions,[8] the institutions that provide most postsecondary vocational training. However, in recent years, state budget crises have reduced many states' support for community colleges, necessitating tuition increases that are not reflected in these data. In short, affordability appears to be an increasing problem for all postsecondary students.

Supplemental Service Availability

The extent to which supplemental services are available as needed for special population students (i.e., disabled, educationally or economically disadvantaged, and LEP students) is difficult to determine. Institutions claim to provide services to any student who expresses a need for assistance, and by and large institutions seem to make good faith efforts to provide these services. Nonetheless, some problems do exist. We noted above that services and programs for LEP students seem to be in short supply in some areas. The General Accounting Office (GAO) also noted in their recent study of postsecondary vocational education that some schools have difficulty finding language interpreters for LEP students.[9]

As mentioned above, there is also an increasing need for remedial education and other services for educationally disadvantaged students. Remedial programs are currently quite common; 95 percent of public two-year postsecondary institutions offer these programs, and remedial programs are expanding.[10] However, these offerings apparently are not keeping pace with demand; the GAO study noted that of all supplemental services, colleges have the greatest difficulty meeting the need for remedial courses and tutors.

Further, demand for these services is likely to rise, in response to both increasing postsecondary enrollments and new state standards and policies. For example, some states are prohibiting remediation in four-year institutions, and others are increasing the academic requirements for postsecondary vocational students.[11] Both of these policies will increase demand for remedial education programs in sub-baccalaureate institutions.

Services for disabled students seem to be more adequately addressed, most likely because of strong federal legislation (the Individuals with Disabilities Education Act), as well as the relatively small and stable size of this population. For example, the GAO study noted that neither students with disabilities nor

advocates for disabled individuals indicated problems with these services within postsecondary institutions.

Summary

Student access to postsecondary education varies in response to students' preparation for postsecondary coursework, postsecondary attendance costs, and the availability of institutions, programs, services, and financial assistance. In general, access to postsecondary vocational education appears to be quite good for the "typical" student, but is more limited for LEP students and those with educational or economic disadvantages, as services and financial assistance fail to keep pace with rising needs. As we will see below, however, postsecondary vocational enrollments, including those of most special needs students, continue to increase in spite of these constraints on access.

VOCATIONAL ENROLLMENT TRENDS

Unlike — and in spite of — declining vocational enrollments at the secondary level, vocational enrollments at the postsecondary level are increasing at about the same pace as overall postsecondary enrollments. From fall 1986 to fall 1989, postsecondary enrollments increased 13 percent. Vocational enrollments increased 11 percent, and non-vocational enrollments increased 14 percent. Higher postsecondary attendance rates among recent high school graduates account for part of this growth. Increases in the economic return to postsecondary education may also be boosting enrollments.

There was also a shift in the distribution of vocational students among postsecondary institutions from 1986 to 1989. The percentage of vocational students enrolled in four-year and proprietary institutions increased, while the proportion enrolled in community colleges declined (see Table 2.1).

The growth of enrollments in proprietary schools may be problematic, as proprietary student loan default rates tend to be high,[12] implying that the economic gains from these institutions often do not outweigh their costs. (Chapter 6 also reports mixed findings on the economic outcomes of proprietary institutions.) This insufficient return is all the more troubling because proprietary schools serve relatively high shares of minority and low-income students[13] — those students most in need of better opportunities for economic success.

VOCATIONAL ENROLLMENTS BY PROGRAM AREA

In 1989, almost three-quarters of all postsecondary vocational students were enrolled in just three program areas: business (29%), health (22%), and technical (23%). An additional 15 percent were in trade and industry, leaving 11 percent in

Table 2.1
Changes in Vocational Enrollments From Fall 1986 to Fall 1989, by Institution Type[a]

Institution Type	Vocational Enrollments			Percent of All Vocational Enrollments	
	1986	1989	Percent Change	1986	1989
Private four-year	60,685	94,769	56	2	3
Public four-year	86,897	172,541	99	3	5
Private two-year	99,079	97,164	-2	3	3
Public two-year	2,086,155	2,213,243	6	68	64
Public Voc-Tech	129,746	128,520	-1	4	4
Proprietary	601,753	767,340	28	20	22
Total[b]	3,892,380	4,309,200	13	100	100

[a] Fall enrollments are used because only such enrollments are available in the 1986 NPSAS. Fall enrollments underestimate total enrollments in the sub-baccalaureate institutions, which typically have open enrollments during the school year.

[b] Totals are greater than the sum of institution-type enrollments because institution-type data were not available for some cases.

Source: 1986 and 1989 NPSAS

agriculture (1%), marketing (2%), occupational home economics (4%), and "undefined" areas (5%) (most likely students who are undecided on a major).[14] Compared to secondary education, these data show larger enrollments in the more "high tech" health and technical fields, and smaller enrollments in the traditionally "low tech" trades.

Changes in postsecondary enrollment largely parallel projections of demand in the labor market. From 1986 to 1989, enrollments remained constant in most vocational fields, but decreased in business (39% to 28%) and increased in health (16% to 23%) and occupational home economics (2% to 5%). Employment projections show decreasing demand for typists and word processors, while

nurses, medical assistants, home health aides, child care workers, and food preparation workers are among the fastest growing occupations.[15]

WHO TAKES VOCATIONAL EDUCATION?

We know that vocational enrollments make up a relatively large and constant percentage of all postsecondary enrollments (at least from 1986 to 1989). But who are the students that take vocational education, and have these students changed over time? For example, we saw in Chapter 1 that disabled and disadvantaged students are increasingly overrepresented in secondary vocational education. In this section, we examine whether similar patterns are evident at the postsecondary level. We first review the distribution of students by sex, race, and special population status, then examine enrollments in programs nontraditional for one's sex.

Sex and Race

Although vocational program enrollments tend to be highly sex-typed (as we will see below), vocational students in general are 54 percent female and 46 percent male, which matches the sex distribution of all postsecondary students.

On the other hand, vocational students are somewhat more likely than students in general to be black or Hispanic; these students make up 18 percent of all postsecondary students but 24 percent of vocational students. Blacks are particularly likely to be overrepresented in vocational education, a fact that is not just due to their lower socioeconomic status (SES). Independently of SES, blacks are more likely than individuals of other racial/ethnic groups to enroll in vocational programs rather than other types of postsecondary programs.[16] The reasons for this enrollment pattern are unclear.

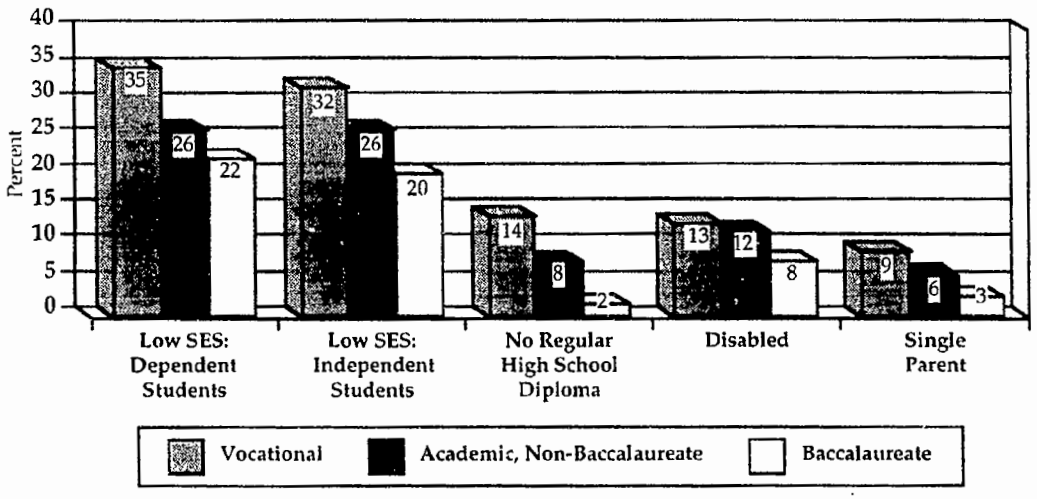
Special Population Students

The Perkins Act seeks to ensure that special population students have equal access to quality vocational education programs at both secondary and postsecondary levels. Enrollments of these students are thus of particular interest. As defined in the 1990 Perkins Act, special population students include those who are educationally disadvantaged, economically disadvantaged, disabled, limited English proficient, or enrolled in programs designed to eliminate sex bias in vocational education.

Data on the postsecondary participation of each of these groups are very limited. Here, we review information available from the NPSAS and the Omnibus Surveys. Using NPSAS data, we constructed categories for each of the special population groups except LEP students and for single parents, another group targeted by the Perkins Act.[17]

Vocational programs enroll a higher proportion of disabled, disadvantaged, and single-parent students than do other postsecondary programs (see Figure 2.3). This pattern mirrors that at the secondary level, where disabled and disadvantaged students participate in vocational education at higher rates than other students. However, while secondary LEP students enroll in vocational education at relatively high rates, at the postsecondary level they enroll at relatively low rates. The GAO found that over 40 percent of "regular" students are in vocational education programs, as are over 50 percent of disabled and disadvantaged students, but only 33 percent of LEP students.[18] It is unclear whether this low participation rate results from a shortage of vocational language services or from different educational goals among these students.

Figure 2.3
Postsecondary Students in Each Special Population Category by Program Type, 1989



Source: Tuma (1993)

For those groups that are overrepresented in vocational education, enrollment imbalances exist primarily across, not within, institutions. The exclusively vocational institutions (vocational-technical institutes and proprietary schools) enroll the highest proportions of special needs students, while the four-year institutions, with a predominantly academic focus, enroll the smallest proportions. The more "mixed" institutions, such as community colleges, fall in between. (See Table A-2.1 in the Appendix.)

However, within each type of institution, vocational students are no more likely than other students to be disabled, educationally or economically disadvantaged, or single parents. (Data are not available for LEP students.) This suggests different levels of access among these institutions, with exclusively vocational institutions providing the most access for (vocational) special population students, and four-year colleges the least. A number of factors probably contribute to this access pattern, including institutions' entry requirements, locale, and recruitment strategies.

From 1986 to 1989, few changes occurred in special population enrollments. No longer-term enrollment data are available, but we do have administrator reports on vocational enrollment changes from 1987 to 1992 from the Omnibus Surveys. These data suggest that the proportion of vocational students who are disabled or LEP may be decreasing, while the proportion who are disadvantaged may be increasing (see Figure 2.4). We cannot tell, however, if these changes reflect changes peculiar to vocational education, or whether they are part of more general changes in the postsecondary student population.

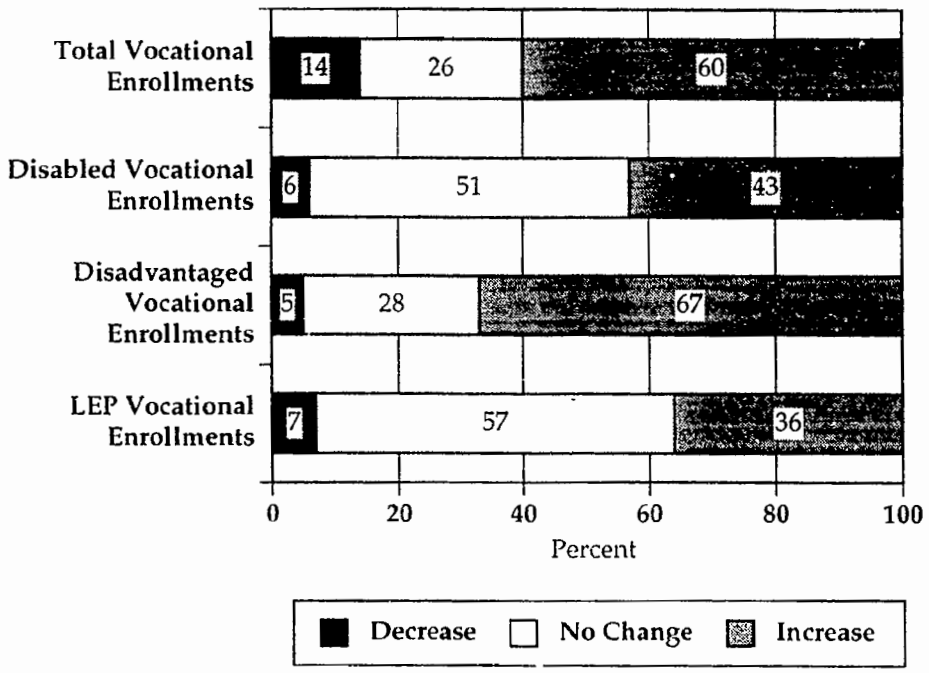
Nontraditional Vocational Education Enrollments

The Perkins Act encourages the enrollment of students in programs that are "nontraditional" for their gender. Monitoring these enrollments allows us to determine the extent to which progress is being made in this area. In this section, we examine nontraditional enrollments by reviewing the gender composition of students in different majors, and how these have changed over time. (These data are listed in Appendix Table A-2.2.)

In general, while both vocational and academic majors run the gamut from predominantly female to predominantly male, more vocational than academic majors are highly sex-segregated. For example, in 1989, 10 of 21 vocational majors enrolled at least three-quarters of students of one gender, compared to only 4 of 19 academic majors. The most male-dominated vocational majors are those in trade and industry (engineering, transportation, precision production, mechanics, and construction), and among academic majors, the physical sciences and philosophy. The most female-dominated majors include vocational majors in health, business support, consumer services and home economics, and academic majors in legal assistance, education, and public affairs.

From the mid-1970s to 1989, nontraditional enrollments have shown a one-way shift: Men have increased their enrollments in predominantly female fields — business support, consumer services, home economics, and allied health — but women have not increased their enrollments in predominantly male fields (see Appendix Tables A-2.2 and A-2.3). These trends are similar to those for secondary vocational education, where male enrollments have increased in business and, to a lesser extent, occupational home economics.

Figure 2.4
Changes in Vocational Enrollments at Two-Year Public Postsecondary Institutions From 1987–88 to 1991–92



Source: Omnibus Postsecondary Institution Survey

In short, sex equity for women is not being achieved, or even approached, in postsecondary or secondary vocational education. Vocational majors are more sex-segregated than academic majors, and while male students at both secondary and postsecondary levels seem to be moving into some predominantly female fields, female students show little, if any, tendency to move into predominantly male fields.

However, this seemingly discouraging pattern may simply reflect adjustments to a changing labor market. Because of job declines in the trades and increases in health and human service occupations, it may be that vocationally oriented women choose to pursue the better employment prospects in fields that have always been more open to them. On the other hand, men who may have entered the trades in the past have fewer "male" vocational alternatives to pursue, and so may be moving into more "female" occupations in order to maximize their employment prospects.

POSTSECONDARY COMPLETION, PERSISTENCE, AND DROPOUT RATES

Finally, as Chapter 6 shows, obtaining an educational credential (diploma, certificate, or degree) contributes to the employment success of vocational students, and thus can serve as one measure of the value or quality of the education students receive. In this section, we examine the rate at which postsecondary students, particularly those in sub-baccalaureate institutions, earn credentials.

Determining postsecondary completion rates is complicated by the different goals of individuals who enroll in sub-baccalaureate institutions. While some students attend these institutions to obtain a credential, others intend instead to transfer to a four-year institution, upgrade their job skills, or meet strictly personal goals. For these latter students, the receipt of a (less than baccalaureate) credential is irrelevant to their "success."

No data sets accurately separate these different groups of students, and doing so is virtually impossible, as students are often unclear as to their intentions, exaggerate them, or change them over time. However, by considering only those students who seem most likely to be working toward a degree or certificate, we can obtain reasonably valid estimates of completion rates. Here, we restrict our analyses to recent high school graduates, a group likely to have high rates of intention to complete postsecondary education, and to full-time postsecondary students, another group likely to be planning to earn a credential.[19]

Since the available data follow postsecondary students for a limited time (2–4 years), not all students can be definitively categorized as completers and non-completers. We divide them into three groups: completers (those who have earned a credential), persisters (those still in school), and dropouts (those who have left school). Eventually, the persisters will complete or drop out, and some of the dropouts may return to earn a credential — but we cannot determine which students will follow these paths.

Completion rates over a period of 2.5 years for full-time students enrolled in sub-baccalaureate institutions range from 26 to 65 percent, depending on the type of institution (see Table 2.2). The relatively low completion rate and higher persistence rate at community colleges may reflect the continued enrollments of students who intend to transfer to four-year institutions, and of those taking courses for non-credentialing purposes. (Note that the dropout rates across two- and three-year institutions are nearly identical. Students in community colleges just seem to take courses over a longer period of time.) If we exclude community colleges, the remaining completion rates for full-time students (42–65%) are similar to the rate at four-year institutions, where (using the most comparable data available) about 40 percent of students entering immediately after high school receive a bachelor degree within four years.[20]

Table 2.2
Completion, Persistence, and Dropout Rates for Full-Time Students Entering Sub-Baccalaureate Institutions in 1989–90[a] (Percent)

Institution Type	Completion Rate	Persistence Rate	Dropout Rate
Less-than-two-year			
Public	44	*	52
Private	52	*	41
Proprietary	65	*	33
Two- or three-year			
Public	26	33	40
Private	42	17	41
Proprietary	52	6	42

* These data are collected two-and-a-half years after program entry. Very few students at less-than-two-year institutions persist in their studies for this long. The persistence rates for these institutions are 4,7, and 2 percent respectively.

[a] Rates as of February 1992.

Source: 1992 Beginning Postsecondary Study

Completion rate data for vocational students are limited, but suggest that within community colleges, vocational and academic students are equally persistent, leaving school at about the same rate.[21] The data on students who pursued a vocational program in high school are more mixed. In community colleges, those who were enrolled in secondary vocational programs are the most likely to drop out and the least likely to complete. But at public technical institutes and proprietary schools, which tend to have shorter programs with less academic emphasis, those who were high school vocational students complete at relatively high rates (see Table 2.3). These findings suggest that high school vocational students are relatively well-prepared for short, occupationally focused postsecondary education, but are the least prepared of all high school students for longer-term postsecondary education with an academic foundation.

The data also enable us to examine trends in persistence rates. Dropout rates at community colleges and public technical institutes increased from the 1970s to the 1980s, although they remained constant at proprietary institutions (see Appendix Table A-2.4). Whether these higher dropout rates signify increased difficulty completing programs, more students pursuing non-credential goals, or other factors is unclear. However, the increases were most pronounced among

Table 2.3
Completion, Persistence, and Dropout Rates for Class of 1980, by Type of Postsecondary Institution and High School Program (Percent)

Postsecondary Institution and High School Program	Completion Rate	Persistence Rate	Dropout Rate
Community College			
Academic	23	46	31
Vocational	13	33	54
General	20	37	44
Vocational-Technical Institute			
Academic	41	15	44
Vocational	43	16	41
General	27	21	53
Proprietary Institution			
Academic	42	23	35
Vocational	38	17	44
General	31	27	42

Source: Goodwin (1989)

the most disadvantaged students — those with low aspirations, low socioeconomic status, and low achievement levels.[22] This implies that increased costs, higher graduation requirements, or other factors that differentially affect disadvantaged students may be contributing to dropout rate increases.

CONCLUSION

Vocational education is a relatively large and stable part of the postsecondary education system. Over one-third of all postsecondary students are vocational, as are two-thirds of students in sub-baccalaureate institutions. Vocational enrollments have been increasing at about the same pace as postsecondary enrollments in general. These increases have occurred in spite of rising attendance costs and a declining cohort of college-aged students. It appears that students continue to be attracted to postsecondary education — both academic and vocational — because of its ability to improve job opportunities and pay.

Vocational programs serve a wider array of students, particularly special population students, than do other postsecondary programs, mainly by providing programs in more diverse and accessible institutions. Blacks and Hispanics are overrepresented in postsecondary vocational education, and in the more costly vocational institutions, perhaps because of a greater interest in the shorter programs offered by these institutions, as well as greater concentration of non-public institutions in urban areas.

Disabled and disadvantaged students are also overrepresented in vocational programs, but LEP students are underrepresented (relative to their enrollments in other postsecondary programs). It is difficult to determine what motivates these enrollment patterns. We do know, however, that although public sub-baccalaureate institutions offer a wide array of supplemental services for special population students, some institutions have difficulty meeting the special needs of educationally disadvantaged and LEP students. Our impression is that these problems are most severe in areas where disadvantaged and LEP populations are relatively large and growing, placing an excessive burden on institutions' resources.

To more adequately meet the needs of all special population students, **Perkins funds should be more closely targeted on institutions with large and growing concentrations of special population students. The concentration of immigrant populations in the institutions' local area (or some other measure of LEP student concentration) should also be considered in the allocation of funds.**

Postsecondary vocational enrollment trends are very different from those at the secondary level. While secondary vocational enrollments are declining, postsecondary enrollments are increasing, and while the concentration of special population students in vocational education is increasing at the secondary level, it appears to be holding steady — or declining — at the postsecondary level. These different trends may represent adjustments to a labor market that is shifting to higher-level vocational skills. To some extent, it may also represent the different pressures that affect secondary rather than postsecondary vocational education — factors such as the need to educate all students, increased academic requirements, and declining program budgets.

Within vocational program areas, secondary and postsecondary vocational education appear to be responding similarly to labor market conditions. Postsecondary enrollments are increasing in areas of job growth, such as the health, child care, and food service industries, and declining in low-growth job areas, such as business. Federal policy action cannot effectively initiate these adjustments to the labor market, but it can help them occur more quickly by providing funds for new equipment and curricula, as the Perkins Act currently does. **To improve vocational programs' labor market responsiveness, and therefore students' employment prospects, Perkins funds should be targeted within institutions on programs in areas with growing job demand.**

At the postsecondary level, the demand for short-term programs appears to be reflected in the continuing growth of proprietary school enrollments. The conflicting needs for more education and immediate income reflected in this preference are likely to continue. This conflict provides one of the greatest challenges for postsecondary vocational education, including tech-prep programs, as some students enter the labor market as soon as they have marketable skills, rather than completing the longer term program.[23]

The need for immediate income is also a likely cause for the relatively low completion rates of postsecondary students, in spite of the economic gains that can be sustained from program completion (as discussed in Chapter 6). Vocational students appear to complete and drop out of programs at rates comparable to those for academic students, although the limited data on completions make this conclusion somewhat speculative.

Limited data also suggest that students who were vocational in high school have lower completion rates than other students at community colleges, although their completion rates are comparable at the more technical postsecondary institutions. This pattern could imply that high school vocational students who enter **vocational** programs in community colleges complete them at relatively high rates, but are less likely to complete academic programs. Even so, this outcome would be problematic, as it implies that secondary vocational students have more limited postsecondary options than other students.

Finally, tentative evidence indicates that postsecondary students in public sub-baccalaureate institutions (which account for almost three-fourths of vocational enrollments) are increasingly leaving school without credentials. These data are for enrollments from the mid-1970s to the mid-1980s; more recent trends may be different. However, the increasing number of postsecondary students needing remediation suggests that completion rates may continue to decline, as remedial instruction increases the time required to complete a program. Recent reforms, such as the elimination of remedial course credits and stricter academic requirements for vocational certificate students, also may lower completion rates.

These trends emphasize the need to focus on the most fundamental determinant of access to postsecondary education — secondary students' **preparation for** further education. For this reason, **the Perkins Act should emphasize the use of funds to substantially upgrade the development of vocational students' conceptual skills, especially at the secondary level.** These skills, including math and verbal ability, are usually considered academic, but as Chapter 4 of Volume III observes, they can effectively be taught in an applied context. The education that high school graduates receive should virtually eliminate the need for postsecondary remedial programs — as well as remedial programs in business and industry — over the long run.

ENDNOTES

1 Most postsecondary data do not distinguish between vocational and academic programs or students. The NPSAS does, but includes only two points in time. We use Department of Education and Census Bureau data to present longer trends, and to address issues not as well covered by the NPSAS. These data distinguish between two-year and four-year institutions and between Associate and Bachelor degrees. This is not a clean vocational-academic distinction, but is the best available for many long-term trend analyses. All enrollment data are based on student headcounts.

2 National Center for Education Statistics (1993), *Digest of Education Statistics*, p. 240, U.S. Department of Education.

3 U.S. Department of Education (1994), *National Assessment of Vocational Education: Interim Report to Congress*, pp. 135-136.

4 Based on the College Board Survey of all postsecondary institutions in 1991–92.

5 Alsalam, N., et al. (1992), *The Condition of Education*, p. 58, U.S. Department of Education.

6 Milne, A., Martindale, M., & Michie, J. (1993), *Vocational Education in Communities*, p. 38. Westat.

7 Alsalam, et al. (1992); Kirshstein R.J., et al. (1990), *The Escalating Costs of Higher Education*, Pelavin Associates; National Commission on Responsibilities for Financing Postsecondary Education (1993), *Making College Affordable Again*.

8 National Center for Education Statistics (1992), *Digest of Education Statistics*, U.S. Department of Education; National Commission on Responsibilities for Financing Postsecondary Education (1993).

9 General Accounting Office (1993c), *Vocational Education: Status in Two-Year Colleges in 1990–91 and Early Signs of Change*. One of the five schools visited by the GAO reported difficulty finding needed language interpreters.

10 Based on Omnibus Survey data and the Community Case Studies (Milne et al., 1993).

11 Milne et al. (1993).

12 Fraas, C. (1990), *Proprietary Schools and Student Financial Aid Programs: Background and Policy Issues*. Library of Congress, Congressional Research Service.

13 See the *Interim Report*, p. 146.

14 Tuma, J. (1993), *Patterns of Enrollment in Postsecondary Vocational and Academic Education*, MPR Associates.

15 U.S. Bureau of the Census (1992), *Statistical Abstracts of the United States, 1992*, p. 13, U.S. Department of Commerce.

16 Tuma (1993).

17 Economically disadvantaged students were defined as those in the lowest quartile of a constructed SES measure based on a linear combination of parents' occupation and education; for dependent students, parents' income was also included. Educationally disadvantaged students were those who did not earn a regular high school diploma. (Other measures of economic and educational disadvantage were also considered; these measures yielded findings similar to those used in this report.) Students' disability and marital status were based on existing NPSAS variables created from student self-reports and institutional records.

18 General Accounting Office (1993c).

19 The data for recent graduates are derived from the 1972 National Longitudinal Study (NLS) and the 1980 High School and Beyond (HSB). Data on full-time postsecondary students are from the 1992 Beginning Postsecondary Study.

20 Based on analyses of the 1972 NLS.

21 A dropout rate of 42% was found for both groups in Goodwin, D. (1989), *National Assessment of Vocational Education, Vol. IV, Postsecondary Vocational Education*, U.S. Department of Education. Rates of 44% and 39%, respectively, were found in Grubb W.N. (1989), Dropouts, spells of time, and credits in postsecondary education: Evidence from longitudinal surveys, *Economics of Educational Research, 8.*

22 Grubb (1989).

23 Chapter 3, Volume IV of this report discusses this problem in the context of postsecondary vocational education programs for Native Americans. For obvious reasons, this problem is more severe for economically disadvantaged groups, such as Native Americans and other minorities.

PART II

QUALITY OF VOCATIONAL EDUCATION

CHAPTER 3

TEACHERS IN VOCATIONAL EDUCATION

INTRODUCTION

The Perkins Act calls for an assessment of "the preparation and qualifications of teachers of vocational and academic curricula."[1] This chapter discusses the qualifications of teachers in secondary and postsecondary institutions, using measures of preparedness such as teaching experience, education credentials, nonteaching work experience, and occupational credentials. It examines opinion data from a survey of secondary teachers on their preparation to teach academic and vocational subjects. It also discusses vocational teacher education in colleges and universities. Throughout, the chapter assesses teacher preparation from the standpoint of the Perkins mandate to integrate academic and vocational curricula.

In a final section, the chapter addresses the question of whether there are any shortages of secondary vocational teachers, consistent with the Perkins mandate for this assessment.[2]

SECONDARY EDUCATION

The data on the characteristics, experiences, and opinions of secondary teachers come from the 1992–93 National Assessment of Vocational Education Teacher Survey and from the Schools and Staffing Surveys (SASS) of 1987–88 and 1990–91. The populations surveyed were teachers in grades 9–12 in public schools. The populations are similar in many ways, but differ in that the vocational teachers in the Teacher Survey are those in vocational courses specifically designed to prepare students for occupations, while the SASS includes teachers of all vocational courses.[3] (These surveys are described in more detail in the Technical Appendix in Volume V.)

Before discussing the preparation and qualifications of vocational teachers, it will be useful to look at some background information, including their numbers, their distribution across program areas, and their demographic characteristics.

Based on the SASS, in 1990–91 the number of vocational teachers in the nation's secondary schools was estimated at 146,000. This represents a 9 percent decline from 160,000 in 1987–88. Over the same period, the number of non-vocational teachers increased 7 percent, from 667,000 to 714,000. Paralleling vocational student enrollments, the numbers of vocational teachers are decreasing both absolutely and as a proportion of all teachers.

Teachers in Vocational Program Areas

The percentage of occupational vocational education teachers in each of the main program areas is shown in Table 3.1. Business education is the largest field, followed by trade and industry. Together, these two fields comprise over half of all secondary vocational teachers. Home economics teachers who prepare students for occupations make up 14 percent of the total; each of the other specific fields accounts for less than 10 percent.

Table 3.1
Distribution of Secondary Vocational Teachers by Vocational Program Area

Program Area	Percent of Teachers in Area
Agricultural education	9
Business and office	33
Health occupations	3
Marketing/distributive education	4
Home economics	14
Trade and industrial education	20
Technical/communication	3
Other	12

NOTE: Numbers do not add to 100 because of rounding.

Source: National Assessment of Vocational Education Teacher Survey

Some of these vocational education programs tend to be offered primarily in comprehensive high schools, others primarily in vocational schools, and still others in similar proportions in both kinds of schools. Three programs — business and office education, home economics, and technology education (not shown separately above) — are located primarily in comprehensive high schools. Until the 1960s, business and office courses were not usually classified as vocational education; rather, they formed the core of the "commercial" track in many regular public high schools. Beginning in the 1960s, business programs were often incorporated in the vocational education system, but they tended to remain in comprehensive high schools. Home economics and technology education (successor to the traditional industrial arts courses) were also familiar

parts of the curriculum in regular public high schools and have generally remained in the same institutions.

Programs requiring large amounts of space and/or specialized equipment, such as trade and industrial education and health occupations, are usually found in vocational schools. Other programs, such as agricultural education and marketing/distribution education, are about equally distributed in both types of schools.

Demographic Characteristics

While there are demographic differences between vocational and academic teachers, they are not as great as is often supposed (Table 3.2). In 1990–91 vocational education teachers were a little older, on average, than non-vocational teachers (43.5 years, as compared to 41.9 years). The difference, while small, is statistically significant ($p < .05$). Gender differences between vocational and other teachers are not significant, but some race/ethnic differences are: Vocational teachers are more likely than others to be black, although most are white.

Table 3.2
Demographic Characteristics of Secondary Vocational and Non-Vocational Teachers, 1990–91

	Vocational	Non-Vocational
Average age (years)	43.5	41.9
Sex (percent)		
Male	52	51
Female	48	49
Race/Ethnicity (percent)		
Native American	1	1
Asian	1	1
Black	9	6
White	88	90
Hispanic	2	3

NOTE: Numbers may not add to 100 because of rounding.

Source: 1990–91 Schools and Staffing Survey

The major gender differences are not between vocational and academic teachers, but among vocational teachers in different program areas. Almost all the teachers in agriculture, industrial arts, and trade/industry (T&I) are male (93%, 96%, and 91%, respectively). On the other hand, almost all secondary home economics teachers are female (99%), as are about two-thirds of the business teachers (67%). These gender differences parallel those of secondary vocational students as described in Chapter 1.

There are few substantial differences in race-ethnicity by program area, although there are some differences by age. Agriculture teachers tend to be considerably younger (38.7 years) than average, while teachers in trade and industry tend to be older (45.6 years).

In all, vocational teachers are a little older than other teachers, but they are no more likely to be male, and blacks are somewhat overrepresented. As with students, there are strong gender differences by vocational program area. Teachers in the program that many regard as typical of vocational education — trade and industry — are much more likely than non-vocational teachers to be male and they tend to be older than other teachers.

Preparation and Qualifications of Teachers

Education and Experience

This section examines the educational credentials, teaching experience, and other occupational experience of secondary school teachers. Some formal post-secondary education is required for public school teaching in all states, and the credentials of teachers are widely considered to be measures of quality in educational institutions. As Chapter 6 shows, the labor market generally rewards educational credentials. Although sometimes too much or too little emphasis is given them, teaching credentials usually reflect essential preparation. Outside the regular education system, occupational credentials such as licenses reflect the acquisition of skills that can be essential for teaching vocational subjects.

Work experience tends to improve performance, and pay scales usually recognize this improvement by rewarding experienced workers more than beginners. [4] At some point in people's careers, however, the benefits of additional experience level off and begin to decline a little. We assume that these principles apply to teachers as well as others and that teaching experience improves performance, at least up to a point.

Work experience outside of teaching, if related to the subject taught in school, can be another valuable element in teacher preparation, especially for those teaching vocational subjects. Academic teachers in school systems attempting to integrate academic and vocational subjects might also benefit from work experience outside of school.

Data on the teaching experience, nonteaching work experience, and educational and occupational credentials of secondary teachers are provided in Table 3.3.

Table 3.3
Preparation of Secondary Academic and Vocational Teachers

	Academic Teachers	Vocational Teachers		
		All	Comprehensive Schools	Vocational Schools
Highest degree (percent)				
High school diploma or GED	0	2	1	4
Associate's degree or 2-year certificate	*	6	2	22
Bachelor's degree	40	39	41	31
Degree above bachelor's	60	50	55	33
Nonteaching occupational certificate or license	0	4	2	10
Mean years of teaching experience	18	17	17	14
Related nonteaching work experience (percent)	19	66	63	78

* Less than 1%.

Source: National Assessment of Vocational Education Teacher Survey

On average, both academic and vocational teachers have about the same number of years' teaching experience — 17 and 18 years respectively, although teachers in vocational schools have less (14 years) than others.

Secondary vocational teachers also tend to have less formal education than academic teachers. Twelve percent of vocational teachers lack bachelor's degrees, while all academic teachers have them (they are required for academic teacher certification in all states). Likewise, 60 percent of academic teachers have advanced degrees, compared to 50 percent of vocational teachers.

In comprehensive high schools, the education levels of academic and vocational teachers are rather similar, in most cases reflecting common certification requirements. However, teachers in vocational schools have considerably less formal education. While all academic teachers have bachelor's degrees, only 64 percent of the teachers in vocational schools do. While 60 percent of academic teachers have degrees above bachelor's, only 33 percent of the teachers in vocational schools have this much education.

For many vocational teachers, outside work experience related to the teaching field seems to replace higher levels of formal education and to provide much of their subject-matter expertise. Vocational teachers are much more likely than academic teachers to have related work experience. While only 19 percent of academic teachers have such experience, 66 percent of all vocational teachers and 78 percent of those in vocational schools have related work experience.

Moreover, the work experience of vocational teachers, and particularly those in vocational high schools, is more recent than that of academic teachers. Between 1990 and 1992, for example, 7 percent of academic teachers, one-fifth of all vocational teachers, and one-third of those in vocational schools had (or have) jobs in fields related to their teaching.[5] Because the survey measures only work experience related to teaching field, we cannot conclude that academic teachers have little work experience outside of teaching; no doubt many have unrelated jobs.

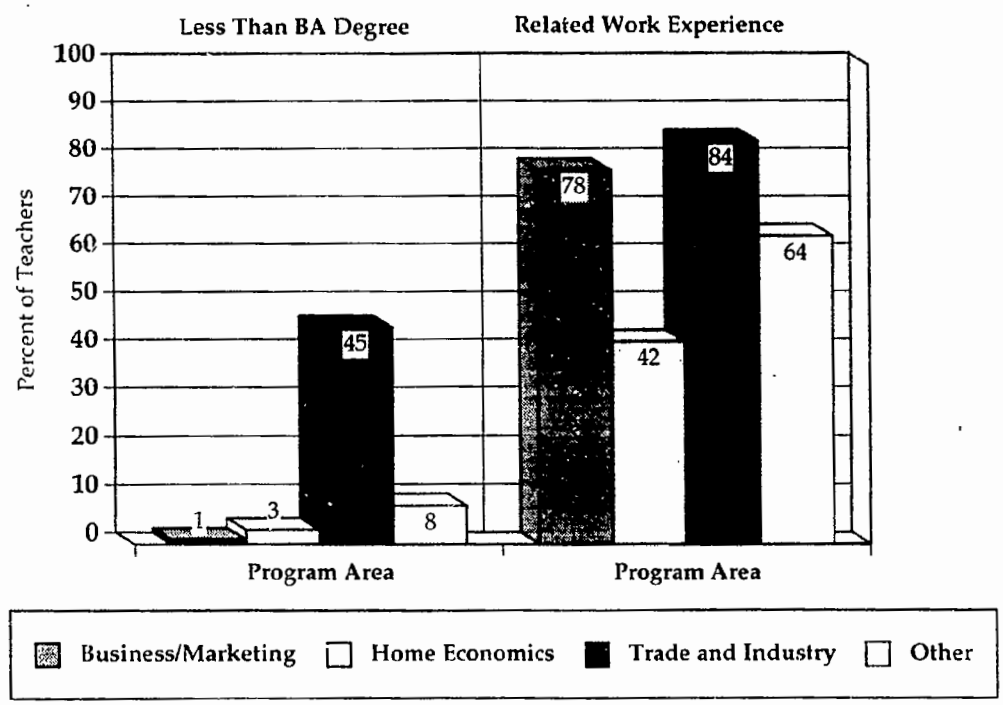
Only 23 percent of secondary vocational teachers have (nonteaching) occupational licenses or certificates; that is one-third of the 66 percent who have occupational experience related to their teaching field. However, this low level of licensing and certification is not necessarily a problem. All but 2 percent of vocational teachers (4% of those in vocational schools) have at least an associate's degree **or** occupational certification.

Credentials and Work Experience in Trade and Industrial Education

The tendency for vocational teachers to have less education and more work experience than academic teachers is heavily concentrated in trade and industrial education, although most business/marketing teachers also have related work experience, as Figure 3.1 shows.[6]

Some 45 percent of trade and industry teachers have less than a bachelor's degree, while in other vocational fields few teachers have this little education. However, T&I teachers are the most likely to have related occupational experience. In fact, they have more than **twice as much** experience as other vocational teachers, on average, 17 years as compared to 8 years. (Figure 3.1 shows that business/marketing teachers are almost as likely as T&I teachers to have **some** related work experience, but it does not show how many years of experience they have.) Trade and industry teachers are also more likely to have

Figure 3.1
Educational Credentials and Related Work Experience of Secondary Vocational Teachers



Source: National Assessment of Vocational Education Teacher Survey

occupational credentials: 43 percent of T&I teachers have occupational certification, while only 1–9 percent of other vocational teachers do (data not shown).

This pattern of less education and more work experience goes back many years. As Lynch explains,

> Beginning with the . . . 1917 Smith-Hughes Act and continuing to the present time, nearly all states substitute years of work experience [for] college preparation [in] certifying T&I teachers. In fact, only Hawaii and Wisconsin require the baccalaureate degree for initial certification . . . Seven states require a baccalaureate degree and five states require an associate degree for full certification. Beginning teachers in 43 states may teach in T&I programs without any college credits. [7]

Most states do require from 16 to 200 hours of pedagogical preparation in the first year of teaching, typically obtained through workshops or college courses. Many states also require licensure in occupations such as cosmetology, health technologies, plumbing, and auto mechanics. In addition, 12 to 18 states require individuals within the first year of teaching, or preservice teachers lacking work experience, to pass National Occupational Competency Testing Institute (NOCTI) tests.[8]

Teachers' Perceptions of Their Abilities

To get teachers' opinions of their preparation to teach, especially in the context of integrated academic/vocational curricula, we asked survey respondents how well prepared they felt to teach various academic and occupational subjects. Since these are self-reports, we assume that the respondents gave themselves the benefit of the doubt in assessing their own abilities. Thus we focus on those who said they are "very well prepared" to teach a subject, assuming that response reflects a good grasp of the subject.

The results of these self-assessments are shown in Tables 3.4 and 3.5. Vocational teachers are more likely to say they are very well prepared to teach writing (31%) than to teach basic algebra (19%) or math beyond basic algebra (10%). However, vocational teachers are not as likely as academic teachers to feel prepared to teach any of these subjects. The comparable proportions for academic teachers are writing, 49 percent; basic algebra, 38 percent; math beyond basic algebra, 30 percent.

Viewed by subject area, the pattern is different. Academic teachers tend to say they know their own subjects, but not other areas. For example, all math teachers say they are prepared to teach basic algebra, but only 12 percent say they are prepared to teach writing; 89 percent of English teachers say they are prepared to teach writing, but only 2 percent say they are prepared to teach basic algebra. In contrast, some vocational teachers in each program area report being able to teach academic subjects. For example, between one-fourth and one-sixth of vocational teachers, depending on program area, say they could teach basic algebra. Between one-fifth and two-fifths report being able to teach writing. While a significant minority of vocational teachers feel that they could teach academic subjects, a smaller minority of academic teachers — 12 percent over all — say that they could teach occupational principles. Judging by these self-reports, there is probably enough knowledge on each side to begin integrating academic and vocational education, but much more preparation will be needed in the long run.

Table 3.4
Percent of Secondary Academic Teachers Feeling "Very Well Prepared" to Teach Listed Subjects

Subject	Major Teaching Field					All Teachers
	English	Math	Science	Social Science	Foreign Language	
Basic algebra	2	100	61	8	10	38
Math beyond basic algebra	2	93	35	3	3	30
Writing	89	12	32	46	61	49
Occupational principles	15	11	8	16	11	12

Source: National Assessment of Vocational Education Teacher Survey

Table 3.5
Percent of Secondary Vocational Teachers Feeling "Very Well Prepared" to Teach Listed Subjects

Subject	Major Teaching Field				All Teachers
	Business	Home Economics	T&I	Other	
Basic algebra	16	17	22	23	19
Math beyond basic algebra	7	2	15	13	10
Writing	37	40	18	28	31
Occupational principles	82	68	80	71	75

Source: National Assessment of Vocational Education Teacher Survey

POSTSECONDARY EDUCATION

The characteristics of vocational teachers in public two-year postsecondary institutions differ somewhat from those of their secondary counterparts. The data on these faculty members come from the NCES 1988 National Survey of Postsecondary Faculty.

Demographic Characteristics

While secondary teachers are about equally distributed by gender, the faculty in two-year postsecondary institutions are more likely to be male (61%) than female (39%). This difference reflects a broader pattern in education: The more advanced the education level taught, and the higher the prestige and salaries, the more likely the faculty are to be male. Most elementary teachers are female; secondary teachers in grades 9–12 are about 50/50; two-year postsecondary faculty are about 60 percent male/40 percent female, and the proportions of male faculty in four-year institutions range from 71 percent in liberal arts colleges to 81 percent in private research universities. [9] Although both academic and vocational faculty follow this postsecondary gender pattern, vocational faculty members are a little more likely than academic teachers to be male (65%, 59%).

Faculty in two-year postsecondary institutions are also somewhat older than secondary teachers. As with gender, this age difference is part of a broader pattern in education: The higher the level of the educational institution, the higher the average age of the faculty. Postsecondary vocational faculty are a little older than their academic counterparts; 36 percent of vocational teachers are age 50 or older as compared to 31 percent of academic teachers.

The great majority of vocational teachers at both levels are white (91% of postsecondary and 88% of secondary faculty). However, while secondary vocational teachers are more likely than others to be black, there are few significant racial/ethnic differences between academic and vocational faculty at the postsecondary level.

Experience and Education

The experience and education levels of faculty in two-year postsecondary institutions are shown in Table 3.6. Vocational faculty have somewhat less teaching experience than other faculty. For example, 23 percent of non-vocational faculty and 17 percent of vocational faculty have more than 20 years' experience teaching. Among vocational teachers in the various subject areas, there are substantial differences in experience. Only 9 percent of the computer faculty have more than 20 years' experience, presumably because this is a relatively new field. On the other hand, 31 percent of the faculty in engineering/science/technology have been teaching for more than 20 years (and two-thirds have been teaching 10 or more years).

Table 3.6
Experience and Education of Two-Year Postsecondary Faculty
(Percent of Faculty Members)

Experience and Education	Non-Vocational[a]	All Vocational	Business/ Office	Health	Computer	Engineering/ Science/ Tech.	Trade/ Industry
More than 20 years' experience	23	17	20	11	9	31	19
Highest degree							
Less than bachelor's	2	15	4	12	18	29	33
Bachelor's	10	36	36	35	37	29	39
More than bachelor's	87	50	59	52	44	43	28
Major[b]							
Specific academic	53	6	6	5	11	7	1
Specific occupational	15	71	75	75	70	74	63
Education	29	22	18	20	16	17	34

[a] Non-vocational faculty comprise teachers in all fields other than vocational education. Most of them are academic teachers.

[b] Specific academic majors include mathematics, sciences, social sciences, letters, humanities, communications, art, and design. Specific occupational majors include the occupational categories in the column heads. A small "other" category is excluded from the types of majors.

Source: Hoachlander, E.G., et al. (1992).

As at the secondary level, two-year postsecondary vocational faculty have less formal education than their academic counterparts. This is especially the case for faculty in postsecondary trade and industry programs, probably for the same reasons discussed above.

Surprisingly, the distribution of highest degrees for two-year postsecondary vocational faculty is very similar to that for secondary teachers. Some 15 percent have less than a bachelor's degree, as compared to 12 percent of secondary teachers; 36 percent have BAs, as compared to 39 percent of secondary teachers; and 50 percent of both groups have advanced degrees. Non-vocational faculty at the postsecondary level have considerably more education than at the secondary level.

Considered by subject field, between 43 and 59 percent of two-year postsecondary vocational faculty have advanced degrees, with one exception: Only 28 percent of those in trade and industry have advanced degrees, and one-third of them have less than a bachelor's degree. Thus, the proportion of postsecondary trade and industry faculty without bachelor's degrees (66%) is higher than that of secondary T&I teachers (45%). It also seems odd that a relatively high proportion of teachers in the engineering/science/technology field (29 percent) have less than a bachelor's degree.

In the case of secondary teachers, we saw that outside occupational experience and credentials take the place of formal education, especially in trade and industry programs. We do not have data on the occupational experience of two-year postsecondary faculty, but the fact that vocational faculty tend to have less formal education, especially in trade and industry, suggests that they may be more likely than others to have nonteaching work experience and occupational credentials.

A substantial majority of postsecondary vocational faculty (71%) were trained in specific occupational fields, while a bare majority (53%) of non-vocational faculty were trained in specific academic fields, such as math, English, and the social sciences. If teachers' education in specific subjects enhances their performance, postsecondary vocational faculty have an advantage in this respect. The proportion of vocational faculty with specific occupational training is fairly constant across subject matter fields, except for those in trade and industry. A smaller proportion of trade and industry faculty have specific training than do other vocational teachers and a larger proportion were general education majors.

The data in Table 3.7 tell us something about the relative status and salaries of non-vocational and vocational faculty members in two-year postsecondary institutions. At the time of the survey (1988), vocational faculty had somewhat lower formal status than other faculty in public two-year postsecondary institutions. They were less likely to be professors and more likely to be assistant professors, instructors, or lecturers. Moreover, at each level of rank except one, the average salaries of vocational faculty were slightly lower than those of other faculty (the exception is at the professorial level). The combination of lower status and lower pay within rank meant that the mean salaries of vocational faculty were lower than those of other faculty members ($30,953 vs. $33,460).

Two qualifications to these findings should be noted. First, some two-year institutions do not have rank. The usual academic ranks were not applicable to 25 percent of non-vocational faculty and 14 percent of vocational faculty, and no salary data are available for these categories. Second, we do not have information on the part-time/full-time status of faculty by rank. Since part-time pay is lower than full-time, the proportion of part-time faculty at a given level will affect the mean salary at that level.

Table 3.7
Rank and Salary of Two-Year Postsecondary Faculty

Rank	Percentage of Faculty		Average Salary ($)	
	Non-Vocational	Vocational	Non-Vocational	Vocational
Professor	12	7	38,887	39,972
Associate Professor	5	6	36,103	33,247
Assistant Professor	5	8	31,165	29,263
Instructor	48	59	30,412	29,247
Lecturer	2	4	—	—
Other	3	3	—	—
Not applicable	25	14	—	—

Source: Hoachlander et al., (1992), pp. 127, 129.

THE RELATIVE VALUE OF OCCUPATIONAL EXPERIENCE AND FORMAL EDUCATION

The fact that vocational education teachers in general, and trade and industry teachers in particular, have less formal education and more occupational experience than others has been an issue for some time. There is controversy about whether T&I teachers, or any teachers, should be able to teach in public schools without a college degree. Historically, vocational educators have argued that work experience is indispensable for teaching students how to perform certain kinds of jobs. Indeed, it is hard to see how teachers who have never been carpenters or plumbers could teach carpentry or plumbing to students. The question is not whether any work experience is valuable, but how much is needed and what level of formal education is needed.

Lynch has reviewed the literature on this subject for the National Assessment of Vocational Education.[10] The review covered studies that related teacher preparation to several measures of vocational teaching quality: supervisory assessments of teacher performance and competency; student achievement; and teacher competency test scores.

The relation between occupational achievement and **supervisory assessments** of vocational teachers was examined in six studies identified by Lynch. Four found

either no relation or a negative relation between length of occupational experience and teacher performance. The authors of these studies concluded that a certain minimum of occupational experience — on the order of two to four years — is beneficial, but that additional experience has no positive effect on teaching performance. One study of Virginia's T&I teachers did find a positive association between occupational experience and assessed teacher competency,[11] but a subsequent study of these teachers found no association between the two variables.[12]

The relation between **vocational student achievement** and teachers' occupational experience was examined in four studies identified by Lynch. These studies found either no relation or a negative relation between the two variables. Three of the four also found that a limited amount of occupational experience was positively associated with student achievement, but that longer term experience was negatively related to it. Two studies that showed positive associations between teachers' occupational experience and vocational student achievement were subsequently criticized for failing to provide data to support the conclusion.

The relation between teachers' **tested occupational competencies** and their occupational experience was examined in five studies reviewed by Lynch. Three studies, using tests developed by the State of Pennsylvania, found no relation or a negative relation between years of occupational experience and teachers' scores on these tests. Two other studies used tests developed by the National Occupational Competency Testing Institute. One found positive relationships between occupational experience and tested competencies, varying with occupation; a second found no relationships. Lynch could find no validation studies relating NOCTI test scores to teacher performance, and it is unclear whether the Pennsylvania tests have been validated.

An experiment in which applicants to New York City career magnet programs were randomly selected or rejected found that students in magnet programs that use more teachers recruited from industry had higher absenteeism than control students. Poor readers in the magnet programs with more teachers recruited from industry also earned fewer credits than poor readers who applied for these programs but were rejected.[13]

The relations between teachers' formal education and a variety of other outcomes were examined in 20 studies reviewed by Lynch. One found that trade and industry teachers who had degrees in teacher education performed better on the core battery of the National Teacher Examination than did those with alternative occupational experience. Two found positive relations between number of college credits earned by T&I teachers and their performance as assessed by their supervisors.

Seventeen studies in one recent literature review[14] related the post-school labor-market performance of students to a number of school quality measures, one of them being the formal education of teachers. (This inquiry focused on all high school students, not specifically vocational students.) The authors concluded, among other things, that "better educated teachers produce more effective employees."

Many of the studies reviewed here have methodological problems, chief among them the lack of control on self-selection into different kinds of preparation for vocational teaching. Nevertheless, the findings across many studies conducted over a period of 40 years suggest that extensive occupational experience confers no particular benefits on vocational teaching, although a few years' experience has a positive impact. Formal postsecondary education is positively associated with desirable teacher and student outcomes. In short, trade and industry teachers would be better off with more formal education and less occupational experience.

PREPARATION OF VOCATIONAL TEACHERS IN COLLEGES AND UNIVERSITIES

Vocational teacher education programs in colleges and universities are shrinking in the face of budget pressures and declining secondary vocational enrollments. As Lynch observes,

> Evidence is abundantly clear that at [the]. . . national level, enrollments in teacher education have declined significantly in most vocational subject areas, programs have been eliminated, and. . . teacher educators, although still employed at the universities, have found work in other than vocational education.[15]

In program after program, the picture is the same[16]:

- A 62 percent decline in newly qualified agriculture teachers between 1975 and 1990.
- A 37 percent decrease in the number of institutions offering marketing education since 1989.
- A 15 percent decrease in graduates of home economics education programs between 1987 and 1989.
- A 70 percent decline in technology/industrial arts education majors over the last 20 years.

Only in the area of vocational special needs has there been an increase in enrollments of teacher-trainees (14% over three years), no doubt reflecting the changing composition of vocational enrollments discussed in Chapter 1.

Coursework of Prospective Vocational Teachers

We saw earlier that vocational teachers are less likely than their academic counterparts to have bachelor's degrees. The majority have completed college, however, and it will be useful to learn what kind of courses prospective vocational teachers take in colleges and universities. How well prepared are they to teach integrated academic and vocational education?

A recent analysis of the transcripts of vocational teachers who received baccalaureates from 22 southern universities[17] found that 30 percent of their coursework in general studies (including the liberal arts) was transferred from other institutions, presumably community or technical colleges for the most part. Almost all of it (92%) was completed in lower division courses in the freshman and sophomore years. Further, this coursework was more concentrated in the social sciences, humanities, and English than in math and science. Vocational graduates of these programs have completed an average of eight credits in math/computers — roughly, a one-semester course in math and one computer course — and 10.5 credits in the natural sciences. The authors of this analysis comment that there may be deficiencies in the undergraduate programs of vocational teachers.

> It seems clear that, in general, beginning vocational education teachers did not pursue a rigorous liberal arts program . . .. Moreover, T&I teachers took significantly fewer courses in these academic areas in their preservice preparation than any of the other beginning vocational teachers.[18]

They also note that

> This is of particular concern if these graduates begin their careers by working with teachers of mathematics, science, and other general areas in the integration of academic and vocational education.

Similarly, Lynch observes that

> It can generally be assumed that [graduates receive] industry- or business-based occupational experience, preparation to work with at-risk or special needs students, a course in computer applications, preparation on advising vocational youth organizations, preparation to work with business-or industry-based groups, and experience in a pre-service teaching clinical environment. It is less

> likely that they [receive] instruction in integrating basic skills with vocational education.[19]

Lynch notes that other researchers have also concluded that "vocational education teachers are not prepared to teach basic skills in integrated education programs."

Informing Prospective Teachers About Perkins Reforms

Postsecondary institutions providing preservice education for vocational teachers have begun to take some steps to inform students about the Perkins Act. Information from 20 universities affiliated with the University Council on Vocational Education indicates that most institutions are working within existing courses to increase awareness of integration and tech prep. These efforts typically involve the use of video and printed materials, guest speakers, field trips, teleconferences, and applied academics materials. A few universities have developed credit courses in integration and tech prep.

Whether these changes do more than scratch the surface, however, is open to question. One participant in a tech-prep focus group of state administrators of vocational education observed that:

> Nothing is being done at the university level. At every conference I go to, I ask how many people in the audience [are involved in tech prep]; they are just not involved. On a preservice basis, it's business as usual . . . . They don't even know what we are talking about when we say tech prep.[20]

Postsecondary institutions with preservice vocational programs seem to be more active in promoting work experience and links with employers. Most have co-op or other work experience programs. Five of the 20 universities affiliated with the University Council on Vocational Education have new courses on apprenticeship, education-labor force linkages, or work-based education programs. Six others have infused school-to-work transition issues in their work experience programs.[21]

Useful as this information may be, however, it will not provide the solid academic base that prospective vocational teachers need to help integrate curricula in high schools. That will require a reconsideration of the college graduation requirements for these students.

THE DEMAND FOR VOCATIONAL EDUCATION TEACHERS

The Perkins Act, as noted earlier, calls for an assessment of the "shortages" of vocational and academic teachers. Table 3.8 addresses this question with SASS

Table 3.8
Indicators of Demand for Teachers in Public Secondary Schools

Subject Area	Percent of Schools With Teaching Vacancies	Of Schools With Vacancies, Percent Saying Vacancies Very Hard to Fill	Percent of All Schools With Hard-to-Fill Vacancies
English	42.1	4.8	2.0
ESL	9.0	35.2	3.2
Biological Science	25.2	14.6	3.7
Vocational Education	27.5	17.4	4.8
Math	39.6	12.6	5.0
Physical Science	26.5	19.3	5.1
Foreign Language	26.1	27.0	7.0
Special Education	37.5	27.1	10.2

Source: 1990–91 Schools and Staffing Survey

data showing the percentage of secondary schools with vacant teaching positions in a number of different fields; the proportion of those that said it was very difficult or impossible to fill the vacant positions; and the resulting proportion of schools that had positions that were very difficult or impossible to fill (the product of the first two columns).

The proportion of districts with vacancies in vocational education was about average — less than the percentage of schools with vacancies in English, math, and special education, more than the percentage of schools with vacancies in English-as-a-Second Language.[22] Similarly, the proportion of schools with vacancies in vocational education that found those vacancies *very difficult* or *impossible* to fill was also in the middle range of the various subjects.

Consequently, the same is true of the proportion of **all** secondary schools with hard-to-fill positions. An estimated 5 percent of all schools had hard-to-fill positions in vocational education, about the same as the proportions for math and the physical sciences. Comparable proportions in other subjects ranged from 2 to 10 percent. The subject in which there clearly was a shortage, relative to other subjects, was special education.

A review of the literature on teacher supply and demand conducted for the National Assessment by Henke finds no present or likely future shortages of vocational teachers:

> The existing literature offers no evidence of a national teacher shortage in the fields that have been studied, although regional and local shortages may exist in particular fields. . . . Furthermore, despite the declining number of vocational education teacher training programs, . . . no extant data or projections justify the concerns some have raised regarding future shortages of vocational education teachers. Because teacher attrition generally has declined in recent years and enrollments at both the secondary and postsecondary levels are not expected to increase dramatically in the next decade, the likelihood of significant vocational education teacher shortages seems small indeed.[23]

Nevertheless, the review notes two possible developments that could contribute to vocational teacher shortages in the future. First, the recent wave of occupationally oriented reforms in secondary education — the emphasis on workforce preparation and the school-to-work transition — could increase the demand for vocational teachers. (See Chapter 1, Volume III for a discussion of these reforms.) Second, low morale among vocational teachers and dissatisfaction with having to teach students whose achievement levels are decreasing over time may reduce the supply. (See Chapter 1 of this volume.) These two possible developments are unlikely to go hand in hand, but they could occur at the same time in different locations.

While one cannot discount the possibility that there may be vocational teacher shortages in the future, no systematic data suggest that this will occur.

CONCLUSION

The field of secondary vocational teaching faces some significant problems. Paralleling student enrollments, the numbers of vocational teachers are declining, while the numbers of other teachers are increasing. College and university programs in vocational teacher education are being cut back, evidently in response to reduced demand. Hence, there is no evidence of any shortage of vocational teachers.

Secondary vocational teachers tend to have less formal education than others, but they have more related occupational experience and credentials. This emphasis on occupational experience in lieu of formal education is concentrated in trade and industrial education, where it has been guided by state policies in a tradition going back to the Smith-Hughes Act of 1917.

Postsecondary vocational faculty also have less formal education than others, although they are more likely to have subject-specific training. In fact, the educational level of postsecondary vocational faculty is about the same as that of secondary vocational teachers. Those in trade and industry have even less formal education than their counterparts in secondary schools.

The chapter examined studies bearing on the relative emphasis that should be accorded occupational experience and formal education in certifying vocational teachers, especially those in trade and industry. On balance, substituting occupational experience for formal education does not seem to be a good idea. The evidence suggests that more than two to four years of occupational experience does little to improve teaching and may be counterproductive. On the other hand, formal postsecondary education is associated with positive teaching outcomes.

We recommend that state certification requirements for all new vocational teachers, including those in trade and industry, include attainment of a bachelor's degree and preparation in teaching methods. Depending on the educational field taught, some occupational experience should also be required. Postsecondary institutions, whose T&I teachers are even less likely than those at the secondary level to have completed college, should also require bachelor's degrees of all new occupational faculty. The fact that most vocational teachers, and over half of those in secondary trade and industry programs, already meet these standards suggests that changing the requirements should not make it too difficult to recruit qualified teachers.

Vocational education is changing as a result of reform activities at the federal, state, and local levels. (See Chapter 1, Volume III.) States and localities are beginning to respond to the reforms called for in the Perkins Act and the federal School-to-Work initiative. Some states are undertaking fundamental reforms of secondary education to better prepare non-baccalaureate students for the workforce. **Assuming these reforms continue to spread and take on substance, the ways in which vocational and academic teachers are prepared for their jobs will have to change.**

The reforms that teachers will need to be prepared for include:

An orientation toward workforce preparation for a large part of the secondary student body;

Emphasis on developing cognitive and broad technical skills in an integrated context;

Preparing non-baccalaureate students for postsecondary education in community colleges and technical institutes through arrangements such as tech-prep programs; and

Student participation in work experience programs.

If such reforms are to be effected, there will have to be substantial changes in the way teachers are prepared in colleges and universities. The Perkins Act should support the pre-service, as well as in-service, preparation of teachers for integrated, contextualized education oriented toward work. Academic teachers will need more familiarity with the world of work, possibly through courses in business and technology, or through work experience outside of teaching. They will also need to learn how to apply features of their academic disciplines to work-related subjects. Vocational teachers will need more and more rigorous courses in the liberal arts. For many prospective vocational teachers, a greater emphasis on math and computers will be required. Beyond these changes in teacher education programs, states will need to tailor the preparation of their teachers to particular elements of reform in their systems.

ENDNOTES

1 Section 403 (b) (3).

2 Ibid.

3 Apart from the timing of the two surveys, there are important differences in their design. For this chapter, the most important difference is that the National Assessment Teacher Survey included only those vocational teachers who were training students for occupations, while the SASS included all vocationally oriented teachers. In particular, the SASS included all home economics and industrial arts teachers, while the Teacher Survey included only the teachers of those courses specifically designed to prepare students for occupations (e.g., commercial food preparation in occupational home economics). The occupational and non-occupational vocational teachers in the SASS cannot be distinguished. Thus, the characteristics associated with teaching for occupations are more pronounced among the National Assessment teachers than among the SASS teachers. This chapter and the next rely mainly on data from the Teacher Survey, so the teachers referred to are primarily those who teach occupational vocational courses. Only the SASS data will refer to non-occupational teachers as well.

4 Hamermesh, D.S., & Rees, A. (1984), *The Economics of Work and Pay*, Harper and Row.

5 It is also interesting that teachers in vocational high schools are about twice as likely as other teachers to have had related work experience in the Armed Forces: 12% vs. 6%. The tendency of vocational schools to hire former military members is of particular interest during this time of reductions in military manpower. Virtually all enlisted personnel have high school diplomas; many have some college, often acquired in the military; and most have acquired vocational-technical training and work experience in the military.

6 Relatively high proportions of health occupation teachers also lack college degrees, but their numbers are small.

7 Lynch, R.L. (1993), *Vocational Teacher Education in U.S. Colleges and Universities and Its Responsiveness to the Carl D. Perkins Vocational and Applied Technology Education Act of 1990* p. 11, University of Georgia, School of Leadership and Lifelong Learning.

8 Ibid., p. 17.

9 Russell, H., et al. (1990), *Faculty in Higher Education Institutions*, U.S. Department of Education, Office of Educational Research and Improvement; Hoachlander, E.G., et al. (1992), *Vocational Education in the United States, 1969–1990*, U.S. Department of Education, National Center for Education Statistics.

10 Lynch, R. (1994), *Occupational Experiences as the Basis for Alternative Teacher Certification in Vocational Education*, University of Georgia, School of Leadership and Lifelong Learning.

11 Schwartz, N.K. (1974), *Effects of Trade Experience, Teaching Experience, and Professional Education on the Classroom Teaching Performance of Secondary School Vocational Industrial Education Instructors.* Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University. Cited in Lynch (1994), p. 8.

12 Mullins, A.W. (1993), *The Relationship Between Desirable Teacher Competencies and Years of Trade Experience, Years of Teaching Experience, and Teacher Training of Trade and Industrial Teachers in Virginia*, Unpublished doctoral dissertation. Virginia Polytechnic Institute and State University. Cited in Lynch (1994), p. 8.

13 Memorandum from Robert Crain and Robert Thaler, June 1994, Teachers College, Columbia University, New York City.

14 Johnson, A.W., & Summers, A.A. (1993), *What Do We Know About How Schools Affect the Labor Market Performance of Their Students?* University of Pennsylvania, National Center on the Educational Quality of the Workforce. Cited in Lynch (1994), p. 12.

15 Lynch (1993), pp. 5–6.

16 Ibid., pp. 6–11.

17 Finch, C.R., et al. (1992), *Course-Taking Patterns of Vocational Teacher Education Baccalaureate Degree Recipients: Teacher Preparation, General Education, and Teaching Content Area Studies*, National Center for Research in Vocational Education, in the literature review by Lynch, (1993), pp. 20–22.

18 Ibid., p. 22.

19 Lynch (1993), p. 22.

20 National Assessment of Vocational Education Focus Group on Tech Prep, meeting of the National Association of State Directors of Vocational and Technical Education, Kansas City, September 1992.

21 Lynch (1993), pp. 28–34.

22 The probability that a vacancy will occur in a particular field in a school is a function of the number of teachers in that field in that school. The SASS data do not permit these estimates, but calculations at the aggregate teacher level indicate that taking number of teachers into account does not substantially change the conclusions drawn from Table 3.8, except that shortages of special education teachers are much more pronounced than the table suggests.

23 Henke, R. (1994). *The Supply and Demand of Vocational Education Teachers: A Review of the Literature*, p. 2, MPR Associates.

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CHAPTER 4

PROGRAM REQUIREMENTS AND COURSES IN SECONDARY VOCATIONAL EDUCATION

INTRODUCTION

Having discussed the preparation and qualifications of vocational teachers, we turn to an examination of program requirements and courses in secondary vocational education, to assess their consistency with Perkins goals, their role in preparing students for work, and some aspects of their role in secondary education. The chapter draws on data from the Omnibus Surveys, the Community Case Studies, the National Assessment of Vocational Education Teacher Survey, and the National Education Longitudinal Study's (NELS) 1992 Followup Survey. (These data sources are discussed in the Technical Appendix.)

The chapter first examines completion requirements in secondary vocational programs, with reference to the Perkins standard that recipient programs should comprise a coherent sequence of academic and vocational courses. It then looks at students' assessments of their preparation for jobs in the future.

After describing some of the teaching and learning activities in vocational classes, the chapter turns to course content. It examines computer training, cross-curricular content (e.g., academic subject matter in vocational classes), and applied academics in vocational education. Cross-curricular content is important because of its potential to facilitate the Perkins goal of integrating academic and vocational education.

The chapter also describes and/or assesses some other aspects of education in vocational classes — the assignment of homework, factors in grading decisions, and methods of measuring student performance.

VOCATIONAL PROGRAM REQUIREMENTS

Program requirements establish criteria for entering and completing vocational programs, among other things. In so doing, they determine much of the subject matter a vocational student learns. Our Community Case Study and Omnibus Survey data provide some information on program requirements. Course materials collected in the 20 case study sites contain information on prerequisites for vocational courses. In addition to this information, the Surveys contain data on completion requirements for vocational programs.

An examination of the course materials from the case study sites indicates that vocational courses usually do not have prerequisites. They are generally open to all students in a given grade range. This "open admissions" approach is often

seen as necessary to help maintain vocational enrollments, and is often defended on equal access grounds. At the same time, this approach foregoes an effective means of linking vocational courses with other relevant courses, both vocational and academic. Easy-entry, stand-alone vocational courses may serve the interests of students who want to explore occupational areas, acquire a limited set of specific skills, or fill out an otherwise demanding schedule with an easier course. But they do not facilitate the concentration of vocational courses that is associated with better employment outcomes (see Chapter 6), nor are they consistent with the development of coherent sequences of academic and vocational courses that the Perkins Act requires of its Title II fund recipients.

The completion requirements of secondary vocational programs are also a matter of concern. Table 4.1 shows how districts define completers in their vocational programs.

Table 4.1
Districts' Vocational Completion Requirements by Urbanicity
(Percent of Districts, Students)

	All Districts	All Students	Urban Districts	Suburban Districts	Rural Districts
No definition of completer	34	16	16	24	42
Minimum number of courses	13	11	12	14	12
Course concentration	54	72	69	59	49
Course sequence	35	53	54	39	32

Source: Omnibus District Survey, Version A

Some 54 percent of districts encompassing 72 percent of students require a concentration of vocational coursetaking for program completion (e.g., three or more courses in business education). A smaller proportion, 35 percent of districts encompassing 53 percent of students, require a **sequence** of vocational courses (e.g., Introduction to Technology, Electronics 1, Electronics 2 — sequencing is a subcategory of concentration). Some 34 percent of districts with 16 percent of students have no completion requirements, and 13 percent of districts with 11 percent of students require completion of a minimum number of vocational courses, regardless of occupational area.

Rural districts are the least likely to require a concentration or sequencing of courses and the most likely to have no definition of a completer. Many of these districts are small and tend not to have fully developed vocational programs. Urban districts, on the other hand, are the most likely to require concentration and sequencing, and the least likely to lack a definition of a vocational completer. Suburban programs fall in between.

If we regard course concentration in an occupational area as the minimum necessary to prepare a vocational student for work, we can conclude that most students have access to vocational programs that require at least the minimum for program completion. Nevertheless, a significant minority of students (28%) do not have such access, especially students in rural areas, where higher proportions of students take vocational courses.

The Perkins Act sets a higher standard than course concentration, however, calling upon Title II recipients to develop coherent sequences of vocational **and** academic courses. Only a third of the districts, serving about half of the students, require a sequence of **vocational** courses. Among Title II funded districts, to which the Perkins Act applies, 42 percent of districts including 55 percent of students require a vocational sequence.

Thus, just under half of all secondary students lack access to programs that require a sequence of vocational courses (47% of students in all regular districts, 45% in Title II funded districts). Clearly the proportions lacking access to a coherent sequence of both academic and vocational courses are higher, although we do not know how much higher. Thus it is evident that districts have considerably more work to do in order to meet the Perkins standard for program coherence.

PREPARING HIGH SCHOOL STUDENTS FOR WORK

A key measure of the effectiveness of vocational programs is how well they prepare students for work. Chapter 6 looks at the employment outcomes of vocational education, but here we examine students' own assessments of their preparation.

As a rule, students consider vocational courses more useful but less demanding than academic courses. For example, among surveyed students taking specific kinds of courses, 58 percent said their business/vocational courses were "very useful"; 53 percent said the same of their English courses; 47 percent, their math courses; 28 percent, their science courses; and 18 percent, their social studies courses. In the same survey, 54 percent of students characterized their vocational courses as "very easy," while 31 percent characterized their English courses in that way, and 23–26 percent, their science and math courses.[1]

Traditionally, secondary vocational programs have trained students for entry-level jobs after they leave high school. However, entry-level jobs can quickly become dead-end jobs for those who cannot use them as stepping stones to better positions. While we have no data on how well students think they are prepared for work immediately after high school, the NELS survey contains student assessments of their preparedness for jobs later on. Table 4.2 shows how well four different groups of students think they are prepared for jobs they might have five years after graduation.

Table 4.2
Seniors' Assessment of Their Skill Needs for Jobs Five Years After Graduation (Percent in Each Type of Program)

	College Prep	General	Vocational Concentrators[a]	Vocational Specialists[b]
Enough skills now for job five years from now?				
Yes	4	11	14	11
No	96	89	86	89
Of those lacking skills, percent needing:				
Job training/ apprenticeship	24	21	26	17
Work experience, on-the-job training	3	9	20	21
2- or 4-year college	72	61	37	49
Vocational/trade school	1	10	16	12

NOTE: Percentages do not add to 100 because of rounding.
[a] Those taking three or more courses in an occupational subject.
[b] Those taking four or more courses in an occupational subject, at least two of which are advanced courses.

Source: 1992 NELS

Around 9 out of 10 students say they do not have the skills needed for a job five years after graduation. Vocational students are not much different from others in this respect. Of those saying that they need additional skills, a majority in all groups think they need some postsecondary education, either in college or technical school. Most of those oriented toward postsecondary education say they need to attend a two-year or four-year college. Sizable minorities, ranging from 27 percent to 46 percent, say they need some form of work-based training. Formal job training/apprenticeship is the preferred option among these work-oriented students, except for the vocational specialists. Not with standing this broad preference for postsecondary education, vocational students are more likely than others to say they need work experience and less likely to say they need postsecondary education.

The NELS data do not tell us whether students think their high school programs adequately prepare them for entry-level jobs. What they do tell us is that very few students, vocational or other, think their programs adequately prepare them for jobs beyond the entry level. The great majority of students think they will need additional education and training, and most of them are looking to postsecondary institutions to provide it.

CLASS CHARACTERISTICS

The National Assessment of Vocational Education Teacher Survey collected information on many characteristics of vocational classes, including grade level, the size and length of classes, and instructional practices. Each teacher was asked to provide information on a specific class that he or she taught.[2]

Basic Features of Vocational Classes

The academic classes on which the teachers reported were fairly evenly distributed across grades 9, 10, 11, and 12, while the vocational classes were more heavily concentrated in grades 11 and 12. Some 45 percent of the academic classes were in these two grades, as compared to 62 percent of all vocational classes and 74 percent of vocational classes in vocational schools.

In vocational programs, we expect to find somewhat lower teacher/pupil ratios because the availability of equipment may limit the number of students a class can accommodate, and the presence of equipment may require more individual supervision of students. Also, declining enrollments may result in smaller class sizes. In the present sample, the mean size of the vocational classes surveyed was a little smaller than that of the academic classes — 21 as compared to 24 students. The difference is statistically significant ($p<.05$), but not dramatic. It may confer a slight quality advantage on vocational classes, inasmuch as smaller classes give teachers better control and students more personal attention. Consistent with this observation, students in the NELS dataset whom we classify as vocational

specialists are more likely than other students to say that their teachers are interested in students.

Classes in vocational schools are typically longer than classes in comprehensive high schools. Academic and vocational classes in the comprehensive schools average 5 hours a week, or one hour a day, fitting conveniently into the master schedule. However, the classes in vocational schools average 14 hours a week (almost 3 hours a day). Most of these institutions are area vocational schools where students are sent from comprehensive high schools for half of each day. There they receive a little less than 3 hours of instruction daily, on average.

Instructional Practices

Teachers in the survey provided information on the teaching and learning activities that took place in the designated classes when they met most recently before the survey administration. Table 4.3 shows their responses to these questions.

Table 4.3
Activities in Most Recent Class
(Percent of Teachers Reporting Each Activity)

Activity	Academic Classes	Vocational Classes		
		All	Comprehensive High Schools	Vocational Schools
Lecture	75	77	75	83
Students writing a paragraph or more	54	42	41	42
Test or quiz	42	43	40	58
Students using computers	13	40	41	36
Students using instruments, tools, or equipment	37	73	70	88

Source: National Assessment of Vocational Education Teacher Survey

When we think of traditional academic classes, we usually imagine a teacher in front of the class lecturing, or students at their desks writing or taking tests. When we imagine vocational classes, we may imagine students working at some occupational task, whether styling hair or working on a car engine, with the teacher moving around the room monitoring student activities, providing advice and instruction as needed. To what extent are the activities reported in our survey classes consistent with these images?

First, let us look at some classroom activities traditionally regarded as "academic," especially those involving verbal instruction and students' use of pencils and paper. Such activities include lectures, in-class writing assignments, and tests or quizzes. The survey data indicate that the occurrence of these activities in academic and vocational classes does not conform to the popular image of vocational education as strictly "hands-on" instruction.

Lectures were very common in both academic and vocational classes, occurring in around three-quarters of the classes. Surprisingly, they were most common in the vocational schools. Some 83 percent of the classes in vocational schools (and incidentally, the same proportion of trade and industry classes) involve lectures, though that is not the only activity that occurs.

In-class writing assignments were also fairly common in both types of classes. Vocational classes were less likely than academic classes to require students to write a paragraph or more, but the difference (42% versus 54%) was not dramatic. Tests or quizzes occurred about as frequently as writing assignments, in a little over 40 percent of both academic and vocational classes. Again, we find more of this traditional "academic" activity in vocational high schools (58%) than in academic classes (42%).

Of course, the survey data cannot tell us whether the lectures were interesting or boring, the writing assignments basic or advanced, the tests difficult or easy. However, the evidence here indicates that these traditional "academic" activities occur at rather similar rates in academic and vocational classes, and that classes in vocational schools especially have more of them than one might expect.

It should be emphasized that these are not the only teaching activities that occur in classes. The longer classes in area vocational schools especially allow for a wide range of activities. Our case studies and site visits provide many examples of vocational classes beginning with a lecture and then proceeding to work on occupational projects.

"Hands-on" activities are usually regarded as the domain of vocational education, and here the data do support the prevalent view. The survey asked questions about the use of computers and of instruments, tools, and equipment in the classroom. Although the use of computers for written communication, mathematical calculations, and the like would seem to be a logical part of

academic education, computers are not usually available in academic classes. Only 13 percent of these classes involved students using computers on a particular day. In contrast, 40 percent of the vocational classes in the sample involved students using computers.

In secondary schools, the computers tend to be located in vocational programs, particularly in business and office education. However, these computers are often available to students for academic coursework. It is not unusual to see students writing English or history papers on word processors in the business classrooms.

We would expect instruments, tools, and equipment to be used extensively in vocational programs and in the lab sciences. According to the teachers' reports, this occurred in almost three-fourths of the vocational classes and a little more than one-third of the academic classes sampled. Teachers in vocational schools were especially likely to report students involved in such activities: 88 percent of them did so. As observed earlier, area vocational schools were built in part to accommodate specialized equipment.

These measures do not indicate broad quality differences between academic and vocational education. Lectures are widely used in both types of classes; tests and quizzes are fairly frequent, especially in vocational schools. Vocational classes are less likely to involve writing assignments but more likely to involve the use of equipment, including computers.

The Use of Computers in Vocational Classes

As we saw in the Introduction to this volume, computers are becoming ever more present in the workplace, and workers who use computers on the job tend to earn more than comparable workers who do not. The importance of computer literacy in the labor market has been recognized for some time. Over a decade ago, the National Commission on Excellence in Education recommended that every high school graduate have at least one-half year of computer science.[3] Yet today, less than one-third of high school seniors meet this criterion.[4]

At the secondary level, computer use is concentrated in vocational education. As Table 4.4 shows, however, there is wide variation in use across different program areas. According to these Teacher Survey data, only 15–20 percent of the classes in agriculture, health, and occupational home economics involved computer use in the most recent class reported by teachers. In the middle range, 32–46 percent of the classes in marketing, T&I, and industrial arts entailed the use of computers. Computer use in business classes was higher, at 54 percent, and the fact that business is the largest vocational subject area means that many students receive computer experience in this program. However, the program that involves the most computer work is technical/communications education, where students used computers in 84 percent of the recent classes reported by teachers.

Table 4.4
Computers Used in Most Recent Class, by Subject Area

Vocational Subjects	Percent of Classes	Academic Subjects	Percent of Classes
Agricultural education	20	English	17
Business and office	54	Mathematics	15
Health occupations	19	Science	13
Marketing/distributive education	32	Social studies	3
Home economics	15	Foreign language	10
Trade and industrial education	37		
Technical/communications	84		
Technology education/industrial arts	46		
All vocational	40	All academic	13

Source: National Assessment of Vocational Education Teacher Survey

Data from the 1992 NELS Followup show that business and technical students take more computer courses than other students (see Appendix Table A-4.1). Some 72 percent of technical/communications students have taken at least one semester of computer science, as have 63 percent of business students. The proportions in other vocational fields range from 16 to 27 percent.[5] Moreover, a recent study by the International Association for the Evaluation of Educational Achievement has found that business education not only trains many students in computer use, but involves a range of computer applications, including word processing, programming, spreadsheets, and data analysis, among other things.[6]

We concur with the National Commission on Excellence in Education in recommending that every high school graduate be required to have at least one semester of computer training. We think that vocational education, and especially business programs, are positioned to provide the bulk of the training in this field.

POTENTIAL FOR ACADEMIC/VOCATIONAL INTEGRATION

Cross-Curricular Content

The emphasis of the 1989 National Assessment on using vocational education in part as a vehicle for academic instruction, the 1990 Perkins Act's emphasis on academics in vocational programs, and the broad emphasis in both documents on integrating academic and vocational education raise empirical questions

about the academic content of vocational classes and the occupational content of academic classes. The Teacher Survey data enable us to address these questions.

The data files contain information on the proportions of time spent in academic and vocational classes working on algebra, writing, biology, chemistry, physics, and occupational principles. We will focus on basic algebra, math beyond basic algebra, writing, and occupational principles, because these subjects are arguably the broadest and most likely to be involved in efforts to integrate curricula. On the assumption that more than 10 percent of class time is a minimum needed to convey much useful information on a subject, Figures 4.1 and 4.2 and Appendix Table A-4.2 show the percentages of classes spending this much time on the subjects.

Except in writing assignments, the proportions of all vocational teachers who devote the minimum amount of time to a given academic subject in their classes are quite small, 11 percent or less (Table A-4.2). The proportions working with these subjects for longer periods — 25 percent of the time or more — are smaller still; only 1 to 3 percent of vocational teachers spend this much time on basic algebra, more advanced math, biology, chemistry, or physics (data not shown).

Classes in trade and industry and the "other" vocational category (which includes technical/communications and agricultural education) tend to involve more math than all other subjects except math and science. Still, only one T&I class in five devotes more than 10 percent of the time to basic algebra problems, and only one in 14 devotes that much time to more advanced math. Although vocational classes do involve a fair amount of basic math (addition, subtraction, multiplication, division, percentages, fractions, decimals), few reach the level of Algebra I.

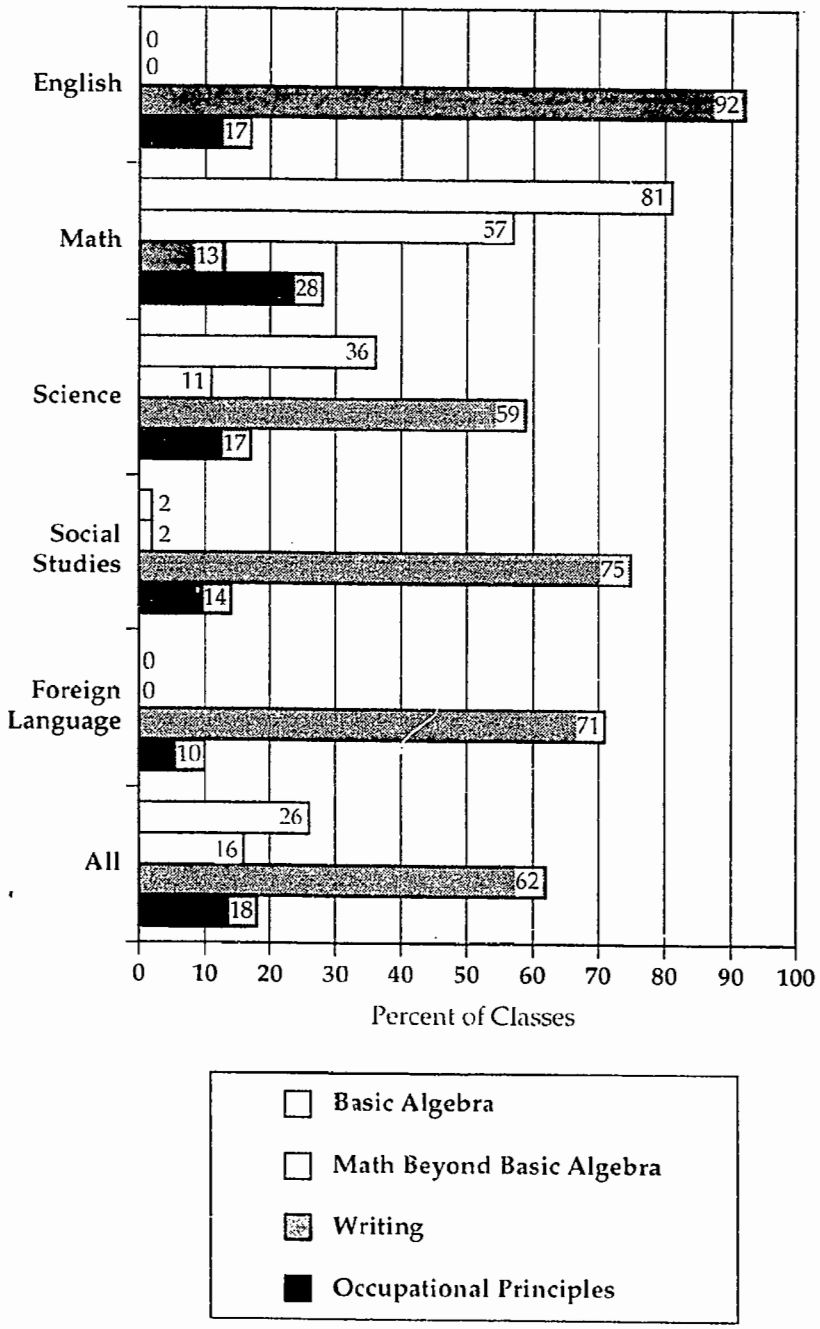
Another way of looking at the data is to ask not what proportion of vocational teachers spend a certain amount of time on a **specific** academic subject, but what proportion spend that much time on **any** academic subject. It turns out that a little over half of all vocational teachers (54%) spend at least 10 percent of their class time on academics of any kind, and only 14 percent spend at least 25 percent of their time on academics.

The modest amount of academic content in vocational classes is nevertheless greater than the occupational content of academic classes. Only 18 percent of academic teachers spend more than 10 percent of their class time on occupational principles, and only 4 percent spend more than 25 percent of their time on occupations. Math classes are more likely than others to give the minimum amount of time to occupations (28% do), perhaps because of the applied math classes being taught.

Figure 4.1
Percent of Vocational Classes Spending More Than Ten Percent of Time on Specified Subject

Source: National Assessment of Vocational Education Teacher Survey

Figure 4.2
Percent of Academic Classes Spending More Than Ten Percent of Time on Specified Subject



Source: National Assessment of Vocational Education Teacher Survey

Using class time spent on a subject as a measure of course content, there seems to be enough academic course content in vocational courses and (barely) enough occupational emphasis in academic classes to begin the process of integration. The present level of cross-curricular knowledge is compatible with an integrative approach that might designate academic courses as specific prerequisites for vocational courses, or with some limited amount of team teaching. However, a good deal more cross-curricular knowledge would be necessary, especially on the academic side, for integrated education that involved large-scale restructuring and a large portion of the student body. These findings reinforce the recommendation in Chapter 3 that both academic and vocational teachers be prepared to teach in integrated context, wherever large-scale restructuring is planned.

Applied Academics in Vocational Education

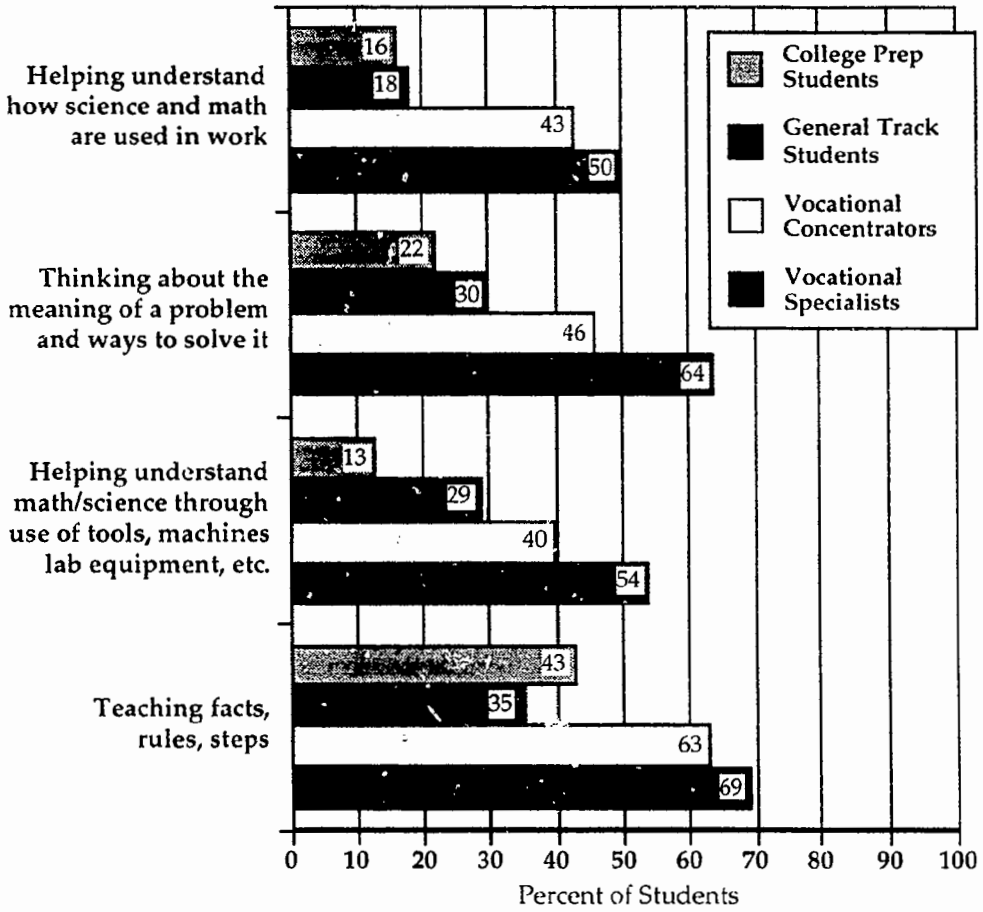
Applied academics are an important element in the integration of academic and vocational curricula. By the early 1990s, they were becoming a fairly standard part of many secondary vocational education programs. As of 1993, virtually all states (98%) were helping districts purchase applied academic materials from commercial vendors, and two-thirds of the secondary districts had purchased such materials for themselves (see Chapter 4, Volume III).

Vocational students in the 1992 NELS Followup also report the use of applied academic methods in vocational classes. Based on their coursetaking patterns, the respondents are categorized as college preparatory students, general track students, vocational concentrators (those taking three or more courses in an occupational subject), and vocational specialists (those taking four or more courses in an occupational subject, at least two of which are advanced courses).[7] Figure 4.3 shows the proportions of seniors who say their vocational classes place major emphasis on applied academics and on a more traditional teaching approach.[8]

Vocational students, particularly the specialists, are the most likely to report that their vocational courses place major emphasis on some forms of applied learning — in this instance (a) helping students understand how scientific ideas and mathematics are used in work; (b) thinking about what a problem means and the ways it might be solved; and (c) helping students understand mathematical and scientific ideas through the use of tools, machines, lab equipment, and so on. It seems that there is a substantial emphasis on applied academics in the more advanced vocational courses.

The vocational students are also the most likely to report that their current or most recent vocational classes place major emphasis on "facts, rules, and steps," the kind of rote learning that many education researchers think is not very effective (see Chapter 4, Volume III). Nevertheless, this type of instruction may be a necessary part of some vocational courses.

Figure 4.3
Student Perceptions of Emphasis in Vocational Courses
(Percent Reporting "Major" Emphasis)



Source: 1992 NELS

OTHER ASPECTS OF VOCATIONAL CLASSES

Homework

The assignment of homework is a traditional way of increasing the amount of time students spend on a subject, and there is research evidence that homework improves students' performance in school. [9] For this reason, we assessed the extent to which homework is assigned in academic and vocational classes. The Teacher Survey asked teachers about the amount and kind of homework they gave their students. Table 4.5 shows the responses.

Table 4.5
Homework Assignments of Se'ected Classes

Characteristics	Academic Classes	Vocational Classes		
		All	Comprehensive High Schools	Vocational Schools
Percent saying homework is assigned in this class	95	59	57	65
Percent saying homework was assigned on October 1, 1992	81	45	44	50
Mean hours of homework in last 5 school days	3	2	2	2

Source: National Assessment of Vocational Education Teacher Survey

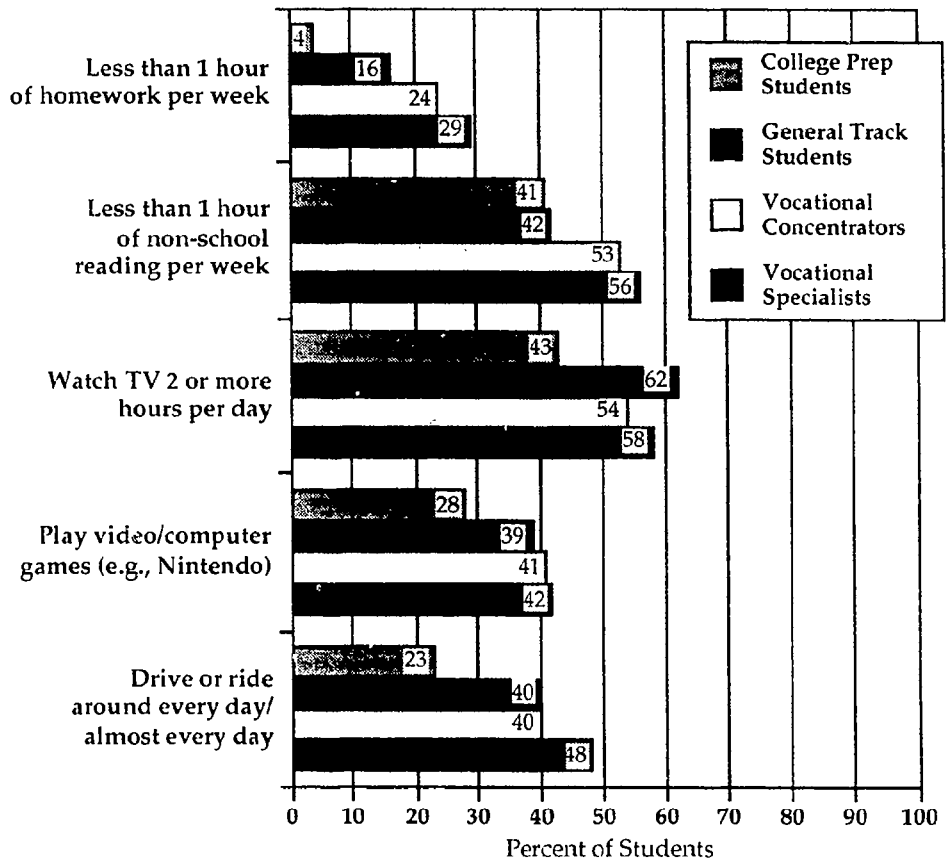
There are marked differences in the proportions of academic and vocational classes requiring homework. In almost all the academic classes (95%), teachers assign some homework. On the other hand, only 59 percent of vocational classes assign any homework.[10] (On October 1, 1992, homework was actually assigned in 81% of the academic classes and 45% of the vocational classes.)

On average, vocational classes were about three-fifths as likely as academic classes to have homework. The amount of homework assigned in vocational classes is about two-thirds the amount assigned in academic classes (an average of two hours a week in vocational classes and three hours in academic classes that assign it). By multiplying the three-fifths and the two-thirds, we can arrive at a rough measure of the relative homework demands made on students in the two kinds of classes: On average, vocational students are assigned about 40 percent as much homework as academic students.

There is also a difference **among** vocational classes in different kinds of schools in the tendency to assign homework. Teachers in vocational schools are more likely to require at least some homework than vocational teachers in comprehensive high schools, although the average amount of homework is the same. By program area, T&I classes are the least likely to require homework; only about half (52%) of them do so. (The *Interim Report* described the type of homework assigned in vocational and academic classes.[11])

Findings from the NELS survey are consistent with the teachers' reports. Figure 4.4 shows how much homework vocational and academic students report doing, and some of the other ways they spend time outside of school.

Figure 4.4
Student Activities Outside School



Source: 1992 NELS

Vocational students, and particularly the specialists, do less homework than college prep students, and they also do less outside reading. On the other hand, they watch more TV, are more likely to play video or computer games such as Nintendo, and are more likely to spend time driving or riding around in cars. General track students tend to do more homework and reading outside of school than vocational students. They also spend a little more time watching TV and are about as likely to play computer games or ride around in cars.

The point here is not that vocational students are less serious than others — for one thing, they are more likely to hold jobs while in high school. (For example, 71 percent of the vocational specialists in the 1992 NELS reported having jobs, as compared to 52 percent of college-prep students.) The point is that students in general, and especially those in vocational programs seem to have the time outside of school to do more homework than they are doing. We know that homework improves academic performance, and it is a reasonable guess that it improves performance in vocational courses as well. These considerations suggest that vocational teachers should assign their students more homework.

It is possible that increasing the amount of homework in vocational education would cause some marginal students to drop out of school. Part of the appeal of vocational courses seems to be that on average, they are regarded as easier than academic courses. Some students have told us they were staying in school because vocational education offered them an easier alternative than academics and because it required no homework.

This apparent tradeoff between homework and the chances of dropping out is part of a larger problem: If schools increase their expectations of students, some will not be willing or able to meet the expectations. While it is worthwhile trying to keep marginal students in school, we think that often too little is asked of students; that high but realistic expectations in interesting classes can help keep students in school; and that vocational programs should increase the amount of homework required of most students.

Factors in Teacher Grading Decisions

The factors that affect secondary students' grades are important because they reflect many of the underlying values in the classroom. They indicate what the teacher, and the educational system, value in student performance. The Teacher Survey asked teachers how much each of 18 different factors contributed to the grades of students in their classes. There are three types of factors: traditional academic skills, SCANS skills, and traditional vocational skills. The SCANS skills, designed by the Labor Secretary's Commission on Achieving Necessary Skills to prepare students for an internationally competitive workforce, are described in Appendix 4-A.

Vocational teachers are most likely to consider specific occupational skills and work readiness skills, such as general employability, self-management, and completing work on time, important in their grading decisions (Appendix Table A-4.3). Certain SCANS workplace competencies — ability to use technology, teamwork, and understanding systems — occupy a middle position in grading decisions.

The proportions of vocational teachers emphasizing academics vary widely, depending on the type of skills in question. Just under half of the teachers

consider applied academic and basic reading skills important; one-fourth consider basic math important; and smaller proportions consider other academic skills important in grading. While basic academics play a role in these decisions, advanced academics usually do not.

The SCANS skills play a fairly important role in the grades assigned by teachers in vocational schools. Yet the definition of these skills is relatively new, and their contribution to job performance is a subject that requires investigation. One empirical study of SCANS in the utilities industry finds that the "**foundation skills**," which emphasize academics, thinking skills, and personal character, are significantly related to job performance.[12] The "**workplace competencies**" (e.g., teamwork skills, understanding technological systems) are not significantly related to job performance, with one exception — information management, probably the most academic of these competencies.

Vocational teachers place a good deal of emphasis on some foundation skills (oral communication, creative thinking, self-management), but less on others (basic math, and especially writing). The workplace competencies, which do not seem to pay off in the utilities industry, receive moderate to heavy emphasis from vocational teachers. The one exception is research and reference skills, which are associated with better job performance, but which receive little emphasis in vocational (or academic) grading decisions.

Measures of Student Performance

This section looks briefly at the ways in which vocational and academic teachers measure student performance. While factors in grading decisions reflect the educational values of the class, performance measurement makes it possible to chart students' progress and identify areas where they need more work. The percentages of academic and vocational teachers who use various means of measuring student performance are shown in Table 4.6.

Teacher-developed tests account for the largest part of the grades given in both academic and vocational classes. Student classwork, and presentations or projects also play a prominent role in determining students' grades in both kinds of classes. There are, however, marked differences in the extent to which academic and vocational teachers rely on these and other measures.

Academic teachers rely more heavily on tests that they develop and on homework than do vocational teachers, especially those in vocational schools.

Vocational teachers, especially in vocational schools, emphasize performance in lab or shop much more than do academic teachers. In fact, in vocational schools performance is more important than any other measure as a determinant of students' grades .

Table 4.6
Mean Percent of Student Grades Based on Various Student Performance Measures

Measure	Academic Classes	Vocational Classes		
		All	Comprehensive High Schools	Vocational Schools
Teacher-developed tests	39	24	26	18
Student classwork	15	19	21	12
Performance in school lab or shop	3	17	14	28
Student presentations or projects	10	12	13	9
Attendance and/or class participation	5	8	7	14
Standardized tests	7	6	6	7
Student homework	14	6	6	4
Job performance at worksite	0	3	3	3
Student portfolios of best work	4	2	2	3
Other	2	2	2	3

NOTE: Percentages may not add to 100 because of rounding.

Source: National Assessment of Vocational Education Teacher Survey

Standardized tests play a small but significant role in students' grades in all classes. Portfolio assessments are not used much, accounting for only 2 to 4 percent of the grades in all classes.

CONCLUSION

In general, secondary vocational programs need more coherence than they currently have. Most programs have no prerequisites, and the typical completion requirement is a number of vocational courses in an occupational area, regardless of course level. The Perkins Act sets a higher standard for fund recipients: It calls for coherent sequences that include both academic and vocational courses. About

one-third of regular school districts, encompassing one-half of secondary students, require sequences of **vocational** courses for program completion. The proportion requiring sequences of vocational **and** academic courses is almost certainly smaller. Except in districts with few vocational offerings, it should be possible for vocational and academic educators to create the coherent course sequences called for in Perkins. Doing so would provide more of the educational structure and context that many students outside the college prep track seem to need.

While secondary vocational programs may prepare students for entry-level jobs, vocational students say they are not prepared for the jobs they expect to hold five years after graduation. In fact, the great majority of all secondary students feel that they need more skills for such jobs. Of these, the majority say they need some form of postsecondary education.

In some ways, secondary vocational classes resemble academic classes. Lectures, paper-and-pencil classwork, and tests are fairly common in both types of classes. However, vocational courses do place more emphasis on working with equipment, activities related to occupational projects, and performance in class.

Instruction in computer literacy is a strength of secondary vocational education and is concentrated mainly in business and technical courses. **Vocational education should build upon this strength, becoming the principal provider of computer literacy for all secondary students.**

Vocational programs have a modest amount of academic content, which tends to be basic rather than advanced. Applied academics seem to receive major emphasis in the more advanced vocational courses, though. Academic courses have very little occupational content, judging from the amount of class time spent on the subject. On the whole, there is enough academic subject matter in vocational education and barely enough occupational emphasis in academic classes to permit integration to begin. However, **large-scale integration will require much more cross-curricular content than exists now.**

Homework is a significant contributor to academic achievement, and arguably to vocational achievement as well. Yet vocational students do considerably less homework than their academic counterparts and clearly have time to do more. We think that **local education systems should give homework more emphasis in preparing students for the workforce. This emphasis should go hand-in-hand with curricular integration.**

In grading decisions, which reflect educational priorities, vocational programs place considerable emphasis on specific occupational skills and on work readiness skills. The SCANS workplace competencies, such as teamwork and the ability to use technology, are significant contributors to students' grades. However, an empirical study finds that the SCANS workplace competencies are

not related to job performance in the industry examined, but that foundation skills are related to it. Vocational teachers give varying weights to the foundation skills in their grading decisions. Self-management skills receive considerable emphasis, but research and reference skills, the one SCANS workplace competency related to performance in the study cited, receive very little.

ENDNOTES

1 Bishop, J. (1993b), *Educational Reform and Technical Education*, p. 25. Cornell University, Center for Advanced Human Resource Studies.

2 Because asking teachers to report on a random sample of classes was not feasible, we specified a class taught by our random sample of teachers on a particular school day. This event was "the first class you taught *in your primary* assignment to 9th, 10th, or 12th graders on October 1, 1992." The particular date was used only to select the classes to be examined. Most of the questions about these classes are general in the sense that they are not limited to events occurring on October 1, 1992.

3 National Commission on Excellence in Education (1983), *A Nation at Risk: The Imperative for Educational Reform*, p. 24, U.S. Department of Education.

4 McCormick, A., & Holmes, P. (1994), *Computers and Vocational/Technical Education*, draft report prepared for the National Assessment of Vocational Education, MPR Associates.

5 Ibid., p. 12.

6 Ibid., p. 11.

7 The definition of college prep students is complex and is found in Chapter 1 in the present volume; vocational concentrators and specialists are described in the immediate text; general students are those who do not fall in any of the other three groups.

8 We do not know what kinds of vocational courses these students are reporting on. It is possible, but unlikely, that the differences in Figure 4.3 are due to differing perceptions of similar courses. The more plausible explanation is that they are reporting on different kinds of vocational courses, and that the vocational concentrators and specialists are describing more advanced vocational courses than the college prep or general track students.

9 See Anastazi, A. (1982), *Psychological Testing*, MacMillan. Also see Rock, D.A., et al. (1985), *School Quality and Student Outcomes*, Educational Testing Service.

10 Homework assignments in vocational education may be increasing. Based on 1987 data, Bishop (1993b) reported that 60% of vocational classes had *no* homework.

11 U.S. Department of Education (1994), *National Assessment of Vocational Education: Interim Report to Congress*, p. 251.

12 Cappelli, P., & Rogovsky, N. (1993), *Skills and Individual Performance*, University of Pennsylvania, National Center on Educational Quality of the Workforce.

CHAPTER 5

EDUCATIONAL OUTCOMES OF VOCATIONAL COURSETAKING

INTRODUCTION

The Perkins Act calls for the National Assessment to evaluate "the academic and employment outcomes of vocational education. . . ."[1] Employment outcomes are the subject of the next chapter. In this chapter we examine the relation between vocational education and academic coursetaking, student achievement, high school completion, and educational attainment.

The data for the chapter come from the High School and Beyond Survey (HSB); the National Assessment of Educational Progress (NAEP); a review of the literature on academic outcomes by Kulik[2]; and a recent analysis of the 1992 Followup of the National Education Longitudinal Study (NELS) by Rasinski.[3] These data sources are discussed in the Technical Appendix. Because most of the available data pertain to secondary students, our analysis concentrates on the academic and educational outcomes of secondary vocational education.

Academic, Vocational, and "General Track" Students

Some secondary students focus their coursetaking on preparation for college, others on job preparation, while still others have no apparent focus — they prepare for neither of these alternatives. How many students are in each of these groups?

To make this determination, students were classified based on the following criteria:

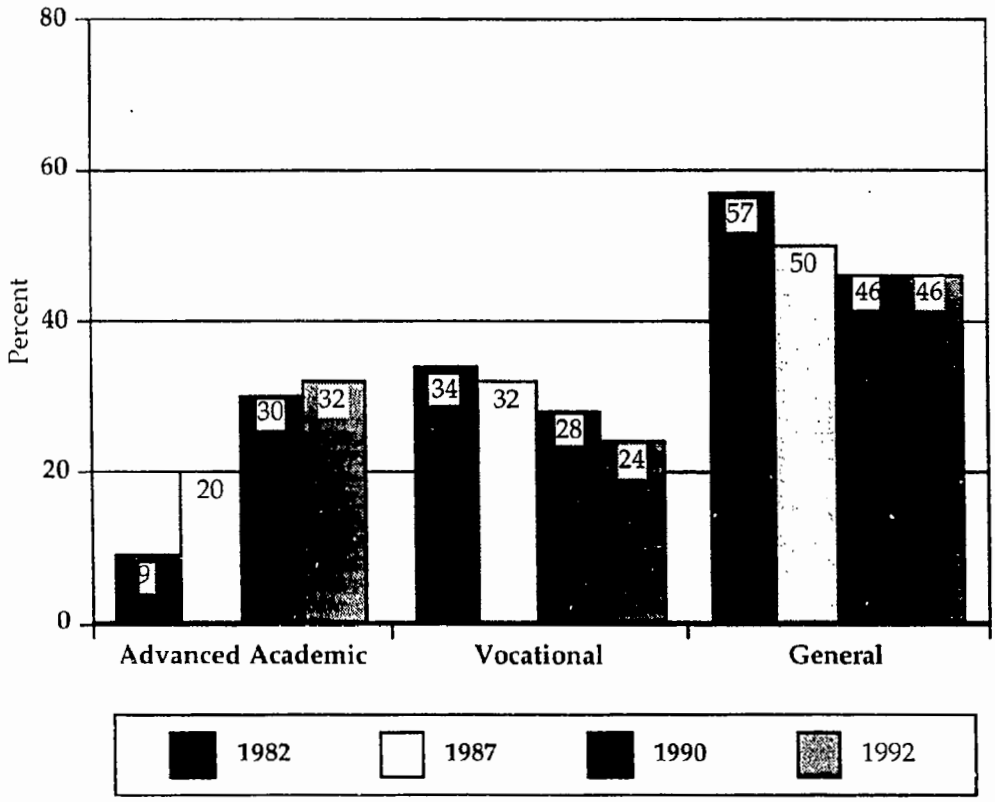
- Advanced academic: Students who earned at least four credits in English; at least three credits in mathematics, with at least one credit in algebra or higher mathematics; at least three credits in science with at least one in a physical science; and at least two credits in a foreign language. These criteria approximate current typical college entry requirements, which are much higher than those used in earlier years. As a result, this category underestimates the size of the college-bound pool in earlier cohorts.

- Vocational completers: Students taking at least three credits in a specific vocational labor market area (agriculture, business, etc.). This criterion approximates the definition many schools use to define a vocational completer (see Chapter 4).

- General track: Students who meet neither of the above criteria. These students can be considered to be preparing for neither college entry nor entry into a skilled or semi-skilled occupation.

It is important to recognize that these are constructed categories. While they reflect underlying realities in the types of educational programs students pursue, they compartmentalize coursetaking patterns that are inherently much more complex and indistinct. Schools may or may not define students in these terms, but they are useful analytic tools. The distribution of students across these categories from 1982 to 1992 is shown in Figure 5.1.

Figure 5.1
Percent of Students in Advanced Academic, Vocational, and General Tracks, 1982, 1987, 1990, and 1992



NOTE: Columns for each year sum to more than 100 because the advanced academic and vocational tracks are not mutually exclusive.

Sources: 1992 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

By these definitions, 32 percent of 1992 high school graduates were advanced academic students, 24 percent were vocational students, and the largest proportion — 46 percent — were general track students. The changes over time in the distribution of these types of students reflect the marked growth of academics and the decline of vocationalism discussed in Chapter 1. The proportion of general track students has also declined over the last decade, but they outnumber vocational students almost two to one and their curriculum remains the most common one for high school students.

There is a small but increasing overlap between the vocational and academic tracks. In 1982, only 0.4 percent of vocational students met the advanced academic course requirements. By 1990, 2.8 percent met these requirements, and by 1992, 4 percent did so. While this is still a very low proportion, it is indicative of an overall trend toward more academic preparation for vocational students, as we will see below.

ACADEMIC COURSETAKING OF VOCATIONAL STUDENTS

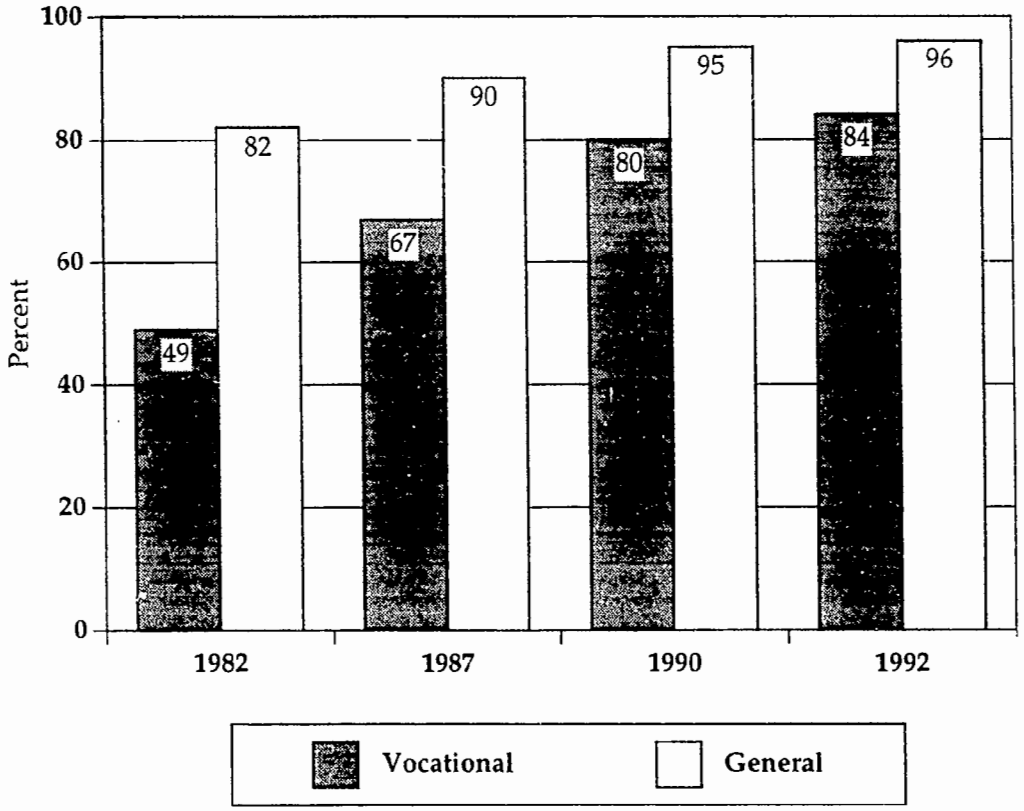
One approach to assessing the academic side of vocational education is to see how much academic education vocational students typically receive relative to that of other students, and how patterns of academic coursetaking have changed in the recent past.

In this analysis, we define a **basic** academic program to include at least 12 credits in English, mathematics, science, and social studies. Note that this is less academic work than the advanced curriculum for college prep students discussed in the preceding section. All academic track (college prep) students necessarily meet this criterion. Some 96 percent of general track students and 84 percent of vocational students also complete a basic academic education. (See Figure 5.2.)

The proportions of both general and vocational students who complete a basic academic program have increased since 1982, apparently in response to the higher graduation standards resulting from education reforms in the 1980s. Of the two groups, the proportion of vocational students completing an academic program has increased at a much faster rate. Thus, the academic coursetaking gap between (advanced) academic, general, and vocational students is closing, and it is closing most rapidly for the vocational students.

The much lower basic academic completion rates for vocational students in the early and mid-1980s (49%, 67%) are consistent with data in Chapter 2, which show that community college students who had been vocational students in high school had lower completion rates than those who had been academic or general track students. Vocational students' lower level of academic coursetaking in high school may have made them less prepared to succeed in a community college

Figure 5.2
Percent of Vocational and General Track Students Meeting "Basic Academic" Criterion, 1982, 1987, 1990, and 1992



Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

program. If so, vocational students today would seem to have better chances of succeeding in these institutions.

How much academic coursework do students take in different subject areas? Figure A-5.1 in the appendix addresses this question with data on the number of credits earned in different academic areas by students in the three tracks.

In 1992, vocational students earned an average of 4.0 credits in English, 2.9 in mathematics, 2.4 in science, 3.3 in social studies, and 0.4 in computer science (classified in these data sets as a subcategory of mathematics). In all these subjects except computer science, vocational students earned fewer credits than academic and general track students. In computer science, vocational students earned slightly more credits than academic or general students. On the whole,

vocational and general students are more nearly similar in their coursetaking patterns than either group is to academic students.

Not surprisingly, academic students look most different from other students in the "gateway" subject fields of mathematics and science. These are also the subjects in which general track students most surpass vocational students. In other words, it is in mathematics and science that vocational students' academic "deficit" is largest. Since many vocational and technical careers require mathematics and science training (e.g., drafting, health-related careers, carpentry), this deficit demands the attention of education policy makers.

The data in Figure A-5.1 also show that vocational students have gained on academic and general track students in English, mathematics, computer science, and science, although they lost ground in social studies. Until 1990, their gains were smaller for advanced mathematics and science courses than for others, although the 1990–92 span showed some improvement in this respect.

In general, it seems clear that increased academic standards have improved the academic coursetaking of vocational students, especially in English and the basic math and science courses.

STUDENT ACHIEVEMENT

The preceding section examined the academic coursetaking of vocational students. This section examines the effects of vocational coursetaking on the tested academic achievement of students.

It is reasonable to ask why we should be concerned about the consequences of vocational coursetaking for academic achievement. After all, common sense suggests that pursuing a course of study tends to raise one's level of skills in the subject taught — that is the purpose of education and training. And despite some obvious qualifications to this statement (e.g., a poor course may add nothing to one's achievement in a subject), there is ample evidence to support this view.[4] Participation in academic classes tends to increase academic achievement and participation in vocational courses tends to increase occupational skills.

Still, there are at least two reasons for wanting to know just how vocational education is related to academic achievement. The first is that the education reform movement and the Perkins Act emphasize increased academics for vocational students, generally through integrated coursetaking. There is evidence, consistent with contextual learning theory, that some vocational courses can increase academic test scores: The last National Assessment of Vocational Education found this to be true of math-enriched vocational courses.[5]

The second reason is that there is a tradeoff between vocational and academic courses — the more vocational courses one takes, the fewer academic courses one

can take.[6] Academic coursetaking improves academic achievement; achievement is related to the amount of postsecondary education one receives; and the latter improves employment outcomes. Thus, it is important to know what a student gives up in academic achievement by taking vocational rather than academic courses. (It is also important to know what one gains by taking vocational rather than academic courses. The following chapter examines this issue in the context of employment outcomes.)

Most studies use standardized test scores as the principal measure of achievement. Kulik's review of the literature shows, not surprisingly, that the average test scores of vocational students are lower than those of academic (college preparatory) students, but about the same as those of students in the general track.

Academic students score at about the 71st percentile on standardized achievement tests at the end of high school, while vocational students score at about the 34th percentile. Of course, this difference cannot be attributed entirely, or mostly, to the programs that students participate in. On average, the students were different in terms of aptitude, prior achievement, and many other characteristics before they entered the programs. Kulik estimates that the selection of (substantially different) students into the academic and vocational tracks accounts for 80 percent of the test score difference between them; 20 percent of the difference is due to the programs themselves. Kulik attributes about half of this program effect, or 10 percent of the total, to the different number of advanced academic courses taken in core subject areas (math, English, history, etc.) by academic and vocational students. The remaining 10 percent is due to other curricular and program factors.

The Kulik review thus finds that participation in a vocational rather than an academic program has only a small effect on achievement test scores, and part of this small effect is due to the fact that academic students take more advanced academic courses than do vocational students.

General track students have about the same scores as vocational students at the beginning and end of high school, and multivariate analyses indicate that the effects of the two programs on achievement are equivalent.

Similarly, the Rasinski analysis finds that the test scores of academic students are higher than those of vocational students, while those of general track students are only marginally higher. However, when other controls are applied to the comparison, vocational education turns out to have no effect on academic achievement scores.

Rasinski uses two-stage multiple regression analysis of 1992 NELS data to assess the contribution of vocational coursetaking to gains in academic achievement in

grades 10–12. Prior achievement, student background, and academic coursetaking are among the controls. Rasinski finds no relation between coursetaking in any vocational program and gains in math, science, or reading for students of similar backgrounds who took similar academic courses and had similar achievement scores before taking the vocational courses. The biggest contributor to test score gains is prior achievement on the tests (a variable captured in Kulik's student selection factor).

As expected, participation in various academic courses does affect student achievement (e.g., taking algebra helps raise math scores), and we can infer that if the number of academic courses were not controlled in the analysis, vocational students would still have lower achievement scores than academic students. Rasinski concludes that students give up some achievement gains by foregoing academic courses and taking vocational courses instead, although he does not estimate how much they give up. Kulik's analysis indicates that the effect of foregoing academic classes is real, but relatively small.

Rasinski also conducted regression analyses for various subgroups of students (e.g., rural students, black students, special education students). His major findings held true for most groups in most vocational programs; that is, vocational coursetaking per se does not affect academic achievement. There are some exceptions, however. For certain subgroups of students, participation in certain vocational programs is significantly related to test score gains (or losses). Table 5.1, which draws on the results of Rasinski's regression analyses, shows these relationships.

The table presents a mixed picture of achievement gains and losses associated with a few types of vocational programs. Taking consumer and home economics courses is associated with math losses for rural students. Health education is associated with improved science scores for blacks and improved reading scores for special education students; however, it is associated with math losses for special education students and reading losses for dropouts.

A residual specific labor market preparation category[7] is positively associated with reading gains for public school students (the survey also included private and parochial students) and for dropouts. It is associated with losses for Native Americans in reading and science.

Generally test score gains in one area are offset by losses in another, whether one considers type of program or type of student. For some reason, all but one of these significant associations are in two small program categories — health occupations and the residual specific labor market preparation.

Table 5.1
Vocational Program Effects on Academic Achievement by Type of Student

Vocational Program	Type of Student	Achievement Test	Relation of Program and Test (Gain or Loss)
Consumer/home economics	Rural	Math	(-)
Health occupations	Black	Science	(+)
Health occupations	Special education	Reading	(+)
Health occupations	Special education	Math	(-)
Health occupations	Dropout	Reading	(-)
Specific labor market preparation (other)	Public school	Reading	(+)
Specific labor market preparation (other)	Dropout	Reading	(+)
Specific labor market preparation (other)	Native American	Reading	(-)
Specific labor market preparation (other)	Native American	Science	(-)

Source: Rasinski (1994)

Vocational Skill Outcomes

We would expect training in vocational subjects to contribute to measured skills and knowledge in those subjects. The available research on this topic is modest, but it supports the hypothesis.

Bishop has shown that there are substantial and predictable differences between vocationally trained and untrained students in scores on an occupational competency test developed by the American Institutes for Research.[8] He finds similar differences between juniors and seniors in performance on the Ohio Vocational Education Achievement Test. Bishop notes that selective attrition and maturation may be contributing to the observed differences.

A study by Hilton provides evidence that the rates of growth in achievement on a test of industrial arts knowledge are very different for academic and general students on the one hand, and for vocational students on the other.[9] The industrial arts knowledge of academic and general students falls or remains constant in grades 7 through 11, while that of vocational students increases significantly. (See Figure 5.3.) It is interesting that despite the gains of vocational students, academic students had higher scores throughout the period in question. This may reflect academic students' stronger cognitive abilities, which would enable them to score higher on a range of tests in different subject areas. The role of cognitive ability in education and employment is discussed in Chapter 6.

Although these studies do not prove conclusively that vocational coursetaking improves vocational skills, the findings conform to common sense and are quite believable. Indeed, it would be astonishing if students trained in welding or carpentry for a reasonable period did not know more about their crafts than students with no training in these subjects.

HIGH SCHOOL COMPLETION

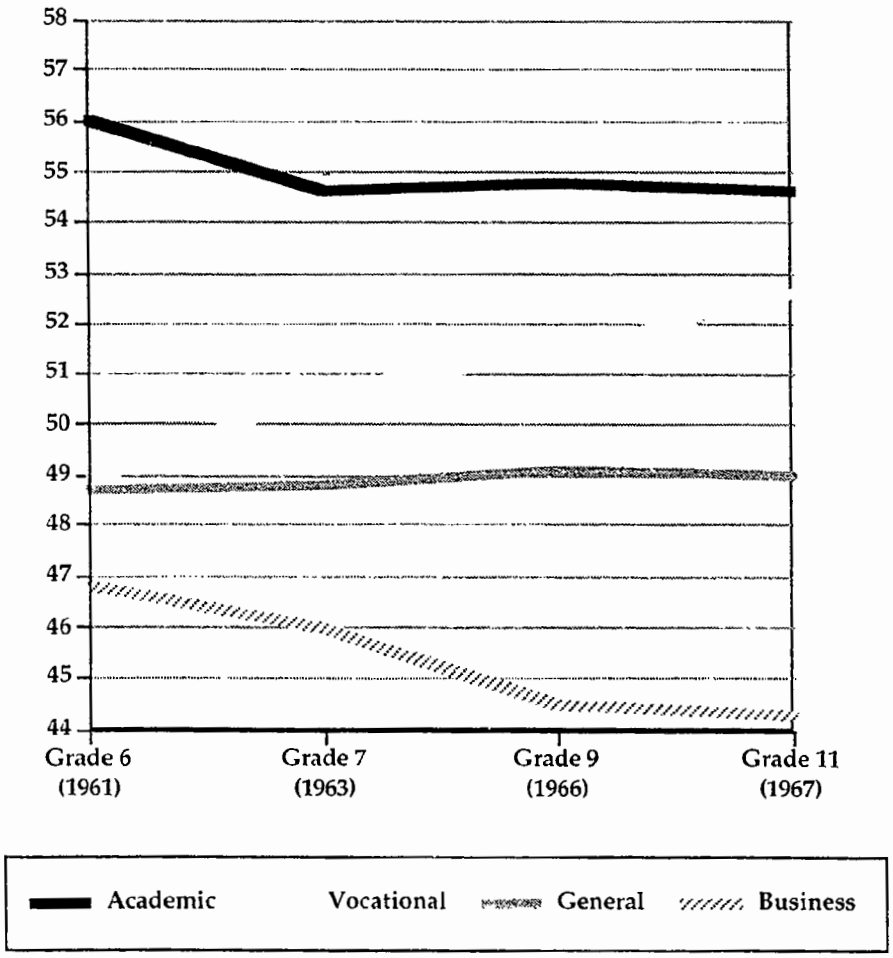
Keeping students in school has been regarded as a strength of occupational curricula almost from the beginning of public education in this country. Mertens, Seitz, and Cox observed that:

> By 1823, two years after the opening of the first publicly supported high school in America, 76 of the entering class of 176 had dropped out. The School Committee of the City of Boston, in response to this high attrition, recommended that the most useful and practical subjects should be offered in the first year . . . The use of occupationally relevant instruction to prevent high school dropout had begun.[10]

This goal was also reflected in the Smith-Hughes Act of 1917, which initiated federal support for vocational education, and in legislation since then.

It is not hard to see why vocational education might reduce dropout rates. Students may see occupational courses as more immediately relevant to their interests, and as we saw in Chapter 4, they regard vocational education as easier than academics. But does it reduce dropout rates? Kulik's review of the literature provides much useful information on this subject. The data he reports are classified here in three categories: descriptive findings, comparisons of matched groups, and multivariate analyses.

Figure 5.3
Mean Standardized Scores on TGI Industrial Arts Scale by Year and Curriculum



Source: Based on Hilton (1971)

Descriptive Findings

The dropout rates from several of the studies reviewed by Kulik are shown in Table 5.2.

Analyzing High School and Beyond data and using sophomore student reports of their curricular status, Peng and Takai[11] found that vocational students were a little more likely than general students to drop out, and much more likely than academic students to do so.

Table 5.2
Dropout Rates by Program Type (Percent of Students)

Study	Vocational	General	Academic	Non-Vocational
Peng & Takai, 1983 (High School and Beyond)				
Sophomore definition	15	13	4	—
Coombs & Cooley, 1983 (Project Talent)				
9th grade definition	21	—	—	15
Followup definition	11	—	—	24
Weber, 1988 (High School and Beyond)				
Senior definition	16	21	3	—
Catterall & Stern, 1986 (High School and Beyond)				
Defined by years voc. ed.	12	15*	4*	11
Defined by vocational concentration	5	17*	4*	12

* Rates calculated by Kulik.

Source: Kulik (1994)

Analyzing Project Talent data, Coombs and Cooley[12] earlier had found that students who identified themselves as vocational in the ninth grade were more likely to drop out than those who identified themselves as non-vocational. However, ninth grade student reports of curricular status are likely to be unreliable. Using Project Talent **followup** data, in which students specified their high school curricular status after the fact, Coombs and Cooley found that vocational students were less likely than non-vocational students to drop out of school.

Weber's[13] analysis of High School and Beyond data, which used seniors' reports of their curricular status, showed that vocational students were less likely than general track students to drop out, and that academic students were the least likely of all to do so.

Data from Catterall and Stern,[14] as transformed by Kulik, show the same pattern: General track students are the most likely to drop out of school; vocational students are less likely to drop out; and academic students are the least likely to do so. These findings are implicit in the Catterall and Stern data, not explicit. Data in one of their analyses show that vocational and non-vocational students have about the same dropout rates — 11 to 12 percent. However, Kulik observes that non-vocational students can be divided into two groups: academic students, who constitute 40 percent of non-vocational students in High School and Beyond and are known to have a 4 percent dropout rate; and general track students, who constitute 60 percent of the non-vocational youth and whose dropout rate must be higher than the 11–12 percent for all non-vocational students. In two different analyses, Kulik's calculated dropout rates for general track students are 15 percent and 17 percent. (The dropout rates for general track students vary because the definition of this group changes with the definition of vocational students. General students are the "other" group left after vocational and academic students have been defined.)

Comparisons of Matched Groups

Descriptive analyses such as those in the preceding section tell us that students in different programs have different probabilities of dropping out, but they do not indicate whether these outcomes are due to the programs or to other things. However, the fact that vocational and general students are similar in many ways suggests that student characteristics do not account for the different dropout rates between these two groups.

Studies that compare matched groups of students hold important student characteristics constant while looking at differences between programs in dropout rates. Table 5.3 shows the results of these studies.

In an experiment in New York City schools, Perlmutter[15] examined the dropout rates of selected students who applied and were admitted to a vocational high school, who applied but were not admitted, and who did not apply. The students were matched on the basis of schools previously attended and measures of math and reading achievement. Sixteen of the selected 99 students in the vocational high school dropped out over a five-year period; 24 of the 99 students who applied but were not admitted dropped out; and 18 of the 99 who did not apply dropped out. Moreover, across all students in the experiment, the dropout rate for those who entered the vocational high school or took vocational courses in other schools was 12 percent; the rate for those with no vocational courses was 31 percent.

Table 5.3
Proportion of Students in Matched Groups Who Dropped Out of High School

Study	Vocational	Non-Vocational
Perlmutter, 1982		
Vocational/non-vocational coursetaking	12	31
Stern et al., 1989 (Academy/ Comparison)		
Over 3 years	7	15
Over 2 years	7	14
Over 1 year	3	2

Source: Kulik (1994)

Stern and associates[16] collected data on students in 11 California occupational academy programs (see Chapter 4 in Volume III) and on other students in the same schools matched on race, gender, attendance, grades, and test scores. Table 5.3 shows that over periods of two and three years, academy students were less likely to drop out than comparison students. The lack of difference in rates over one year is not very important; it evidently reflects measurements at the beginning and end of the 1987–88 school year, whereas most dropouts occur between school years.

Multivariate Analyses

Studies using multivariate analyses carry the process of controlling factors other than vocational education a step further. Where the previous studies matched students on several characteristics (e.g., gender, race, achievement) before comparing them, regression analyses can match students on additional characteristics, including features of the schools and programs they enroll in.

Table 5.4 summarizes the results of regression analyses in seven different studies that examined the relation between vocational education and dropping out of school. The table shows the estimated reduction in the dropout rate due to participation in vocational education programs. (Studies in which the control group is non-vocational or general students report percentage point differences. Those in which the control group is students with fewer vocational credits report relative percentage reductions for each additional vocational credit.)

The analyses in Table 5.4 present a very mixed picture of the effects of vocational education on dropout rates. Four of the effects (those in Grasso & Shea,[17] Wagner,[18] and Rasinski) are nontrivial and statistically significant; two are trivial but significant (Mertens et al., grades 10 and 12); and four are not significant (Mertens et al., grade 11, Catterall & Stern, Stern et al., and Pittman[19]).

Table 5.4
Regression Estimates of the Effect of Vocational Education on Dropout Rates

Study	Data Source	Estimated Effects (Percent)	Statistically Significant ($p < .05$)	Control Group
Grasso & Shea, 1979	NLS-LME	0.5	yes	General track students
Mertens, Seitz, & Cox, 1982	NLS-Y			Potential dropouts with fewer vocational courses
Grade 10		0.1[a]	yes	
Grade 11		—	no	
Grade 12		0.02[a]	yes	
Catterall & Stern, 1986	HSB	—	no	Students with less vocational concentration
Wagner, 1988	NLTS			Non-vocational disabled students
All variables		2.7	yes	
Selected variables		7.0	yes	
Stern et al., 1989	Academy	—	no	Non-Academy students
Pittman, 1991	HSB	—	no	Students with less vocational participation
Rasinski, 1994	NELS	12.3[a]	yes	Students with fewer vocational courses

[a] Relative reduction in dropout rate for each additional unit of vocational education.

Source: Kulik (1994)

However, the studies differ in ways that affect our interpretation of the results. When Wagner included absenteeism and course failure as predictor variables in her analysis, she found that special education students who took vocational courses have a 2.7 percent lower dropout rate than those who did not take vocational courses. But lower absenteeism and course failure rates may themselves result from taking vocational education courses, and they contribute to lower dropout rates. Because absenteeism and course failure rates could be outcomes of vocational education, rather than prior controls, Wagner removed them from her regression analyses. When she did, the difference in dropout rates increased from 2.7 percent to 7 percent.

Rasinski found the same thing in his analysis of NELS data. When he included class rank, absenteeism, and special program participation, along with vocational coursetaking, as predictors of dropout rates, vocationalism showed no effect. When he took them out, it did. Rasinski found that each additional Carnegie unit of vocational education courses in the first two years of high school reduces subsequent dropout rates by a significant amount. He estimated that an additional vocational course would reduce the dropout rate for students in grades 11–12 from 5.6 to 4.8 percent.

Mertens et al. included absenteeism, grade point averages, and educational aspirations, among other things, as controls in their analysis. Kulik therefore concludes that their slight but significant coefficients showing reduced dropouts "surely underestimate the effect that vocational education has on dropout rates."[20] The same logic could also apply to Stern's analysis, which controls for attendance.

Of the three remaining studies that show no effect, two (Catterall & Stern, Stern et al.) provide few details on their regression analyses and their authors tend to discount them in the face of stronger evidence of vocational effects in other analyses.

In the third of these studies, Pittman identified 1,100 dropouts in the High School and Beyond sample and matched them with 1,100 non-dropouts on the basis of gender, reading performance, and socioeconomic status. His multivariate analysis of the sample of 2,200 indicates that students' social relationships with peers and staff at school affect dropout rates, but that participation in vocational education does not. Kulik argues that Pittman's model and the data used are inadequate. Variables such as race, sex, aptitude, and GPA have no influence on vocational coursetaking in the model (although we would expect at least some of them to) and some measures of school experience obtained after the students left high school are questionable.

In conclusion, the descriptive data, the analyses of matched pairs, and the better regression analyses indicate that vocational education helps reduce dropout rates. The multivariate analyses that show no vocational effect have

methodological shortcomings or are presented in too little detail to evaluate, but they should not be discounted entirely. On balance, vocational education seems to reduce dropout rates, but we do not regard the issue as closed.

EDUCATIONAL ATTAINMENT

Educational attainment refers to the years of schooling a student completes and the degrees or certificates he or she earns. In this case we are interested in how vocational education affects students' chances of attending postsecondary institutions and the amount of education they receive.

Secondary vocational education is usually regarded as a terminal program; vocational students are assumed to be going to work after high school rather than to postsecondary education. Indeed, vocational students are less likely than their academic counterparts to enroll in postsecondary institutions, but the number who do is still substantial, as we will see shortly.

Postsecondary education is becoming ever more important in preparing people for work. The skill demands of the workplace are growing; the economic premium on postsecondary education is increasing; and the economic gains from high school education are decreasing. Given the current structure and content of secondary education, the time when a high school diploma, with or without vocational training, was sufficient preparation for work other than the entry level of low-wage jobs has long since passed.

High school students, including those in vocational education, understand this. As we saw in Chapter 4, the great majority of high school seniors in the NELS, whether vocational students or other, said they did not have the skills needed for the job they expected to have five years after graduation. Of those who believed they lacked the necessary skills, the majority said they needed some form of postsecondary education.

Many vocational students say they plan to enroll in postsecondary institutions. In the 1992 NELS Followup, some 54 percent of the vocational concentrators and 36 percent of the vocational specialists said, as seniors, that they planned to enroll in postsecondary institutions the following year.

Expectations such as these are often inflated, but in fact a substantial number of vocational students do attain some postsecondary education and have done so for many years. Analyses of postsecondary behavior of high school students reviewed by Kulik provide data on this point (see Table 5.5).

Between 14 percent and 26 percent of vocational students enrolled in two-year or four-year colleges within 18 months of graduating from high school, according to estimates by Creech et al.[21] and Hilton. The percentages of vocational students obtaining **some form** of postsecondary education, whether in colleges or

vocational institutions, were higher. Creech and associates found that 29 percent of secondary vocational students had enrolled in some form of postsecondary education within 18 months of graduation. In a second study, Conroy and Diamond found that 48 percent of vocational students in Massachusetts received some postsecondary education within six years after graduation. In a third, Campbell and Basinger[23] found that 61 percent reported receiving such education within seven years.

Given the increasing returns to postsecondary education and the fact that many secondary vocational students participate in it, we need to understand better how secondary vocational programs affect students' chances for postsecondary education.

As Table 5.5 shows, vocational students are somewhat less likely than general track students, and much less likely than academic students, to attend two- or four-year colleges. They are also much less likely than academic students to participate in any postsecondary education, although they are closer to general track students in this respect.

Table 5.5
Percent of Students Enrolling in Postsecondary Schools by High School Curricular Program

Study	Curricular Program			
	Academic	General	Vocational	Non-Academic
Percent enrolled in two- or four-year college				
Creech et al., 1977	69	27	14	21
Hilton, 1971	76	30	26	27
Percent enrolled in any postsecondary institution				
Conroy & Diamond, 1976	—	—	48	—
Creech et al., 1977	81	40	29	35
Campbell & Basinger, 1985	92	60	61	—

Source: Kulik (1994)

The differences in postsecondary outcomes are obvious. The question is to what extent secondary curricular programs contribute to them when students of similar aptitude, background, and educational aspirations are compared. Kulik examines two kinds of studies in which such controls were used.

Studies in the first group estimate the probabilities of attending college or any postsecondary institution. Their results are shown in Table 5.6.

Table 5.6
Probability of Postsecondary Enrollment by Curricular Program

Study	Curricular Program			
	Academic	General	Vocational	Non-Academic
Likelihood of enrollment in two- or four-year college				
Grasso & Shea, 1979	.62	.32	.21	.29
Likelihood of enrollment in any postsecondary institution				
Creech et al., 1977	.75	—	—	.44
Grasso & Shea, 1979	.81	.64	.62	.63
Campbell & Basinger, 1985	.73	.68	.65	—

Source: Kulik (1994)

Grasso and Shea's data show that academic students are almost three times as likely to attend **college** as vocational students who are similar in aptitude and background. General track students are half again as likely as vocational students to attend college. However, this study did not control for educational aspirations to enroll in college. Since academic students are much more likely than vocational students to plan on attending college, this kind of self-selection could explain much of the difference between the two groups.

Two studies estimated the probability of obtaining any kind of postsecondary education (in colleges or vocational institutions) and controlled for student aspirations. Creech found that academic students had much higher chances of attending college than non-academic students, other things equal. Campbell and Basinger, however, found only small differences between the two groups. Grasso and Shea's estimates, which do not control for aspirations, show that academic students are somewhat more likely than vocational students to enroll in postsecondary institutions.

The second set of studies examined by Kulik estimated the **years of education** attained by students of average background from different high school programs. (See Table 5.7.)

Table 5.7
Estimated Postsecondary Attainment by High School Curricular Program for Students of Average Background: z-scores (years)

Study	Curricular Program			
	Academic	General	Vocational	Non-Academic
College only				
Grasso & Shea, 1979	0.41 (14.0)	-0.24 (12.6)	-0.40 (12.3)	-0.29 (12.5)
Hilton, 1971				
One-year follow-up	0.15			-0.25
Three-year follow-up	0.15			-0.24
College and/or postsecondary training				
Jencks & Brown, 1975	0.13 (14.4)			-0.13 (14.0)
Hauser, Sewell, & Alwin, 1976	0.16 (13.7)			-0.17 (13.1)
Vanfossen, Jones, & Spade, 1987	0.28	-0.17	-0.27	-0.20

NOTE: A positive z-score implies a higher than average probability of postsecondary attainment; a negative z-score implies the opposite. Values in parentheses are predicted years of schooling completed.

Source: Kulik (1994)

Grasso and Shea found substantial differences in the amount of college education obtained by academic and vocational students who were similar in aptitude and background, though not necessarily in college aspirations. There was little difference between general track and vocational students. Academic students could expect to attain 14 years of education, on average, while vocational students could expect 12.3 years and general students, 12.6 years. Hilton found that students who were average in aptitude and background but were enrolled in academic or non-academic programs differed by .40 standard deviation in years of schooling attained. His analysis did not control for educational aspirations and did not distinguish between vocational and general track students.

The study by Vanfossen, Jones, and Spade[24] did control for aspirations as well as for aptitude and student background; it found a moderate difference between the educational attainment of academic and vocational students (.55 standard deviation) and a very small difference between that of general and vocational students (.10 standard deviation). Studies by Jencks and Brown[25] (which also controlled for aspirations), and Hauser, Sewell, and Alwin[26] (which did not) found rather small differences (.4 to .6 year) between the attainment of academic students and that of non-academic students. Neither of these studies separated vocational from general students.

On the whole, these studies find fairly large differences (.4 to .8 standard deviation) between academic and non-academic students, and between academic and vocational students, in the probability of attending college and in years of college completed. They find smaller differences (roughly .2 to .5 standard deviation) between academic and non-academic students in the probability of attending any postsecondary institution and in years completed. They find very small differences (.02 to .16 standard deviation) between academic and vocational students in the likelihood of attending any postsecondary institution and in years of education completed (a few months at most).

Kulik thinks that most of the differences between academic and vocational students in these studies cannot be regarded as program effects, however. He considers students' plans for education or work after high school the critical factor. Only two studies control for educational aspirations and compare vocational students with academic students. One (Campbell & Basinger) shows a very small difference (.08 standard deviation) in their probabilities of obtaining some postsecondary education. The other (Vanfossen, Jones, & Spade) shows a moderate difference in years of education attained (.55 standard deviation). Two other studies (Creech et al., Jencks & Brown) control for aspirations and compare academic with non-academic students. Both find significant but rather small differences between the two groups.

In general, Kulik thinks that methodological problems, including inadequate measurement of educational aspirations, cast doubt upon the findings of all the studies. However, the comparisons between vocational and general track

students are less problematic than the others, because these two groups are similar at the outset.

We agree that comparisons between vocational and general students are the most likely to be valid and that the two groups differ little in postsecondary outcomes. However, we do not think that the comparisons with academic students can be dismissed, despite their methodological problems. Essentially they show that academic programs are doing what they are designed to do — preparing students for college. The alternative explanation is that academic programs merely select students who are smart and would go to college regardless of what high school program they took. Given what we know of college entrance requirements, this seems not to be the case. However, the differences between academic and vocational students in the probability of attending any postsecondary institution — whether collegiate or vocational — may indeed be small when other factors are controlled.

CONCLUSION

Given the Perkins emphasis on improved academics for students concentrating in vocational education and the mandate to assess the academic outcomes of vocational education, this chapter has examined the relation between secondary vocational education and academic coursetaking, student achievement, high school completion, and educational attainment. The findings are fairly straightforward.

First, students defined as vocational concentrators ("vocational students") take fewer academic courses than those preparing for college and about the same number as general track students. The deficit of vocational students is greatest in math and science. However, vocational and general students are closing the gap with college preparatory students, probably because of increased academic requirements for graduation. Vocational students are gaining more rapidly than general students.

Second, though academic students score better than vocational and general students on standardized achievement tests, the difference is due primarily to pre-existing differences among the students, not to participation in different curricula. Kulik estimates that 80 percent of the difference in test scores is due to characteristics of the students themselves, 10 percent to the fact that academic students take more advanced academic classes, and 10 percent to other program factors.

Third, vocational education probably helps reduce dropout rates, although there is some evidence to the contrary.

Fourth, most studies find that academic programs improve students' postsecondary outcomes relative to vocational and general programs. General

and vocational programs have about the same effect on postsecondary outcomes, although general programs seem to confer a slight advantage. Because vocational and general students are similar in many respects, comparison of these two programs seems the most appropriate. There is some disagreement about whether the analyses comparing postsecondary outcomes of academic and vocational students are methodologically sound and whether the comparison is meaningful. **Nevertheless, we think that most secondary vocational students should have the academic preparation necessary for some form of postsecondary education, including math and science beyond the basic level.**

ENDNOTES

1 Section 403 (b) (5).

2 Kulik, J.A. (1994), *High School Vocational Education and Curricular Tracking*, draft report prepared for the National Assessment of Vocational Education, University of Michigan.

3 Rasinski, K. A. (1994), *The Effect of High School Vocational Education on Academic Achievement Gain and High School Persistence: Evidence From the NELS 88*, draft report prepared for the National Assessment of Vocational Education, National Opinion Research Center.

4 For example, see Rasinski (1994), pp. 16ff. Also see Bishop, J. (1993b), *Educational Reform and Technical Education*, p. 11, Cornell University, Center for Advanced Human Resources Studies

5 Wirt, J.G., et al. (1989), *National Assessment of Vocational Education: Summary of Findings and Recommendations*, pp. 79ff, U.S. Department of Education. The math score increases attributed to taking these vocational courses was not as great as the increases attributable to taking regular math courses.

6 This assumes a constant level of coursetaking overall. In the 1980s students increased their total courseload, and to the extent that this occurs, the need for a tradeoff between academic and vocational education is reduced.

7 Denotes occupationally specific training in other than the eight major categories of secondary vocational programs: agriculture, business, consumer/homemaking education, health occupations, marketing/distribution, occupational home economics, technical/communications, and trade and industry. This special labor market preparation category includes five types of activities: Cooperative Education 1; Cooperative Education 2; Off-campus Voc/Tech Training (unspecified); Community Vocational and Adult Education; and Courses in Regional Occupational Centers (unspecified).

8 Bishop (1993b), p. 15.

9 Hilton, T.L. (1971), *A Study of Intellectual Growth and Vocational Development: Final Report*, Educational Testing Service. Cited in Kulik, p. 38 (1994).

10 Mertens, D. M., Seitz, P., & Cox, S. (1982),*Vocational Education and the High School Dropout*, Ohio State University. National Center for Research in Vocational Education. Cited in Kulik (1994), p. 18.

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16 Stern, D., et al. (1989), Benefits and costs of dropout prevention in a high school program combining academic and vocational education, *Educational Evaluation and Policy Analysis, 11,* 405–416. Cited in Kulik (1994).

17 Grasso, J.F., & Shea, J.R. (1979), *Vocational Education and Training: Impact on Youth,* Carnegie Council on Policy Studies in Higher Education. Cited in Kulik (1994).

18 Wagner, M. (1991), *The Benefits of Secondary Vocational Education for Young People With Disabilities: Findings From the Longitudinal Transition Study of Special Education Students,* SRI International. Cited in Kulik (1994).

19 Pittman, R.B. (1991), Social factors, enrollment in vocational/technical courses, and high school dropout rates, *Journal of Educational Research, 84,* 288–295. Cited in Kulik (1994).

20 Kulik (1994), p. 29.

21 Creech, F.R., et al. (1977), *Comparative Analysis of Postsecondary Occupational and Educational Outcomes for the High School Class of 1972,* Educational Testing Service. Cited in Kulik (1994).

22 Conroy, W.G., & Diamond, D.E. (1976), *The Impact of Secondary School Occupational Education in Massachusetts,* University of Lowell, College of Management Science. Cited in Kulik (1994).

23 Campbell, P.B., & Basinger, K.S. (1985), *Economic and Noneconomic Effects of Alternative Transitions Through School to Work,* National Center for Research in Vocational Education. Cited in Kulik (1994).

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25 Jencks, C.L., & Brown, M.D. (1975), The effects of high schools on their students, *Harvard Educational Review, 45,* 273–324. Cited in Kulik (1994).

26 Hauser, R.M., Sewell, W.H., & Alwin, D.F. (1976), High school effect on achievement, in W.H. Sewell, R.M. Hauser, & D. Featherman (Eds.), *Schooling and Achievement in American Society,* Academic Press. Cited in Kulik (1994).

CHAPTER 6

EMPLOYMENT OUTCOMES

INTRODUCTION

This chapter examines the economic outcomes associated with vocational education. Specifically, it investigates the connection between vocational training and employment outcomes for students who received vocational training in high school and in sub-baccalaureate postsecondary institutions. The chapter begins by reviewing the data sources and methodological constraints that affect the studies on employment outcomes. The second section describes the major factors related to economic success for vocational students. Section three presents the findings on employment benefits of vocational and academic coursetaking at the secondary level. The fourth section examines the relation between tested skills and employment outcomes. Section five presents the findings from analyses of employment outcomes for postsecondary vocational students.

Both high school and postsecondary vocational education systems serve a disparate clientele and offer a variety of coursetaking options. Their very diversity, in fact, complicates analysis of factors associated with economic outcomes. Vocational courses are provided to an economically, racially, and ethnically diverse population; individuals vary substantially in the amount of coursework they complete, the types of skills they acquire, and the extent to which they concentrate their coursework in a single program area. Additionally, vocational training at the postsecondary level is provided in an assortment of public and private institutions. All of these factors are likely to affect outcomes of students from vocational programs and, therefore, will be considered as part of this analysis.

STUDIES OF EMPLOYMENT OUTCOMES

The findings reviewed in this chapter were compiled from a growing literature designed to measure the effects of vocational education on the labor market performance of individuals. The work on employment outcomes builds on the human capital model, which predicts that development of additional skills (through either academic or vocational preparation) is beneficial in the competition for jobs and wages after high school.[1]

All of the studies reviewed employed some type of statistical technique, most often regression analysis, to isolate the effects of curricular and background factors on the wages, earnings, and employment patterns of vocational students. Although efforts to isolate the factors that contribute to improved vocational outcomes have grown increasingly sophisticated, they continue to be hampered both by a lack of timely, high-quality data and by methodological constraints. Each of these issues will now be addressed in turn.

Data Sources

The four data sources most commonly used for these studies are the National Longitudinal Study of Youth (NLSY), the High School and Beyond (HSB) survey, the Survey of Income and Program Participation (SIPP), and the National Longitudinal Survey of the High School Class of 1972 (NLS72). Each source has collected information on vocational attainment, wages, and employment, as well as on demographic and socioeconomic characteristics of individuals over time. In addition, the results of several special studies that have been conducted for the National Assessment are discussed in this chapter. (The Assessment studies are described in the Technical Appendix.)

Several important features of these data sources deserve mention because they may directly affect the results of any statistical analysis. First, while some of these sources contain data on coursework derived from transcripts, others contain self-reported data. As Bishop notes in his review of the literature,[2] institutionally reported transcript data are the best source for distinguishing between student participation in vocational and in academic curricula. Self-reported data often fail to accurately capture student participation, in part because students may have difficulty differentiating occupational from academic subjects. Furthermore, self-reported data may contain inflated information regarding course choices and completion rates. (In fact, many of the studies that rely on self-reported data find larger returns to education than do studies that use data from transcripts.) Both the SIPP and the NLSY rely on self-reported data.

Second, in theory, studies of student outcomes should contain a measure of ability both before and after completion of coursework. The human capital model suggests that the benefits of vocational and academic training are related to cognitive growth and development. If the data contain ability measurements only after coursework has been completed, it is difficult to determine how much of any gains should be attributed to innate ability, and how much should be attributed to the coursework itself. Neither HSB senior cohort data nor the NLS72 contain any prior measures of ability.

A third issue—varying time horizons—affects the comparability of these data sets. Most of the analyses of secondary outcomes using HSB data track students for two years after completing high school. Analyses using NLSY go out six years, those using NLS72 data, 10 years. The profile of earnings over time may be different for vocational and non-vocational students. Thus it is important to be able to compare them at several points in time after they complete their education.

Finally, because of the need for longitudinal data, all of these data sources are somewhat dated. The majority of the studies contain data collected in the 1980s, for individuals who may have graduated from high school several years earlier.

Though vocational education, per se, did not change dramatically during that period, recent moves toward bolstering and integrating academic components into the vocational curriculum are not reflected in these data. Furthermore, in all likelihood, recent college graduates face different skill requirements and more competition from experienced workers than did their counterparts who graduated in the 1980s.

Methodological Issues

Methodological issues related to the measurement of coursetaking, the measurement of ability, and selection bias complicate the analysis of employment outcomes.

Measurement of Coursetaking. Researchers traditionally use one of two methods to measure coursetaking: membership in a curricular track, typically academic or vocational, and the number of academic or vocational courses taken. The preferred method is the number of vocational courses taken, collected from transcript data rather than from reports made by individuals.

Measurement of Ability. As noted earlier most of these data sets lack measures of ability prior to coursetaking. When information on prior ability is not available, researchers attempt to control for characteristics of individuals and schools that may *proxy* ability. If a large array of control variables is introduced into the regression equations, the likelihood that the control variables will be correlated with each other increases greatly, leading to multicollinearity among predictor variables. These correlations make interpretation of regression coefficients more difficult.

Selection Bias. In all of the studies reviewed, it is possible that some unmeasured characteristics of students, such as motivation and ability, affect (a) the likelihood of enrollment in vocational education, (b) subsequent student performance and (c) success in the labor market. If these characteristics differ systematically between vocational and academic students (that is, if different kinds of students are "selected" into vocational and academic programs), it may appear that their coursetaking patterns, rather than attributes such as motivation and ability, affect employment outcomes. Yet, short of a controlled experiment in which individuals are randomly assigned to tracks, there is no means to completely control for this type of bias. Although some studies do attempt to control for individual characteristics that are related to ability, the inability to pinpoint innate characteristics is endemic to systematic research on individual outcomes and should be kept in mind in interpreting the results of these studies.

The complexity of these issues and their varying effects on study results require extreme care when interpreting findings, especially between studies that utilize different data sources. These issues also point to the need for analyses of better and more recent data to explore employment outcomes. The 1994 Followup to

the National Education Longitudinal study (NELS) will present the next major opportunity for such analyses.

THE RELEVANT FACTORS

The chapter now turns to a review of the factors most often associated with labor market outcomes for secondary and postsecondary students, including:

- How the match between training and employment affects outcomes;
- How outcomes differ by concentration of coursework (in a single program area);
- How outcomes differ by years of education;
- How outcomes differ for those who completed programs compared with those who did not;
- How the level of a degree (B.S., A.A., certificate) affects outcomes;
- How outcomes differ by field of study;
- How the type of institution where the degree was earned affects economic outcomes;
- How outcomes differ for men and women;
- How vocational coursetaking affects the outcomes of disabled students; and
- How academic coursework affects the outcomes of high school graduates not continuing on to college.

The rest of this chapter will be devoted to reviewing the literature on the extent to which students' successes in the labor market are tied to particular aspects of their vocational experiences.

In general, there does not appear to be a consensus in the literature on the overall influence of vocational education on economic outcomes; the evidence appears to be mixed. Some recent studies have found positive correlations between employment, earnings and vocational training, while earlier work shows mixed or negative economic results from these programs.[3]

Such contrary views, however, may be due in part to the fact that the methodological approaches as well as the data used in these studies have evolved over time. Because early studies used cross-sectional data, they provided only a snapshot of earnings and employment characteristics at only one point in time.

In general, this early work on economic outcomes, particularly for non-college-bound students, demonstrates few positive effects. Campbell et al.[4] summarize the literature by saying "the evidence is mixed as to whether male vocational educated high school graduates earn significantly more/hour or more/week than otherwise similar non-vocational graduates." The findings are similar for postsecondary education. In a review of earlier studies, Grubb[5] found that individuals with sub-baccalaureate credentials tended not to earn more than high school graduates of equivalent experience. Lewis et al.[6] report similar results. Although these early studies did not find improved economic outcomes for men, they did demonstrate that both high school and postsecondary vocational education have positive effects on earnings for women.[7]

Later studies improved upon early methodology in three important ways. First, researchers began to look at outcomes for subgroups of the vocational education population (e.g., degree holders vs. nondegree holders), in order to observe whether the results of the aggregate analyses masked gains for certain subpopulations. Second, researchers began employing more sophisticated statistical methods to sort out the effects of a variety of factors on economic outcomes (e.g., statistical controls for selection effects). And third, longitudinal data that allowed researchers to follow the progression of individuals over time became available for analysis.

With increased technical sophistication, the results of later studies have been fairly consistent. For certain subgroups of secondary and postsecondary students, there appears to be evidence of a positive effect on wages and employment, at least in the short run, when other important individual characteristics are controlled for via statistical techniques.[8]

The following summarizes the factors that have been associated with better employment and earnings outcomes:

- **Finding a job in an occupation that matches a field of study.** The research consistently finds that wage and employment outcomes are superior for those whose field of study and occupation match, as compared to those without a match.

- **Concentration of coursework in a particular field of study.** Vocational education students who complete at least two credits in a vocational specialty area and find jobs related to their training have higher earnings and less unemployment over time than those with a more general background. In addition, individuals with higher concentrations of coursework are more likely to find a training-related job.

- **Amount of schooling.** At all levels, additional years of schooling provide improved employment outcomes. Secondary students who complete high school have much better employment prospects than their counterparts who drop out. For postsecondary students, employment outcomes are directly related to the number of years of schooling. Baccalaureate degrees provide the greatest returns, followed by two-year degrees and certificates. Even those students who take courses that do not lead to a degree show better outcomes compared to high school graduates with no additional schooling.

- **Program completion and certification.** Postsecondary vocational education for students who complete a course of study and attain certification (e.g., an associate's degree) have better employment outcomes than individuals who complete the same number of credits but do not complete a degree program.

- **Field of study**. The effects of high school and sub-baccalaureate credentials vary according to fields of study. At the secondary level, women with training in business and health-related fields have improved wages and employment, and postsecondary completers with degrees in health and technical fields also show better earnings than those in other fields. Though credentials in certain fields do appear to be related to better economic outcomes, many other fields show no such relationship.

- **The type of sub-baccalaureate institution from which a degree or certificate is attained**. For postsecondary students, the type of institution (community college, private technical, public technical) where individuals study appears to affect economic outcomes. Studies consistently show that community college graduates are more likely to be employed and to use their vocational credits than are graduates from other types of institutions.

- **Gender**. Throughout all the studies, women who take vocational education courses have better economic outcomes, in terms of both wages and employment, than do their male counterparts. This effect is particularly strong for women in the fields of business and health who complete degrees and find jobs wherein they can use their vocational skills.

- **Vocational education for disabled students**. Secondary students with disabilities derive a number of benefits from vocational coursetaking, both in school and in the labor market.

The rest of this chapter reviews in detail the findings from the literature for each of the factors associated with improved economic outcomes for secondary and then

postsecondary vocational education students. It also examines the evidence concerning the relationship between tested cognitive and technical skills and employment outcomes.

SECONDARY VOCATIONAL EDUCATION

The evidence on returns to secondary vocational education suggests limited benefits, more evident in some areas than in others. As we saw in the preceding chapter, participating in vocational education probably reduces the dropout rate, and we know that graduating from high school confers some economic benefits. Hence, participation in vocational programs probably has a positive effect on employment outcomes through this mechanism. The evidence is less clear when completers from vocational and general education programs are compared. Some studies that seem to show a payoff to vocational education have methodological problems[9]; others show positive employment outcomes primarily for subgroups of vocational students.

The Match Between Training and Employment

Despite the mixed results regarding overall returns to secondary vocational education, there is evidence of beneficial employment outcomes whenever students find jobs related to their field of study. **The strongest, most consistent finding throughout the literature is that improved earnings do accrue in situations where vocational training is directly related to job tasks.** To quote Medrich and Vergun,[10] "regardless of age or degree, employment outcomes were superior for those with a field of study-occupation match as compared with those without a match." As vocational training is designed to be relatively occupation specific, this finding is not surprising. It is understandable that the highest economic returns accrue to individuals who find employment in the occupation for which they are trained. Conversely, for non-college-bound vocational trainees whose jobs do not draw on their training, there are no apparent economic benefits.[11]

To measure the relationship between coursework and job tasks requires a system to categorize and link both field of study and occupation. Researchers have therefore developed indices to measure the proportion of coursework utilized on the job. As part of the last National Assessment of Vocational Education, the Department of Education formulated two indices to test the hypothesis that increased coursework in job-related areas has positive economic outcomes.[12] The first index, called the *course utilization rate* (CUR), measures the share of all vocational courses taken by high school students that are related to jobs they eventually obtain. The more vocational courses related to employment, the higher the index. A second, related index, the *skilled job course utilization rate* (skilled jobs CUR), measures the share of all vocational courses that are related to the jobs obtained only when those jobs require more than minimal skills. Throughout this section, we will report findings that rely on the CUR as well as on the skilled jobs CUR.

Other researchers have developed their own indices to match field of study and jobs. Some of the variation across analyses may be due to different algorithms used in developing those matching matrices. The sensitivity of the research findings to the methodology employed is a question that has not been explored in the literature, but may affect results.

The Number of Students Who Match Training and Employment. Bishop[13] reported that less than half of the high school graduates with occupational training obtain a job associated with their training. In a related study of graduates who have no postsecondary education, Wirt et al. found that 38 percent of all occupationally specific vocational courses were used in skilled jobs.

From the low proportion of secondary vocational students finding a match between work and employment, Campbell et al.[14] concluded that one reason the earlier studies of aggregate populations did not find improved economic outcomes is that the majority of vocational graduates do not get training-related jobs. Meyer further reports that the course utilization rate varies by gender, and that it is more than 10 percent higher for women than it is for men.

As a result of the relatively low proportion of high school vocational students who find related employment, some have argued for an improved system of credentials for both high school and postsecondary graduates. Triest believes that credentialing systems could serve to correct any market failures regarding the availability of information for those looking for jobs as well as for those looking for employees.[15] He reports that "Correcting this failure might be expected to increase the incentive for skill acquisition, increase the accountability of training providers, and facilitate the job matching process. Wage rates would be expected to rise, job duration increase, and frictional unemployment decrease."

On the other hand, credentialing may lead to a more rigid system of hiring. Triest observes that although the type of credentials system envisioned in the Goals 2000 Act is voluntary, having the appropriate credential may become an unwritten rule in hiring. Since secondary students often try out many jobs before settling into a career (often in fields different from their studies), a credential or lack of a credential may keep them from exploring the full set of options. From the information available, it is difficult to predict just how a system of credentials would affect vocational students, especially with regard to finding a training-related job.

The Effect of Matching on Employment. For both secondary and postsecondary vocational completers who find jobs matching their field of study, the incidence of unemployment over time decreases.[16] Campbell et al., using data from High School and Beyond, reported that high school graduates who found jobs that matched their field of study had a lower rate of unemployment (3 percentage points less), and spent almost 20 percent more time in the labor force than a comparable group of general track students. By contrast, non-college-bound vocational track students

who did not find jobs matching their field of study had no employment advantages over the general track students.

The Effect of Matching on Wages. Bishop[17] discovered a positive effect of secondary vocational education on wages for those employed in a job related to their field of study. He reports that the more relevant coursework an individual has, the higher the wages. Campbell et al., too, found higher wages for high school vocational education graduates with a match between field of study and employment.[18] They report that high school graduates earned 7 to 8 percent more, monthly, when their current job was related to their training. Stevens too, found that for high school program completers in Florida, those with related jobs had significantly higher earnings than those with unrelated jobs.[19]

Concentrations of Coursework

Another important finding in this literature is that students who concentrate in a single area of coursework have better economic outcomes than those who take courses in a variety of subjects. This is true for both the secondary and the postsecondary market.[20] The effects of course concentration (earning more than two credits in a specialty) appear to influence outcomes via the link between training and related jobs. That is, taking more courses in a major subject pays off only if work is in a related field. The more credits that trainees take in their major subject area, the higher the proportion of vocational education credits they use on their jobs, and the more likely they are to obtain a training-related job.

Campbell et al.[21] found that high school students who concentrated in a particular vocational field and obtained employment in a related field earned 7 to 8 percent more than vocational students who found employment in unrelated fields or students who completed a general track program in high school. Campbell also reported that the probability of finding a training-related job (which pays higher wages) increases with course concentration. Approaching the same issue from the opposite direction, Wirt et al.[22] report that "For men, enrollment nonconcentration (not taking a coherent group of courses) was a consistently large source of course underutilization (23 percent in 1983)." This underutilization results in fewer job placements and lower wages.

Field of Study

Another potential explanation for the wide variation in economic benefits to vocational education is the possibility that the particular field of study affects wages and earnings and that looking at outcomes for the population as a whole masks the differences by field. The literature indicates that the effects of credentials do indeed vary by field of study.

Meyer[23] finds that women with high school vocational training most often complete programs in business, health, and home economics. Those traditionally female fields

have higher course utilization rates than the majority of traditional male subject areas. Therefore, completing a program in one of the traditionally female fields yields positive economic outcomes via the link of securing a training-related job.

The improved employment outcomes for women in secondary vocational programs who do not go on to college seem to be driven by the high proportions of women (over 50%) who have business training and find jobs related to their training. Business education is the largest secondary vocational education program. The skilled CUR for women with business training was 53 percent in 1983, and 65 percent in 1985. By contrast, for men with jobs in precision production, the skilled CUR was 27 percent in 1983, and 36 percent in 1985.[24] One qualification to the apparently strong outcomes for women in this field is that in recent years business enrollments have been declining, perhaps in response to reduced growth in secretarial jobs (see Chapter 1). Whether employment outcomes for women with business training are changing is unclear.

The demand for trained, skilled practitioners in the health field is expanding, however. Although there are relatively few health programs in secondary education, the payoff to training in this area is clear. Meyer reported a skilled CUR of 71 percent for women in health fields.

Vocational Education for Students With Disabilities

One goal of the Perkins Act is to improve high school vocational education for students with disabilities. Vocational education may be particularly appropriate and beneficial to such students because so few of them go on to postsecondary education. Wagner[25] observes that students with disabilities "often need training in both work-related behaviors and specific job skills, if they are to function effectively in the competitive job market when they leave high school."

Wagner et al.[26] explored the relationship of vocational education to school performance for students with disabilities. This analysis included a comparison of how students who took vocational education classes in high school fared in making the transition to adult roles and responsibilities, compared with other students. The data came from the National Longitudinal Transition Study of Special Education Students (NLTS). The NLTS is a nationally representative sample of more than 8,000 students in all 11 federal special education disability categories, who were ages 13 to 21 and in special education in the 1985–86 school year.

Wagner et al. used the NLTS data to examine whether disabled students who took vocational education in their most recent year in secondary school were more likely to have positive outcomes than nonvocational students, both during secondary school and in their early postschool years. The outcomes include: (a) school performance as measured by students' school attendance; (b) grade performance as measured by whether students received one or more failing course grades; and (c) persistence in school, as measured by whether the student dropped out. The

postschool outcomes (for youth who had been out of secondary school for up to two years) included enrollment in a postsecondary vocational or trade school, and incidence of paid employment.

Wagner found a "consistent pattern of relationships between enrollment in occupationally oriented vocational education and better school performance." Students who had occupational training were absent from school significantly fewer days (1.5 fewer days per year; $p < .05$) than students who did not have such training, other factors being equal. Similarly, students taking occupationally oriented vocational education were significantly less likely to drop out of school ($p < .01$) when other confounding factors (such as disability and gender differences) were controlled. "The NLTS estimates show that the likelihood of dropping out rather than persisting in school was three percentage points lower for vocational students than for others. The analysis also indicates that vocational students were about three percentage points less likely than others to have failed a course, although this difference did not attain statistical significance."[27]

Wagner also noted that those youth who had been out of high school for up to two years, and had taken secondary vocational education classes, were 8 percent more likely to have attended a postsecondary vocational school in the previous year than were non-vocational students, controlling for other factors.

In addition, students who took vocational education in their last year in secondary school were 9 percent more likely to be competitively employed than youth who had not taken vocational education, other factors being equal. Wagner reports, as well, that, if the secondary vocational education included work experience, the likelihood of employment increased an additional 14 percent beyond the increased probability associated with vocational education enrollment alone.

Thus, the NLTS findings suggest that secondary school vocational education does appear to hold potential for improving both school performance and postschool outcomes of disabled students. A later study by Wagner et al. supported these initial findings, demonstrating that vocational coursetaking increases the likelihood of postschool employment for youth with mild disabilities (e.g., learning disabled, speech, and mild retardation) who have been out of school for one to three years. Their chances of employment increased by 19 percentage points if they took some vocational education, but fewer than four courses within a specific vocational program area, and by 20 points if they took at least four courses in a specific vocational program area. In addition, the study showed increased monetary compensation for those with at least four courses in one area. The findings are particularly important because most disabled students have mild disabilities.

Returns to Academic Coursework

Currently, high school students can choose between academic coursework (either in the general or college track) or vocational courses. But what does this tradeoff

mean in terms of future labor market outcomes? This section summarizes the findings from the literature on the labor market returns to academic education. Such information will be helpful in determining what mix of academic and vocational courses is most suitable for the workforce preparation of high school graduates not pursuing baccalaureate degrees.

To better understand the tradeoff between taking additional academic courses and additional vocational courses, Gamoran reviewed the literature on the value of academic preparation for success in the job market among those who do not attend college.[28] He considers four aspects of the labor market — employment, hourly wages, annual earnings, and attaining occupational status — to test the hypothesis that academic courses contribute to work outcomes by improving cognitive skills, which in turn add to labor market success.

His report is exemplary in that it reviews not only the findings of the literature but the effects that the various methodologies and data sources have on results. Throughout his review, he gives greater weight in his conclusions to the studies that were well specified, including those that controlled for cognitive skills and ability prior to high school, as well as for selection biases. Gamoran first reviews the direct effects of academic coursework on labor market outcomes, then reviews the literature on indirect effects that additional coursework may have on cognitive achievement, as the link to labor market outcomes. His main findings are summarized below.

The Effect of Academic Coursework on Wages. The best available evidence suggests that academic courses in high school slightly increase wages in the first few years after graduation, for those students not continuing on to college. The conclusion holds more securely for women than for men, because some analyses yielded non-significant or negative results for men. Effects may have increased during the 1960s and early 1970s, and they may increase for an individual over time.[29]

The Effect of Academic Coursework on Employment. The only study that controlled for ability prior to schooling suggests that students who take more academic courses are less likely to be unemployed after high school.[30] This result also is found in other studies that do not control for prior ability. In fact, Gamoran reports that the "near absence of short-term wage effects and the presence of short-term employment effects are fairly well established in these data."[31]

The Effect of Academic Coursework on Annual Earnings. For Gamoran, the "analyses of annual earnings yield the most inconsistent and intractable results among the four outcomes we are considering."[32] The studies that controlled for test scores show zero or negative effects with regards to annual earnings. There was one exception to these findings. Hollenbeck,[33] using NLS72 data, shows that academic-track males and females both earn substantially more 14 years after graduation, compared with students of similar ability from the general track. Hollenbeck's findings may differ from the other results because he looks at earnings over a longer

period of time. It may be that the results of academic coursework on annual earnings do not appear until individuals are well into their careers.

Other evidence is consistent with this interpretation. Several studies have shown that wage and earnings benefits to general track students increase over time, while such benefits as accrue to vocational students tend to be larger at first, but to level off over time.

The Effect of Academic Coursework on Occupational Status. In contrast to the effects on annual earnings, effects on occupational status are more consistent with expectations. These studies suggest that students who take more academic courses in high school find higher status jobs soon after graduation, compared with students who take fewer academic courses. Although this effect is not reflected in wages or earnings at the entry level, it probably yields greater benefits over time.

EFFECTS OF TESTED COGNITIVE AND TECHNICAL SKILLS

As a rule, Gamoran finds that tested skills have more consistent effects on employment outcomes than coursetaking.[34] This conforms to the general understanding of the function of courses: Students take them in order to acquire skills and knowledge that will be useful later on. It is not coursework per se that enables an individual to perform well on the job, but the skills and knowledge learned in the courses (and elsewhere).

The Effects of Tested Cognitive Skills

The literature on psychological testing indicates that general cognitive ability is the strongest predictor of job performance.[35] Technically, cognitive ability is defined as the shared variance in scores across different achievement or ability tests. In practical terms, it is the thinking ability that, for example, enables students who score well on math tests also to score well on reading tests. While to some extent hereditary, cognitive ability is also affected by environmental influences, the most relevant of which (for our purposes) is education.

In a meta-analysis of literally thousands of studies, Hunter and Hunter[36] found that general cognitive ability surpassed more specialized abilities such as mechanical and spatial aptitude, as well as job knowledge, in predicting performance at work. Job knowledge is also an important predictor of performance, but only if the work is in an area related to the knowledge. This is similar to our earlier finding that occupation-specific training pays off if a training-related job is found.

General cognitive ability also contributes both to specialized abilities such as mechanical, electrical, and clerical aptitude, and to job knowledge. For example, by one estimate, cognitive ability accounts for 60 percent of the variance across the 10 subtests of the Armed Services Vocational Aptitude Battery (ASVAB), six of which test vocational aptitudes.

Cognitive ability, then, not only affects job performance directly, since general thinking skills are used every day on the job, it also enables individuals to learn more specific skills. The military uses a single score from four tests of verbal and mathematical aptitude to help assess the qualifications of applicants—essentially their trainability. Then the specialized vocational aptitude tests are used to help determine what kind of training a recruit should receive.

As reflected in Scholastic Aptitude Test (SAT) scores, cognitive ability also predicts enrollment and success in postsecondary education. Further, it is closely related to (some say synonymous with) the ability to learn, which is essential to obtaining the additional training and education necessary for later jobs, careers, and lifelong learning.

It also seems likely that general cognitive ability is especially useful in high-performance workplaces, which require flexibility, adaptability, and problem-solving ability, as compared to more routinized jobs, such as those on assembly lines in the traditional Ford/Taylor model.

Thus, the development of cognitive ability is a central and pivotal goal of education. It enables students to learn specific skills, perform well on the job, and/or prepare for postsecondary education, careers, and lifelong learning.

Most of the psychological literature discussed above relates tested skills to job performance. Other research, reviewed by Gamoran, relates the tested skills of high school students to wages and earnings, and employment.

The Effect of Cognitive Ability on Wages and Earnings. Studies show that in the short run, improved cognitive skills do not contribute much to job success, but the benefits increase over time. Bishop has shown in a series of reviews and analyses that few benefits of cognitive ability are evident for young men and women, but that for both men and women in their mid-twenties, there are small to moderate effects on wages and earnings. Estimates of returns to wages or earnings resulting from an increase of one standard deviation in test scores ranged from 3 to 8 percent for males, and from 4 to over 15 percent for females.

In another effort to explore how one cognitive skill — math — affects the wages of graduating high school seniors (with no further education), Murnane et al.[37] compared the wages of 24-year-olds who graduated in 1972 with those of 24-year-olds who graduated in 1980. Each group had been out of high school for six years. The math skills that were measured required no knowledge of geometry or advanced algebra and should have been taught no later than the eighth grade. Using data from NLS72 and High School and Beyond, the researchers estimated that between 1978 and 1986, "the premium for mastery of elementary mathematics skills rose from $0.46 per hour to $1.15 for men (in 1988 dollars) and rose from $1.15 to $1.42 for women after years of schooling are controlled." Evidently basic math is becoming more valuable in the labor market, as the authors concluded that a

mastery of basic math skills will become an increasingly important determinant of wages in future years.

Murnane et al. also found that mastery of basic math skills has a much smaller impact two years after graduation than six years after graduation, again supporting the earlier findings that employment benefits accrue over time for an individual. However, the fact that the benefits to investing in basic math skills accrue over a period of years may act as a disincentive for students to work hard in school, as the promise of long-term returns may be too elusive a goal for many high school students.

On the other hand, additional English courses did not affect employment outcomes, but taking honors English, compared with English in the regular track, did. Gamoran hypothesizes that honors English may affect labor market outcomes by improving cognitive skills, even though the evidence did not show direct results for English in general. From this evidence, Gamoran concludes that "inconsistencies in the relative salience of math and verbal skills across studies may indicate that an underlying set of general cognitive skills, with which scores in all these realms are correlated, contributes to employment outcomes."[38]

The Effect of Cognitive Ability on Employment. While cognitive ability measures have little immediate impact on wages, that is not the case for employment opportunities. Two exemplary studies found that cognitive skills may have their strongest impact at labor market entry. Meyer and Wise[39] reported that the benefits of high test scores, measured by the number of annual hours worked, were greater in the first three years out of school than in the subsequent two-year period. A second study by Heckman and Roselius reported larger effects on annual hours worked for men at age 25 than at age 28.[40] Qualitative studies of the employment process support the conclusion from survey research that stronger basic skills enable high school graduates to find jobs, even if they do not obtain higher wages.

Bishop proposes an explanation for why employment status is improved while wages are not affected very much by improved cognitive abilities.[41] Relying on a literature that shows competence in reading, mathematics, science, and problem solving is strongly related to productivity, Bishop concludes that even though the economic benefits to the employee are quite modest and do not appear until long after graduation, the benefits to the employer are immediately realized in higher productivity. If this is true, employers would be more likely to hire high school graduates who demonstrate higher skills on various tests. This hypothesis is supported by the consistent findings of improved employment outcomes for those high school graduates who have taken more academic courses compared with those who instead took more general track classes.[42]

The Effect of Tested Occupational and Technical Skills

Bishop examined the effects of occupation-specific skills and broader technical skills on outcomes such as wages, earnings, and employment.[43] He reports that a constructed measure of broad technical skills is strongly related to employment outcomes, regardless of the type of job obtained. Bishop created a composite score from the ASVAB's mechanical, auto shop, and electronic subtests. After controlling for a range of other variables, he found that scores on this test composite were strongly related to wages, earnings, and employment status. Moreover, these effects increased over time for the individual.

Two things are notable about this analysis. First, the breadth of the measure seems to permit employment effects that are not dependent on training-related jobs. Second, the measure no doubt reflects a substantial amount of general cognitive ability. As we saw earlier, cognitive ability accounts for much of the variance across ASVAB subtests, and it also is associated with employment outcomes that increase over time. The analysis does not assess the independent effects of the underlying cognitive ability.

Summary of Secondary Employment Outcomes

Evidence regarding the effects of vocational coursetaking **per se** on employment outcomes is mixed, but there are clear benefits early in one's career if a training-related job is found. Academic coursetaking has small effects on early employment outcomes, but somewhat larger effects later on.

Tested skills have more consistent effects on these outcomes than do courses, no doubt because skills affect job performance. Cognitive skills improve wages and earnings, especially later in one's career. Measures of broad technical skills are also related to improved wages and earnings although it is unclear how much of the relation is due to underlying cognitive skills. Nonetheless, these findings are consistent with an educational approach that emphasizes the development of cognitive and broad technical skills.

Outside the context of education, the psychological testing literature shows that general cognitive ability is the strongest predictor of job performance and a strong predictor of other educational and employment outcomes. Job knowledge is also a good predictor of performance in related jobs.

POSTSECONDARY VOCATIONAL EDUCATION

Vocational education at the postsecondary level is quite different from vocational education in high school. First, and probably most important, postsecondary education is voluntary whereas secondary education is mandatory (at least through age 16). Postsecondary programs also are more intensive, more sophisticated, and more likely to be in fields of study that lead to high-paying jobs, such as health or

business. Additionally, compared with high schools, postsecondary vocational education takes place in a variety of environments, such as two-year and four-year colleges, as well as in proprietary and technical institutions. Finally, the postsecondary students are older and have more labor market experience, which greatly improves their chances of finding related employment in "career-type" jobs when they complete their studies. They also have the maturity and knowledge to select training that they will later use.

The diverse nature of the programs offered adds many dimensions to the analysis of economic outcomes for postsecondary students. For that reason, the remainder of this chapter reviews the literature on economic outcomes for postsecondary vocational education students, expanding upon the topics covered for secondary education to include important aspects of postsecondary vocational education.

The Match Between Training and Employment

Again, the most striking evidence in this literature is that postsecondary vocational students who find a match between training and employment show improved economic outcomes, even when other factors are controlled. The evidence also indicates that the economic gains to postsecondary vocational students outweigh those of secondary students, as a much larger proportion of postsecondary students obtain jobs that match their training.

The Number of Students Who Match Training and Employment. Medrich and Vergun[44] found that 61 percent of those aged 18–34 who had attained a postsecondary degree in a vocational field achieved an occupational match. They also report that a match between field of study and occupation shortly after schooling was likely to mean a match throughout the study period. Goodwin[45] found that 58 percent of postsecondary vocational coursework was used on the job. Grubb,[46] too, found positive effects of matching training and employment, but he noted that matches also differ by type of credential. He estimates that 76 percent of men with certificates match jobs and training, but only 22 percent of men with vocational associate's degrees do the same. The comparable figures for women are 67 percent and 45 percent, respectively.

Grubb, utilizing a matching matrix developed by Medrich and Vergun with data from the 1984 SIPP, reports that comparable estimates on matching show that 59 percent of males with a certificate and 57 percent with associate's degrees have a job that matches their training. The differences in these findings support the earlier stated hypothesis that different matching algorithms can affect results.[47]

Stevens, too, reports that a high percentage of postsecondary vocational completers found a job that matched their training. He reports that in Florida 68 percent of completers had training-related jobs.[48]

The Effect of Matching on Employment. Matching training and jobs also appears to reduce unemployment. Using data from the 1990 SIPP, Medrich and Vergun found that during a 91-week period, 76.5 percent of vocational education graduates with a job related to the field of study were employed for the entire period, as compared with 64 percent of those whose jobs did not match their coursework. Goodwin also found a lower incidence of unemployment among those who had a match between jobs and schooling.

The Effect of Matching on Wages. Medrich and Vergun found higher wages for postsecondary students 18–34 years old with vocational degrees and job-training matches (compared with degree completers who did not find a job that matched their training). Breaking earnings into three categories (less than $900 per month, $900–2,000 per month, and greater than $2,000 per month), they report that 7 percent of those with a match earned less than $900 a month, and 15 percent of those without a match earned less than $900. At the upper end of the distribution, 62 percent of those who had achieved a match earned at least $2,000 a month, whereas only 54 percent of those who did not find a match realized such earnings.

At all levels of vocational training, Medrich and Vergun found that women were less likely than men to have earnings over $2,000 a month. Yet, for full-time employed females, 59 percent with a field of study and job match earned over $2,000 a month, whereas only 31 percent of women without a matched job received that level of compensation. Using multivariate analysis, Goodwin also found that the more one's training is related to one's job, the higher the wages. (See the next section.)

Concentration of Coursework

It appears that benefits from vocational training are positively correlated with the amount of training received and the coherence of the program. The positive returns to taking additional courses in a single subject area include increased earnings and decreased unemployment. In Goodwin's study of individuals with postsecondary vocational training (using data from the senior cohort of HSB), a higher level of coursetaking in the vocational major was associated with a significantly lower incidence of unemployment and a greater probability of being employed in one's chosen field.

Goodwin reports that students who took less than 12 vocational credits were 28 percent more likely to be unemployed than those who took more than 30 credits. As the number of credits in the field of concentration increased, the unemployment rate decreased from 20.5 percent for individuals with only a few credits to 16 percent for those with 30 credits. Each additional 30 credits (i.e., a full year of coursework) lowered unemployment by 6 percent. This analysis found that vocational subject credits taken outside of the major field of study do not contribute to a lower incidence of unemployment.

This same study also indicates a positive effect on wages from additional credits in a major field. As the number of completed courses related to the job held increased, so did hourly earnings. Regression analysis indicated that the estimated wages were $0.83 an hour higher ($7.42 an hour) for trainees with 30 matched credits, compared to those who used little of their skills on the job ($6.59 an hour for less than 12 matched credits). Furthermore, each additional 30 credits yields a 12 percent increase in hourly wages. Yet, only about one-quarter of vocational trainees complete more than 30 credits. As before, this analysis shows that additional vocational courses not related to the field of study do not contribute to improved earnings.

Furthermore, Goodwin examined the relationship between the number of credits in the major subject area and the proportion of course skills used on the job. Comparing students with few vocational credits (12 or fewer) to those with a moderate number (13 to 30), he finds that students with moderate training are more likely to be in training-related jobs. For trainees with 12 or fewer related credits, the CUR is 50 percent, whereas for students with 13–30 related area credits (the entire sample), the CUR increases to 58 percent. For each additional 30 credits taken in the subject area, the CUR increases by 5 percent.

Completion of a Degree or Certificate

The literature indicates that persons completing a postsecondary degree in a vocational field have higher earnings than persons with similar amounts of coursetaking who do not earn a degree.[49]

Using data from both the NLS72 and the NLSY, and controlling for family background, Grubb found improved outcomes for degree completers compared with those with an equivalent amount of credits that did not lead to a degree.[50] Grubb reports that "In general, completing a certificate is more beneficial than completing one year of college without a credential, an associate's degree is more valuable than two years of college, and a baccalaureate degree increases earnings by more than four years of college without the credential."[51]

Medrich and Vergun's analysis also showed that completing a degree improved the chances of finding employment in a related field, which, in turn, improved economic outcomes. They report that a high proportion (61%) of those attaining a postsecondary degree in a vocational field found a match between field of study and occupation, leading to better employment outcomes. Goodwin, too, found that among persons who completed a degree, approximately 58 percent had obtained a job related to their field of study. Again, those whose jobs were related to their postsecondary field of study experienced higher returns to education. For men who had completed an associate's degree, Goodwin found increased earnings, though still significantly less than for a baccalaureate degree.

Overall, it appears that completion of a degree program provides greater benefits than the equal number of courses that do not lead to a degree. This is true for all types of degrees, including certificates, associate's degrees, and baccalaureate degrees. However, while the research shows that completing a degree is important, the economic benefits of completion also are related to the type of degree, field of study, and type of institution from which the degree is earned.

Returns to Certificate. Using data from the NLS72, Grubb found that there are no significant returns, in the form of either increased wages or earnings, for completion of certificates.[52] This result holds for both men and women, and is consistent with his earlier findings. By comparison, similar analyses using data from the SIPP show that those with certificates (both men and women) do earn more than high school graduates. Grubb points out that these differences may be due to an upward bias in SIPP from self-reported data, or from the omission of variables that measure achievement.

Returns to Associate's . . . rees. Where Grubb's earlier work shows significant effects resulting from the completion of an associate's degree, when he used NLS72 data and controlled for personal characteristics and high school education, he found insignificant effects for men and significant increases in wages and earnings for women. Academic associate's degrees, on the other hand, showed no economic benefits to women. The comparable analysis using SIPP data showed improved wages and earnings for both men women with associate's degrees. These discrepancies in findings may reflect the upward bias in the SIPP data, due to self-reporting of transcript information.[53]

Lewis et al., using data from HSB, also found positive and significant earnings payoffs for both participation in and completion of associate's degrees in vocational education, compared to the outcomes of high school graduates with no further education.[54]

Completion of Some Postsecondary Coursework. As an increasing number of individuals accumulate postsecondary credits without completing a degree, the question as to the value of this non-degree-producing coursework is raised. Some argue that those who complete only a few courses leave school because they have acquired enough training for a specific job and can therefore earn as much as can completers. Several studies have addressed the value of coursework that does not end in a degree.

Kane and Rouse analyzed NLS72 and NLSY data to address this issue and found positive wage benefits for community college students, even if they do not complete an associate's degree.[55] Grubb also looked at the effect of earning credits without completing a degree to see if this leads to higher earnings. Using data from the SIPP, Grubb finds that the effects of small amounts of college (attending for less than one year) are never significant.[56] Grubb also reports that the effects of one year of

schooling that does not lead to a credential are just slightly less positive than the effects of completing a certificate program.

With data from NLS72, Grubb again finds that, for men, vocational credits in community colleges, but not in technical or proprietary schools, significantly increase wages and earnings. Unlike vocational credits, academic credits do not significantly improve outcomes. He reports just the opposite for women; academic credits significantly increase wages and earnings whereas vocational credits confer no benefits.

The results of this work suggest that there are positive, but erratic, employment outcomes to limited college coursework, but that the benefits depend upon the kind of credits completed as well as the type of institution in which those credits are earned.

Level of Degree

The level of the degree attained also appears to affect the economic outcomes of vocational students. Medrich and Vergun find that a larger proportion of those with a baccalaureate degree or higher, compared with an associate's degree or vocational certificate, have high earnings (over $2,000 per month).

Like Medrich and Vergun, Grubb[57] concludes that the strongest effects of completing a degree are at the baccalaureate level. He estimates that for vocational credits from a four-year institution, each related credit increases earnings by $241, after controlling for other variables.

For women, Grubb reported a different pattern. The baccalaureate degree still carries the highest return, increasing earnings by almost 50 percent, when compared to high school diplomas for women. However, both certificates and associate's degrees also increase wages significantly for women, relative to earnings of women with a high school diploma.

Field of Study

Just as the benefits of certain types of baccalaureate credentials yield higher benefits than others, one would expect to see differing economic returns according to sub-baccalaureate credentials. In his analysis of both the NLS72 and the SIPP, Grubb finds that the returns to vocational education vary substantially with field of study. For men, he finds positive effects of associate's degrees largely in gaining access to careers in the health and technical fields. He also finds that public service and trade and industry credentials have positive effects. For women, he finds increased earnings from business and health-related fields, as well as from technical associate's degrees. For other fields of study, including academic subjects, he finds no statistically significant returns.

Type of Institution

Several of the studies considered in this chapter also examined outcomes for postsecondary vocational education students by the type of institution they attended. The assumption is that if there are systematic quality differences across institution type, one might expect to see differences in economic outcomes for individuals with the same level of education attainment but in different types of institutions.

The evidence of economic effects of proprietary schools is generally negative. The only exception is that Grubb reports that for women, vocational credits in proprietary schools increase wages significantly, but there is no effect on earnings.[58] Lyke et al. reported the same result.[59] There also is some evidence that completion rates are higher than in other institutions, but this does not hold when the analysis controls for background factors.

Goodwin and Lyke et al. also found that when background factors were controlled, unemployment rates were higher for proprietary school students than for students who had attended other sub-baccalaureate postsecondary institutions. Goodwin, using data from the High School and Beyond (senior cohort), reports that the type of postsecondary institution (sub-baccalaureate) is related to the incidence of unemployment for former students in the labor market. Individuals who attended proprietary schools were more likely to be unemployed (27.7%) than those at community colleges (18.9%) or public technical schools (16.5%), and were less likely to use their training on the job.

Furthermore, students at proprietary schools had lower CURs (53%) than did their counterparts in community colleges or public technical schools (both 60%).

On the other hand, studies by Sango-Jordan and Goodwin show that wages and annual earnings of **employed** proprietary completers are substantially higher than those of students from other sub-baccalaureate institutions.[60] Bishop et al.[61] found that proprietary graduates are paid 4 percent more in their initial employment, while Wilms[62] found that proprietary students earn more on their first job, but that their later earnings are not significantly higher than comparable graduates from other institutions. The only significant differences in the wages by type of institution found by Goodwin were that students from public technical institutes earn about 11 percent less than students from community colleges, and 20 percent less than students from proprietary schools.

As for completion rates, Moore[63] reviewed the research that analyzes the outcomes of proprietary schools and comparable public programs. All but one of the studies that analyzed completion rates found substantially higher rates for proprietary schools when compared to similar programs in the public sector. However, this effect disappeared when the completion rate was corrected for different background factors of students at different types of institutions.[64] Moore notes that proprietary

schools have incentives to move students through the program quickly, and that their programs are designed with completion in mind. Data support this theory.

Goodwin concluded, as did Grubb,[65] that the type of institution does not tell the entire story. If the story can be told at all, it will be through the interaction of a variety of factors, including the number of related courses, the type of institution, and the field of study.

CONCLUSION

In this review of the literature on economic returns to vocational education for secondary and postsecondary students, we find that, for certain groups of individuals who receive vocational training, economic outcomes, in terms of wages and employment, are better than for similar individuals without vocational training. This is true in both the secondary and the postsecondary vocational population, and the effects are almost always stronger for women. We also reviewed the literature on the economic returns to academic education in an effort to inform the policy debate on the appropriate mix of academic and vocational training for high school students not continuing on to college.

A rigorous analysis of employment outcomes (for both academic track students and vocational graduates) is hampered by a lack of recent, high-quality data. The data used often rely on self-reported academic information; lack specifics about student ability prior to coursetaking; may not follow students over time; and for the most part reflect courses taken over a decade ago.

Methodological issues also pose problems. Correcting for selection bias is very difficult and developing proxy measures of prior ability often produces its own confounding effects. Both Gamoran and Medrich arrived at the same conclusion: Further analysis with more recent and improved data is needed to validate the results of these studies.

In light of the complications caused by the nature of the data and the methodologies employed, the conclusions reported in this chapter focus on findings that are consistent across studies. The following list highlights those findings.

Outcomes of Vocational Coursetaking

- Most important, we find that early wage and employment outcomes are superior for vocational students whose field of study matches their occupation, as compared to those without matches. Unfortunately, less than half of secondary graduates obtain training-related jobs, limiting benefits to a fairly small group. Postsecondary students are much more likely than secondary students to find jobs that match their training. Nearly two-thirds of postsecondary students find training-related jobs.

- Vocational students who derive the greatest benefits early in their careers are those who take many vocational courses in a coherent program of study and find jobs that utilize their training. This is true for both secondary and postsecondary students.

- Those who complete a postsecondary occupational program tend to have better economic outcomes than individuals with an equivalent number of credits that do not lead to a degree. A much larger proportion of degree completers find jobs that match their training. Taking some postsecondary vocational courses without completing a degree also provides greater benefits than high school graduation alone.

- The level of the degree attained affects economic outcomes. Those with baccalaureate degrees gain the most in terms of wages and employment. There also are benefits for those completing vocational associate's degrees, but the effect is complicated by a variety of factors, including the field of study and the institution where the degree was earned. The results for completers of vocational certificates are mixed. Results from the NLS72 show no improvements in employment outcomes, whereas the SIPP data show improved economic outcomes compared with high school graduates.

- Not surprisingly, specific fields of vocational study are related to different economic outcomes. At both the secondary and postsecondary level, men and women with degrees or certificates in business or health-related fields have improved wages and earnings. In addition, women with technical associate's degrees fare better than most men or other women.

- The type of institution where individuals study affects economic outcomes. Studies consistently find that community college students are more likely to be employed and are more likely to utilize their vocational credits than are students from other types of institutions.

- Throughout this review, economic outcomes for women with vocational credentials surpass those for men, even controlling for other intervening factors. Women are more likely to improve their wages and earnings with vocational training; they are more likely to find a match between training and employment; and they are more likely to benefit from completing a degree, at all levels.

- For high school students with disabilities, participation in vocational programs appears to improve academic performance, reduce dropout rates, and improve the likelihood of employment after school completion.

- At the secondary level, potential dropouts who take vocational courses probably improve their chances of staying in school and derive benefits from finishing high school.

The research findings on the employment outcomes of secondary vocational education **in general** are mixed. One thing is clear, however: The research does not show that vocational students have a clear, consistent, and sizable labor market advantage over general track students. The debate over whether vocational students do a little better than general students, or about the same, should not obscure the larger fact that, on average, high school graduates with no postsecondary education are doing poorly in the labor market (see the introduction to this volume). Without a large difference between the outcomes of vocational and general track students, we must conclude that for most participants, neither program is working very well. However, as we have seen, some students do derive benefits from vocational education. The conclusion to Volume I outlines a strategy for reforming both types of education, while retaining vocational programs for those most likely to benefit from them.

Outcomes of Academic Coursetaking

- Likewise, this research consistently shows that for secondary students not continuing on to college, additional academic coursework, compared with general studies, yields small positive improvements in wages in the short run with larger gains appearing over a longer period of time. Employment outcomes show a larger, more consistent gain, in both the short and long term, for those students who complete more academic courses.

- For all students, additional years of education pay off with improved employment outcomes. Returns, as measured by wages and employment status, are highest for those with baccalaureate degrees, followed by two-year degrees, certificates, some postsecondary coursework, and completion of a high school degree.

Outcomes of Tested Skills

General cognitive abilities and broad technical skills, which include a sizable cognitive component, are strongly related to a variety of employment outcomes.

The strength of the associations between tested skills and employment outcomes suggests the need for competency-based approach to education. The progress of individuals and the success of programs should be assessed in terms of the skills students acquire rather than the courses they take and complete.

The development of cognitive abilities is pivotal, especially in secondary school, because they help prepare students for work and/or for postsecondary education, as well as for lifelong learning, and (arguably) high-performance workplaces.

The development of broad technical skills can complement and contribute to that of cognitive skills. The composite that Bishop used reflected a range of skills in the trades. No doubt other composites based on industries—health care, transportation, etc.—could be put together. Computer literacy is another broad technical skill that seems to pay off in the labor market.

Teaching work-related technical skills and knowledge is important not only because they provide employment benefits, but because they provide a meaningful context within which cognitive skills can be developed. Chapter 4 of Volume III presents research evidence indicating that contextualized learning is a more effective pedagogical approach than traditional classroom methods. For many secondary students, especially those in general and vocational education, traditional academics is often remote and boring. Yet the cognitive skill development of these students is critically important. Applied academics and other forms of contextualized learning show promise as ways of engaging students actively in processes that will help them learn to think better.

Concentrating coursework in occupationally specific areas provides benefits for certain subgroups of students, but as a rule, it pays off only if the program completer gets a related job, and at the secondary level, that happens in less than half of the cases.

Thus, the development of cognitive and broad technical skills and knowledge should be the central goal of secondary education for students preparing for work.

Moreover, given the clear payoff to postsecondary education, work-oriented students should be encouraged and prepared to continue their education at the postsecondary level.

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CHAPTER 7

EMPLOYER INVOLVEMENT AND SATISFACTION

INTRODUCTION

The Perkins Act calls for an assessment of "employer involvement in and satisfaction with, vocational education programs."[1] This chapter examines employers' opinions of vocational programs and some of the ways employers interact with them. The degree of employer satisfaction with vocational education is an important measure of its quality, and as such, it is relevant to the discussion of quality in Chapters 5 and 6. In addition to the Perkins Act, the School-to-Work Opportunities Act and the broad policy interest in the school-to-work transition suggest that it would also be a good idea to examine employer involvement in, and satisfaction with, work experience programs such as co-op and apprenticeship.

The National Assessment of Vocational Education conducted a survey of employers to learn more about their knowledge and involvement with public vocational and technical programs. The survey included a nationally representative sample of business establishments employing at least 10 people across the range of major industries. (See the Technical Appendix in Volume V for information on survey design and methodology.)

The intent of the survey was to provide national-level estimates of employer knowledge and opinions. Slightly more than half of the establishments contacted responded to the survey (the corrected response rate was 55%). Although this response rate is higher than average for surveys of employers, it is still lower than what is normally required for generating national-level estimates.[2] This being the case, a cautious yet useful way to characterize the findings from these data is that they provide important information about the views of the nearly 2,800 employers who did respond to the survey, but may not represent the views of the entire universe of employers, since there may be biases in the data resulting from this low response rate. In sum, although the data represent employers who chose to respond to the survey, the information collected, if interpreted with care, can provide policymakers and employers with useful insights.

EMPLOYER FAMILIARITY WITH VOCATIONAL PROGRAMS

A principal objective of the employer survey was to determine how much knowledge business establishments have about local vocational and technical programs in the areas from which they hire (within a 25-mile radius). Some 40 percent of the responding employers said they were not familiar with any

vocational program. Among the 60 percent that did indicate familiarity, 43 percent were familiar with secondary programs, and 49 percent, with postsecondary programs.

Familiarity by Industry

Table 7.1 shows how many employers in different industries are familiar with vocational programs by industry. There is little variation by industry for secondary programs, but knowledge of postsecondary programs is more variable. Most often, employers in the service industry indicated familiarity with postsecondary programs (59%), whereas employers in the trades were least familiar with those programs (40%). For the other industries surveyed, about half of those responding indicated familiarity with postsecondary vocational programs.[3]

Table 7.1
Percent of Employers Familiar With Vocational Programs, by Industry

Program Level	Industry				All Industries
	Manufacturing	Trade	Service	Other	
Secondary	43	44	41	44	43
Postsecondary	52	40	59	50	49

NOTE: Industries are classified using 2 digit SIC codes. "Trade" includes wholesale and retail trade. "Other" includes agriculture, mining, construction, transportation, utilities, and finance.

Source: National Assessment Employer Survey

Familiarity by Size

It is hypothesized that the size of an establishment is an important factor in determining the extent of its knowledge about vocational programs. Larger employers hire more workers and therefore have a stronger incentive to take the time to familiarize themselves with potential sources of new employees. Table 7.2 shows familiarity with vocational programs by size of establishment for secondary and postsecondary schools. Large employers report familiarity with programs much more often than small employers do, a phenomenon that is true for both secondary and postsecondary programs.

Table 7.2
Percent of Employers Familiar With Vocational Programs, by Establishment Size

Program Level	Total Number of Employees				All Establishments
	Less Than 50	50-249	250-999	Over 1,000	
Secondary	42	44	50	69	43
Postsecondary	46	56	73	82	49

Source: National Assessment Employer Survey

Familiarity by Workplace Model

To test the hypothesis that establishments that have moved toward a high-performance workplace model are more interested in vocational students than those still using traditional workplace methods, employers were asked a series of questions to ascertain if and to what extent their establishment had been engaged in reorganization. Information on eight kinds of activities, such as the use of self-managed teams and employee profit sharing, was collected. The results are summarized in Table 7.3, which shows employer familiarity with vocational programs by the number of steps taken toward workplace reorganization.

Establishments already engaged in the process of workplace transformation are more familiar with vocational and technical programs than are those still using traditional workplace models. This finding is most pronounced for postsecondary programs. For employers that indicated taking four or more steps toward reorganization, 63 percent were familiar with postsecondary programs. In contrast, only 33 percent of establishments that said they had taken no steps toward reorganization indicated familiarity with vocational programs. To some extent, this variation may be due to employer size, because high-performance establishments also tend to be large.

EMPLOYER ROLES IN VOCATIONAL EDUCATION

Employers familiar with vocational education were asked to indicate their involvement in 12 specific activities related to vocational education, such as participating in advisory councils, providing work-based learning, and devising customized employee training. Over half (53 percent) of these employers indicated involvement in one or more activities related to vocational or technical training (see Table 7.4).

Table 7.3
Percent of Employers Familiar With Vocational Programs, by Number of Steps Toward High-Performance Workplace

Program Level	No Steps	1–3 Steps	4 or More Steps	All Establishments
Secondary	35	45	45	43
Postsecondary	33	48	63	49

NOTE: The Survey asked employers which of eight steps toward a "high-performance workplace" they had implemented. Establishments that had implemented at least half of the steps (4 or more) were considered "high-performance workplaces."

Source: National Assessment Employer Survey

Table 7.4
Employer Involvement With Vocational Education, by Industry
(Percent)

Number of Activities	Industry				All Industries
	Manufacturing	Trade	Services	Other	
None	43	54	43	45	47
One or two	30	29	29	31	30
Three or four	15	11	14	11	12
Five or six	9	4	7	9	7
Seven to twelve	4	2	7	4	4

NOTE: Activities include membership in state, local, or program advisory councils or committees; providing work-based learning programs; participating in customized employee training; conducting plant tours; providing professional development for teachers; providing career information to students; actively recruiting and hiring vocational students; making facilities/equipment available for on-site teaching of students; donating equipment or money to vocational programs; and other methods. Totals may not add to 100% due to rounding.

Source: National Assessment Employer Survey

For those employers indicating involvement, the most commonly mentioned activities are (a) providing career information to students, (b) actively recruiting and hiring students, and (c) supervising students in co-op or work-based situations. In addition, almost 80 percent of employers indicated they were involved with a vocational or technical program in some "other" way.

EMPLOYER PERCEPTIONS OF QUALITY

A key issue is how employers regard the quality of vocational programs. To explore this area, the 2,000 employers who indicated familiarity with vocational education were asked to rate the quality of local programs. Table 7.5 shows employer ratings of overall quality for programs with which they are familiar. The vast majority of responding employers who are familiar with vocational programs view program quality as good. With regard to secondary school programs, 82 percent of establishments reported that the quality was "good" or better. For postsecondary programs, almost 90 percent of employers gave programs a "good" or better rating.

Table 7.5
Employer Rating of Overall Quality of Familiar Program(s) by, Industry (Percent)

Program Level and Rating	Industry				All Industries
	Manufacturing	Trade	Services	Other	
Secondary					
Excellent or very good	40	42	33	47	41
Good	37	41	42	42	41
Fair or Poor	23	17	25	10	18
Postsecondary					
Excellent or very good	52	70	47	47	54
Good	33	25	41	37	34
Fair or Poor	15	5	12	16	11

NOTE: Industries are classified using 2-digit SIC codes. "Trade" includes wholesale and retail trade. "Other" includes Agriculture, Mining, Construction, Transportation, Utilities, and Finance. Totals may not add to 100% due to rounding.

Source: National Assessment Employer Survey

These findings contrast with the business community's negative opinion of the quality of high school graduates in general, as expressed in surveys and public statements over the last decade. It is possible that either the business surveys or the Employer Survey do not accurately represent opinion because of various survey biases. It is also possible that the difference is due to the different objects of inquiry — all students and schools, as opposed to vocational programs. However, we think that the principal reason for the difference may be the presence or absence of first-hand knowledge of and involvement with the programs in question. There are analogous findings in other kinds of surveys. Parents express negative opinions of American public education in general but positive opinions of their own children's schools. Citizens are broadly critical of Congress but favorable toward their own representatives. Another survey discussed later in this chapter seems to reflect the same phenomenon.

Quality by Industry

Across industries, employer ratings of overall vocational program quality varied by small amounts and are somewhat more positive for postsecondary programs (see Table 7.5). More than half of the responding employers rated the postsecondary programs as "excellent" or "very good." The trades, such as construction and automotive repair companies, were especially positive in their assessment (i.e., 70% said that the postsecondary programs in their local areas were "very good" or "excellent.") Establishments in the service industry were the least positive about secondary programs.

Quality by Size

For those employers indicating familiarity with secondary programs, there was no significant variation in quality ratings by size of establishment, (see Table 7.6). This was not the case, however, for postsecondary programs. Large employers (over 1,000) are the most positive about postsecondary vocational education: About two-thirds rate these programs "good" or "excellent."

Quality by Workplace Model

As illustrated in Table 7.7, comparisons of quality ratings by the number of steps taken toward adapting a high-performance workplace model show differing patterns for secondary and postsecondary programs. For those employers indicating familiarity with secondary programs, a higher proportion of traditional establishments than of high-performance establishments have positive views of secondary vocational education. Fifty-eight percent of employers that had taken no steps toward workplace reorganization indicated the highest ratings of quality ("excellent" or "very good"), as compared to 34 percent that had taken four or more steps toward reorganization. Perhaps the skills of high school vocational trainees are adequate for employers using traditional workplace models but tend to fall short of expectations for establishments with

Table 7.6
Employer Rating of Overall Quality of Familiar Program(s), by Size (Percent)

Program Level and Rating	Total Number of Employees				All Establishments
	Less Than 50	50-249	250-999	Over 1000	
Secondary					
Excellent or very good	41	40	32	38	41
Good	40	42	51	40	41
Fair or poor	19	17	16	22	18
Postsecondary					
Excellent or very good	53	59	49	64	54
Good	35	30	43	31	34
Fair or poor	12	11	8	5	11

NOTE: Totals may not add to 100% due to rounding.

Source: National Assessment Employer Survey

high-performance workplace components. On the other hand, around half of employers familiar with postsecondary programs reported the highest level of quality, regardless of the number of steps taken toward workplace transformation.

EMPLOYER OPINIONS OF WORK EXPERIENCE PROGRAMS

In addition to the Employer Survey, two recent efforts provide information concerning employers and their involvement with and views of work experience programs. The National Center on the Educational Quality of the Workforce has, for the past several years, been conducting a series of studies of the youth labor market. Two of those studies were designed to explore the feasibility of building a national system of youth apprenticeship programs.

The first study, conducted by Lynn and Wills,[4] surveyed employers that participated in local youth apprenticeship or cooperative education programs in seven cities. A total of 270 employers responded to the survey, the main goal of which was to explore incentives to encourage employer participation in work experience programs. The response rate to this survey was somewhat higher

Table 7.7
Employer Rating of Overall Quality of Familiar Program(s), by Number of Steps Toward High-Performance Workplace (Percent)

Program Level and Rating	No Steps	1–3 Steps	4 or More Steps	All Establishments
Secondary				
Excellent or very good	58	37	34	41
Good	24	49	40	41
Fair or poor	18	13	26	18
Postsecondary				
Excellent or very good	52	57	51	54
Good	36	33	35	34
Fair or poor	12	10	14	11

NOTE: The Survey asked employers which of eight steps toward a "high-performance workplace" they had implemented. Establishments that had implemented at least half of the steps (4 or more) were considered "high-performance workplaces." Totals may not add to 100% due to rounding.

Source: National Assessment Employer Survey

than to the National Assessment Employer Survey — around 65 percent; however, the rate is still low enough to raise concerns about non-response biases.

The second study, conducted by Zemsky,[5] consisted of a series of focus groups of both large and small employers located in the same geographic areas covered by the Lynn and Wills' study. Unlike that study, however, the focus groups were not limited to participating employers. Since these employers were not providing worksite opportunities, the discussions focused on high school students in general, rather than toward vocational students.

Like the Employer Survey, the Lynn and Wills survey found that employers participating in work experience programs are quite satisfied with their arrangements. According to the report:

- Ninety percent of employers surveyed said they either "agree" or "strongly agree" that students become productive workers.

- Eighty-six percent of employers indicated that they were satisfied with the school's ability to provide students with the skills they needed.[6]

It is important to note that those surveyed were employers participating in work-based programs. They are not representative of all employers. Their participation in these programs suggests that they were favorably inclined toward the programs from the beginning.

The opinions about high school students in general expressed by non-participating employers are in marked contrast to these positive responses. Zemsky sums up the focus group findings as follows: "The employers in the focus groups expressed extremely negative views about both students and high schools. . . . According to these employers, young people lack discipline; they expect to be catered to; they don't want to do the dirty jobs; they don't respect authority."[7]

Their opinions regarding the basic skills of youth also were negative. Employers from the focus groups indicated that "Young people lack communication skills; they are neither numerate or literate; they can't make change; they don't understand the importance of providing customer service." The opinions expressed in the focus group are similar to the findings from other surveys in which employers have expressed concerns about the attitudes and work habits of high school students in general.[8]

CONCLUSION

Some 60 percent of employers responding to a national survey said they were familiar with vocational programs in their areas. Large employers and those with high-performance workplace components were more likely to be familiar with vocational programs than were other employers. Just over half of the establishments familiar with vocational programs (53%) were also directly involved in vocational education in some way.

The great majority of responding employers who are familiar or involved with vocational education programs and work experience programs view them as valuable and successful, whereas those employers who are not involved express negative attitudes toward young workers in general and toward the academic preparation of those workers.

Establishments in the process of reorganizing toward high-performance workplaces are less satisfied with the quality of secondary vocational programs than are those still using traditional models of production. It appears that when higher skills are demanded, employers look to workers with more training and experience than is possessed by high school graduates — even those from vocational programs.

ENDNOTES

1 Section 403(b)(6).

2 Martindale, M., & Branden, L. (1994), *Survey of Employers*, draft report prepared for the National Assessment of Vocational Education, Westat.

3 All tables are weighted estimates. The sample was drawn with probability proportional to establishment size, so weights proportional to the inverse of the probability of selection are needed to accurately reflect the population. Westat adjusted these base weights to correct for non-response, a process that assumes that non-respondents would have provided answers similar to those provided by similar respondents. Validity of inferences from these tables hinges on the accuracy of this assumption.

4 Lynn, I., & Wills, J. (1994), *School-to-Work-Transition Lessons on Recruiting and Sustaining Employer Involvement*, Institute for Educational Leadership.

5 Zemsky, R. (1993), *What Employers Want: Youth Apprenticeships and the Development of Effective Policies for Improving the Educational Quality of the American Workforce*, paper for the Association for Public Policy and Management Conference.

6 Lynn and Wills (1994), p. 27.

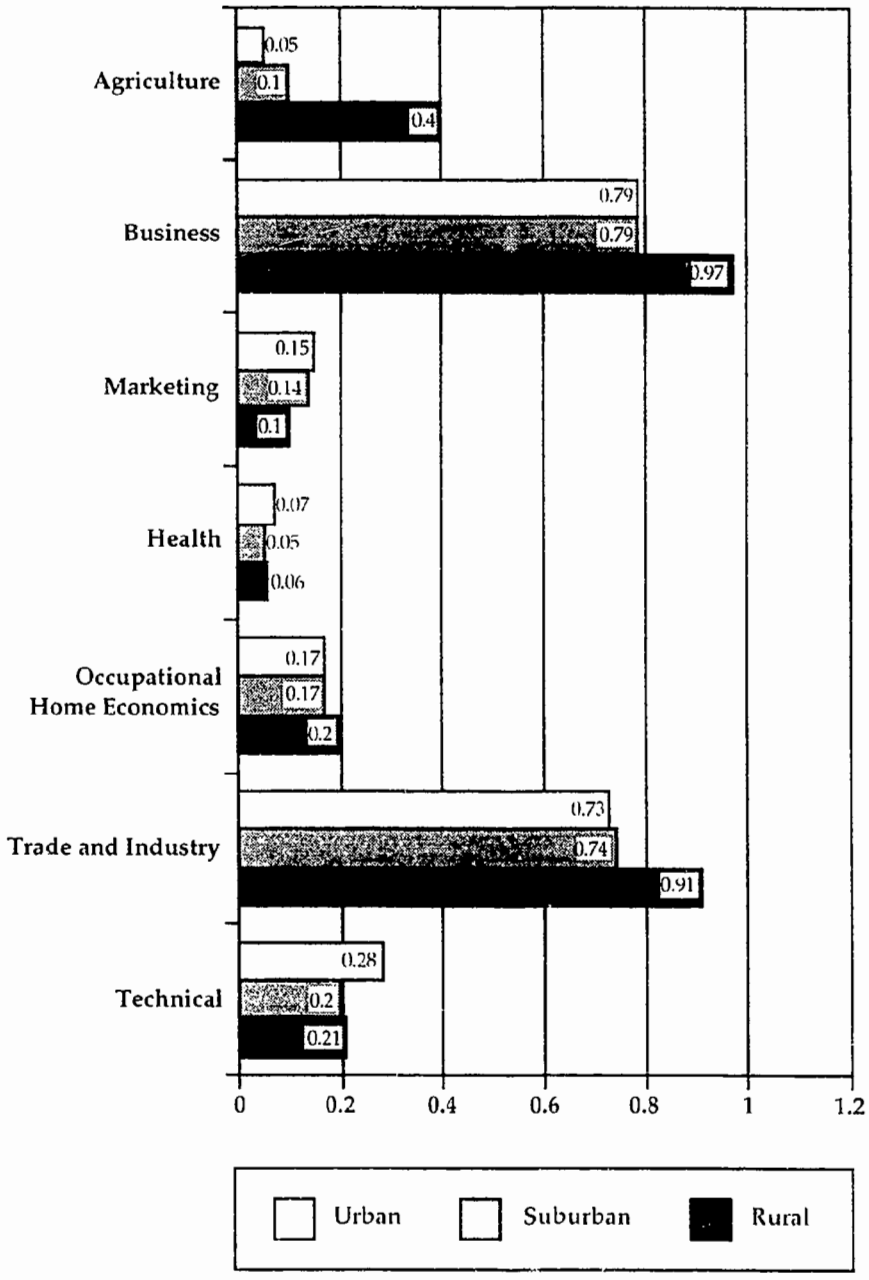
7 Zemsky (1993), p. 8.

8 Lynn and Wills (1994), p. 6.

CHAPTER APPENDICES

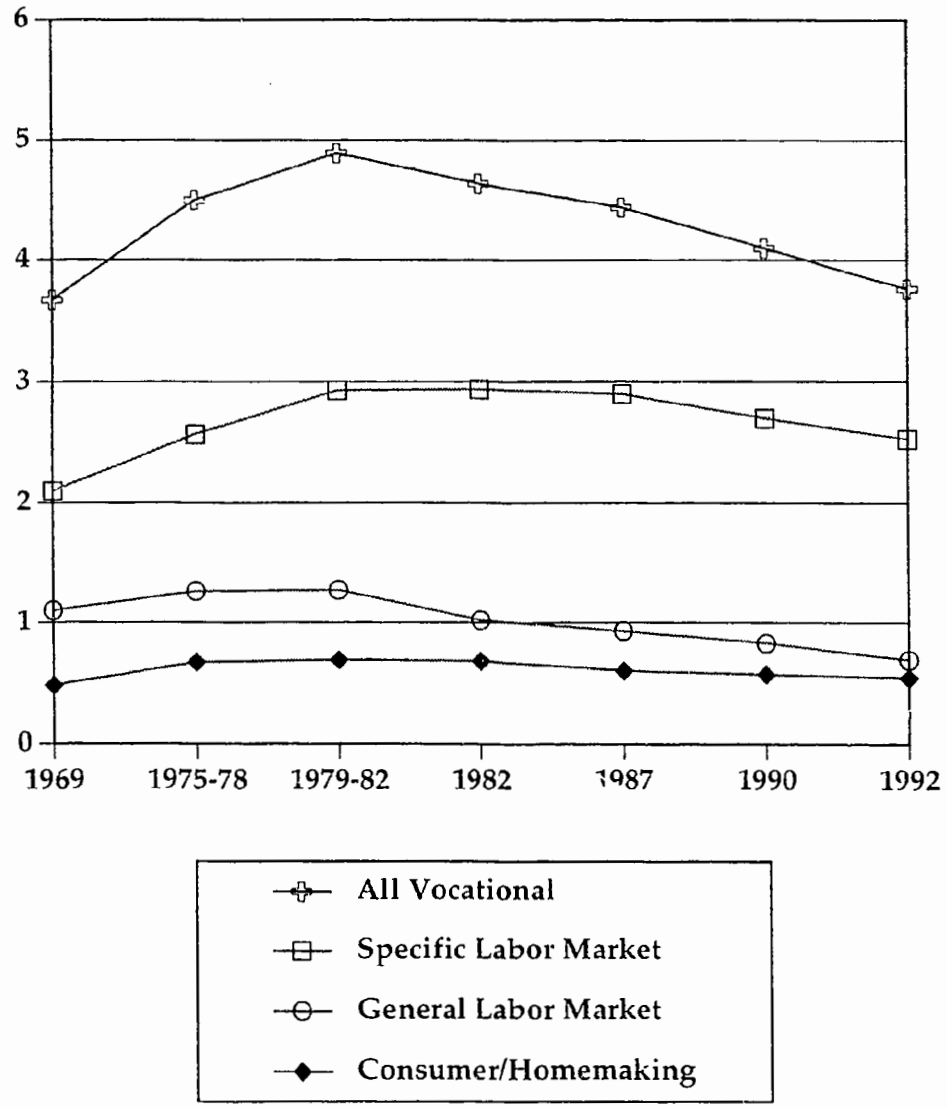
CHAPTER 1 APPENDIX

Figure A-1.1
Average Number of Credits 1992 Graduates Earned in Each Vocational Program Area, by School Locale



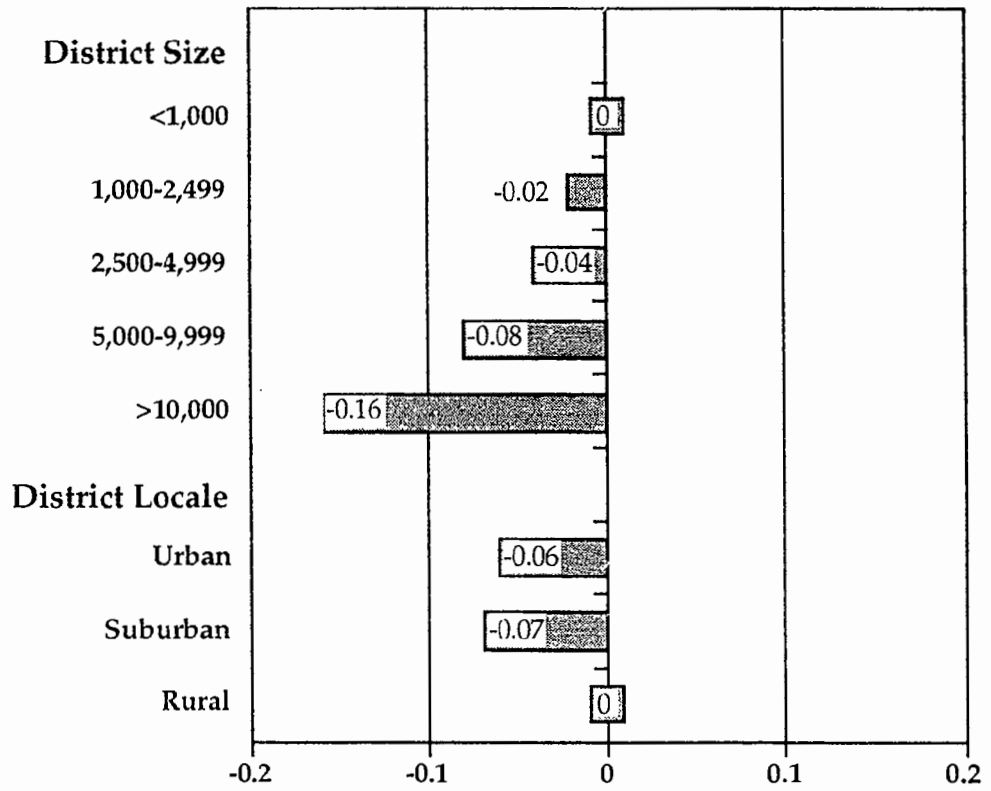
Source: 1992 NELS

Figure A-1.2
Average Number of Credits Earned in the Vocational Curricular Areas, 1969 to 1992



Sources: Muraskin (1993), 1990 NAEP, 1992 NELS

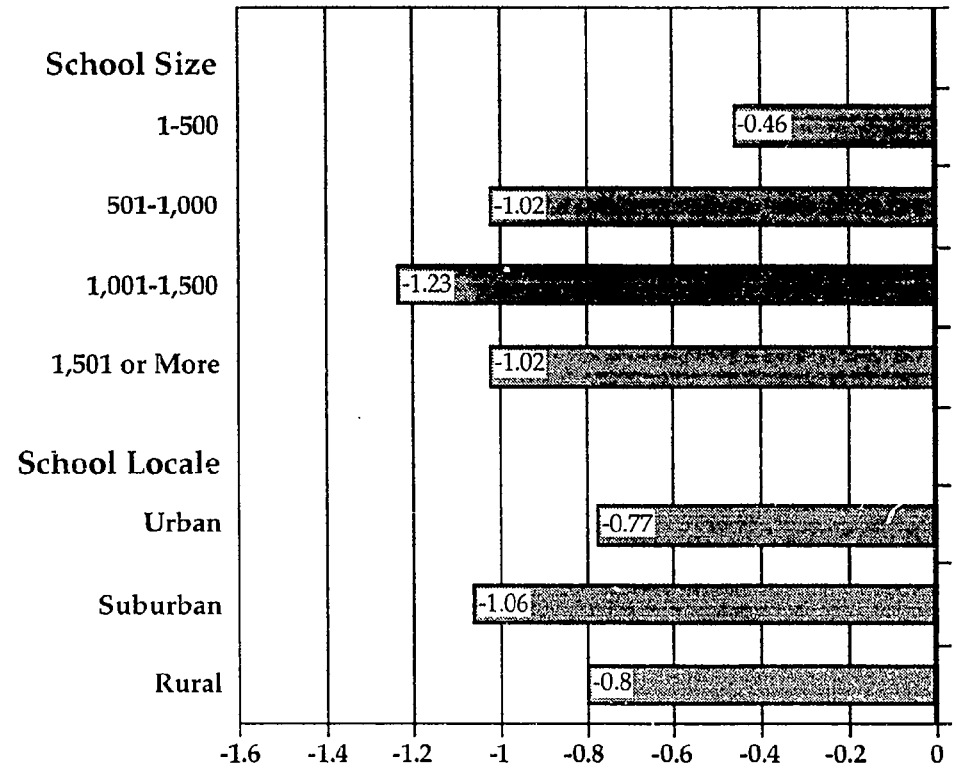
Figure A-1.3
Change in Vocational Enrollments Relative to Total Enrollments, by District Size and Locale, 1987 to 1991 (Regular Districts Only)



NOTE: See text endnote 5 for details of change calculations.

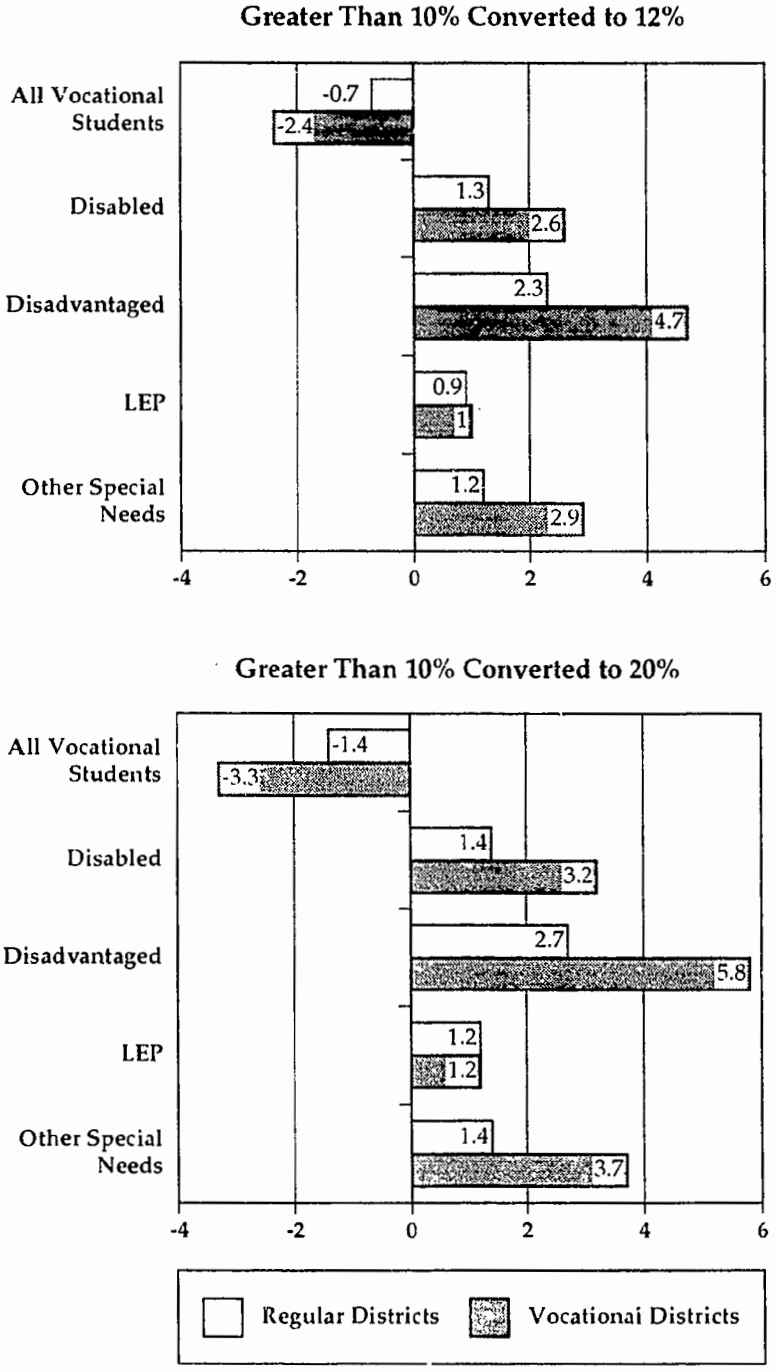
Source: Omnibus District Surveys

Figure A-1.4
Change in Number of Vocational Credits Earned by High School Graduates, by School Size and Locale, 1982 to 1992



Sources: 1982 HSB and 1992 NELS

Figure A-1.5
Average Percent of Change in Vocational Enrollments from 1987 to 1991



Source: Omnibus District Surveys

Table A-1.1
Average Number of Vocational Education Credits Earned, by Student Type, 1982 to 1992[a]

Student Type	1982	1987	1990	1992
Disability status				
Not disabled	—	4.37	4.05	—
Disabled	—	5.99	5.99	—
Test quartile				
Top 25%	2.84	—	—	2.30
50–75%	4.66	—	—	3.42
25–50%	5.55	—	—	4.37
Bottom 25%	5.92	—	—	5.06
GPA				
Mostly As	3.23	2.90	2.59	2.44
Mostly Bs	4.39	4.10	3.69	3.49
Mostly Cs	5.26	5.02	4.85	4.32
Mostly below C	4.96	5.08	5.00	4.74
Remedial credits				
0	4.47	4.17	3.76	3.54
.01–1.99	5.24	5.01	4.93	4.39
2 or more	5.13	5.53	5.53	5.36
SES status				
Highest 25%	3.23	—	—	2.41
50–75%	4.44	—	—	3.54
25–50%	5.12	—	—	4.39
Lowest 25%	5.56	—	—	4.74

[a] Comparable data across years are not available for single parents or LEP students. Disabled students were defined consistently only in the 1987 and 1990 NAEP, and test score and SES data are available only in the 1982 HSB and 1992 NELS.

Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, 1992 NELS

Table A-1.2
Percent of Teachers Reporting Problems for Vocational Education in Their Schools (and Rank)

Problem	Academic Teachers	Vocational Teachers		
		All	Comprehensive High Schools	Vocational Schools
Placing problem students into vocational education programs regardless of appropriateness	39 (6)	55 (1)	56 (2)	52 (1)
Status of vocational education in relation to academic subjects	45 (3)	54 (2)	57 (1)	43 (3)
Student motivation	52 (1)	49 (3)	49 (3)	48 (2)
Maintaining vocational enrollments	33 (10)	47 (4)	49 (3)	41 (4)
Coordinating vocational and academic instruction	43 (4)	42 (5)	42 (5)	39 (6)
Student absenteeism	47 (2)	41 (6)	40 (6)	41 (4)
Adequacy of equipment	36 (7)	39 (7)	40 (6)	33 (8)
Time available for working with students other than students with special needs	40 (5)	38 (8)	39 (8)	37 (7)
Access to computers	35 (8)	34 (9)	36 (9)	27 (10)
Teachers' preparation in instructing students with special needs	31 (12)	33 (10)	34 (10)	30 (9)
Support services for students with special needs	24 (14)	30 (11)	32 (11)	23 (12)
Student discipline	34 (9)	27 (12)	27 (13)	26 (11)
Link between vocational curriculum and local labor market	32 (11)	26 (13)	28 (12)	18 (14)
Maintaining high instructional standards	29 (13)	24 (14)	25 (14)	20 (13)

NOTE: Along with a list of potential problems in their schools, teachers were asked to rate each problem on a scale ranging from no problem (1) to serious problem (4). The rankings shown reflect the proportion of teachers who rated each problem as serious. Thus inappropriate placement of problem students in vocational education is ranked number 1 among vocational teachers because the proportion who considered it a serious problem is larger than for any other problem.

Source: National Assessment of Vocational Education Teacher Survey

Table A-1.3
Percent of Administrators Reporting Problems for Vocational Education in Their Districts (and Rank)

	Regular Districts	Vocational Districts
Funds for vocational classroom support	58 (1)	71 (2)
Finding vocational teachers trained to instruct special needs students	45 (2)	73 (1)
Maintaining vocational enrollments	45 (2)	64 (4)
Equipment or facilities for vocational education	45 (2)	54 (7)
Image of vocational education among students and parents	39 (5)	68 (3)
Knowledge of relevant trends in industry	34 (6)	25 (11)
Finding vocational teachers with ability to provide needed academic instruction	33 (7)	60 (5)
Support services for vocational special needs or special population students	26 (8)	32 (9)
Finding vocational teachers with training in teaching methods	25 (9)	56 (6)
Image of vocational education among business community	24 (10)	34 (8)
Finding vocational teachers with appropriate vocational knowledge and skills	23 (11)	32 (9)
Recruiting special needs students to vocational education	19 (12)	13 (12)

NOTE: See Table A-1.2 for explanation of the ranking system.

Source: Omnibus Surveys, Districts B and Vocational

CHAPTER 2 APPENDIX

Table A-2.1
Percentage of Vocational Students in Each Special Population Category, by Institution Type, 1989

Institution Type	Lowest SES Quartile		No Regular High School Diploma	Disabled	Single Parent
	Dependent Students	Independent Students			
Public two-year	28	30	10	12	8
Public voc-tech	48	47	24	17	8
Proprietary	57	38	27	16	13
Private two-year	36	30	18	10	8
Private four-year	26	27	4	8	5
Public four-year	22	27	4	7	5

Source: Tuma (1993)

Table A-2.2
Percent of Enrollments in Each Major That Are Male, by Vocational and Academic Discipline, Fall 1986 and Fall 1989

Major	1986	1989
Vocational Majors		
Health sciences	14.7	17.8
Business support	8.7	20.6
Consumer services	8.6	21.3
Home economics	5.0	23.2
Allied health	19.7	30.5
Vocational home economics	27.4	31.3
Agricultural sciences	53.3	37.7
Marketing	40.0	41.1
Business management	45.5	49.2
Computer science	51.2	54.8
Science technology	51.7	63.2
Natural resources	83.0	64.8
Protective services	66.5	67.8
Communications technician	64.3	69.3
Agriculture	64.8	74.3
Engineering	86.8	84.9
Transportation	89.1	85.9
Precision production	74.4	87.0
Mechanics	93.8	88.7
Engineering technician	88.7	89.4
Construction	91.2	96.6

(continued)

Table A-2.2 (continued)
Percent of Enrollments in Each Major That Are Male, by Vocational and Academic Discipline, Fall 1986 and Fall 1989

Major	1986	1989
Academic Majors		
Law/legal assistant	32.1	17.2
Education	25.8	18.8
Public affairs	17.8	21.9
Psychology	26.5	26.2
Foreign language	21.5	29.1
Area/ethnic studies	46.3	31.0
Letters	31.7	35.0
General studies	41.7	41.2
Fine arts	40.6	42.2
Military science	61.2	47.3
Communications	49.1	48.4
Theology	64.7	51.3
Life sciences	49.3	51.8
Parks/recreation	—	53.2
Environmental design	57.0	55.2
Mathematics	50.1	55.6
Social sciences	51.2	59.6
Physical science	71.1	67.4
Philosophy/religion	68.4	81.1

— Too few cases to estimate.

Source: Tuma (1993)

Table A-2.3
Ratio of Postsecondary Credits Earned by Men to Credits Earned by Women in Vocational Program Areas, for 1972 and 1980 High School Seniors

Vocational Program	1972 Seniors	1980 Seniors
Engineering/science technology	17.0	27.0
Trades	7.3	10.0
Agriculture	4.0	5.0
Protective services	4.0	1.7
Computers/data processing	1.3	1.7
Marketing	1.0	0.8
Business and office	0.6	0.6
Home economics	0.2	0.5
Health	0.1	0.3

NOTE: These findings are based on the National Longitudinal Study of 1972 (NLS) and the 1980 High School and Beyond (HSB), longitudinal studies that collected transcripts from students who later enrolled in postsecondary education. Since these data are for 1972 and 1980 high school graduates, they show postsecondary enrollment shifts from about the mid-1970s to the mid-1980s. The shift toward relatively more credits earned by females in protective services is attributable to fewer males earning credits in this area, rather than to more females earning credits.

Source: Hoachlander et al. (1993)

Table A-2.4
Completion, Persistence, and Dropout Rates for Classes of 1972 and 1980, Four Years After High School Graduation (Percent)

	Community College	Public Technical Institute	Proprietary School
Class of 1972			
Completion	23	32	38
Persistence	48	32	21
Dropout	30	36	41
Class of 1980			
Completion	19	36	36
Persistence	39	18	22
Dropout	42	46	42

Sources: Goodwin (1989); Grubb (1993a).

CHAPTER 4 APPENDIX

Appendix 4-A

Secretary's Commission on Achieving Necessary Skills (SCANS): U.S. Department of Labor

SCANS SKILLS

The first five skills are **workplace competencies:**

Resources — Knowing how to allocate time, money, materials, space and staff.

Interpersonal skills — Knowing how to work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.

Information — Knowing how to acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

Systems — Understanding social, organizational, and technological systems; knowing how to monitor and correct performance; and knowing how to design or improve systems.

Technology — Knowing how to select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.

In addition, there are three broad **foundation skills**:

Basic skills — Reading, writing, arithmetic, mathematics, speaking, and listening.

Thinking skills — The ability to learn, to reason, to think creatively, to make decisions, and to solve problems.

Personal qualities — Individual responsibility, self-esteem and self-management, sociability, and integrity.

Abstracted from: Secretary's Commission on Achieving Necessary Skills (1991). *What Work Requires of Schools: A SCANS Report for America 2000.* Washington, D.C.: U.S. Department of Labor.

Table A-4.1
Students Taking at Least One Semester of Computer Science, by Vocational Concentration, 1992

Vocational Concentration	Percent Taking Computer Science
Home economics	16.1
Marketing	20.3
Agriculture	25.1
Health	25.5
Trade and industry	26.6
Business	62.6
Technical and communications	72.0
All high school students	37.4

Source: National Education Longitudinal Study (1992).

Table A-4.2
Percent of Classes in Which More Than Ten Percent of Time Is Spent on Specified Subject

Subject	Type of Class										
	Vocational					Academic					
	Business	Home Ec.	T&I	Other	All	English	Math	Science	Social Studies	Language	All
Problems using basic algebra	6	3	20	15	11	0	81	36	2	0	26
Problems using math beyond basic algebra	3	2	7	8	5	0	57	11	2	0	16
Writing assignments	39	53	33	41	40	92	13	59	75	71	62
Biology principles	0	12	3	24	9	0	0	49	2	0	11
Chemistry laws or principles	0	13	8	13	7	0	4	56	1	0	11
Physics laws or principles	0	4	16	25	11	0	12	45	2	0	12
Occupationally related principles	82	80	89	85	82	17	28	17	14	10	18

Source: National Assessment of Vocational Education Teacher Survey

Table A-4.3
Competencies Contributing to Students' Grades
(Percent of Teachers Saying Competency Contributes "to a Great Extent")

Competency	Academic Classes	Vocational Classes		
		All	Comprehensive High Schools	Vocational Schools
Academic Skills				
Basic mathematics skills or concepts	24	24	22	30
Advanced mathematics skills or concepts	12	4	3	9
Basic science knowledge	14	9	7	15
Advanced science knowledge	7	2	2	5
Basic reading skills	60	45	45	47
Advanced reading skills	33	12	12	14
Writing skills	41	18	18	17
SCANS Skills — Workplace Competencies				
Completing work on time	47	45	46	44
Teamwork skills	15	27	26	36
Research/reference skills	12	7	6	11
Understanding of organizational and technical systems	14	27	26	31
Ability to use technology	13	37	38	34
SCANS Skills — Foundation Skills[a]				
Oral communication	34	35	33	44
Creative thinking and problem solving	44	41	40	47
Self-management skills	40	52	51	54
Vocational/Integrated Skills				
Job-specific skills	4	54	51	73
General employability skills	9	53	49	69
Ability to apply academic concepts to occupational tasks	11	47	46	51

[a] Foundation skills also include basic skills in reading, writing, and math.

Source: National Assessment of Vocational Education Teacher Survey

CHAPTER 5 APPENDIX

Figure A-5.1
Average Credits Earned in Different Academic Subject Areas by Vocational, General, and Academic Students, 1982, 1987, 1990, and 1992

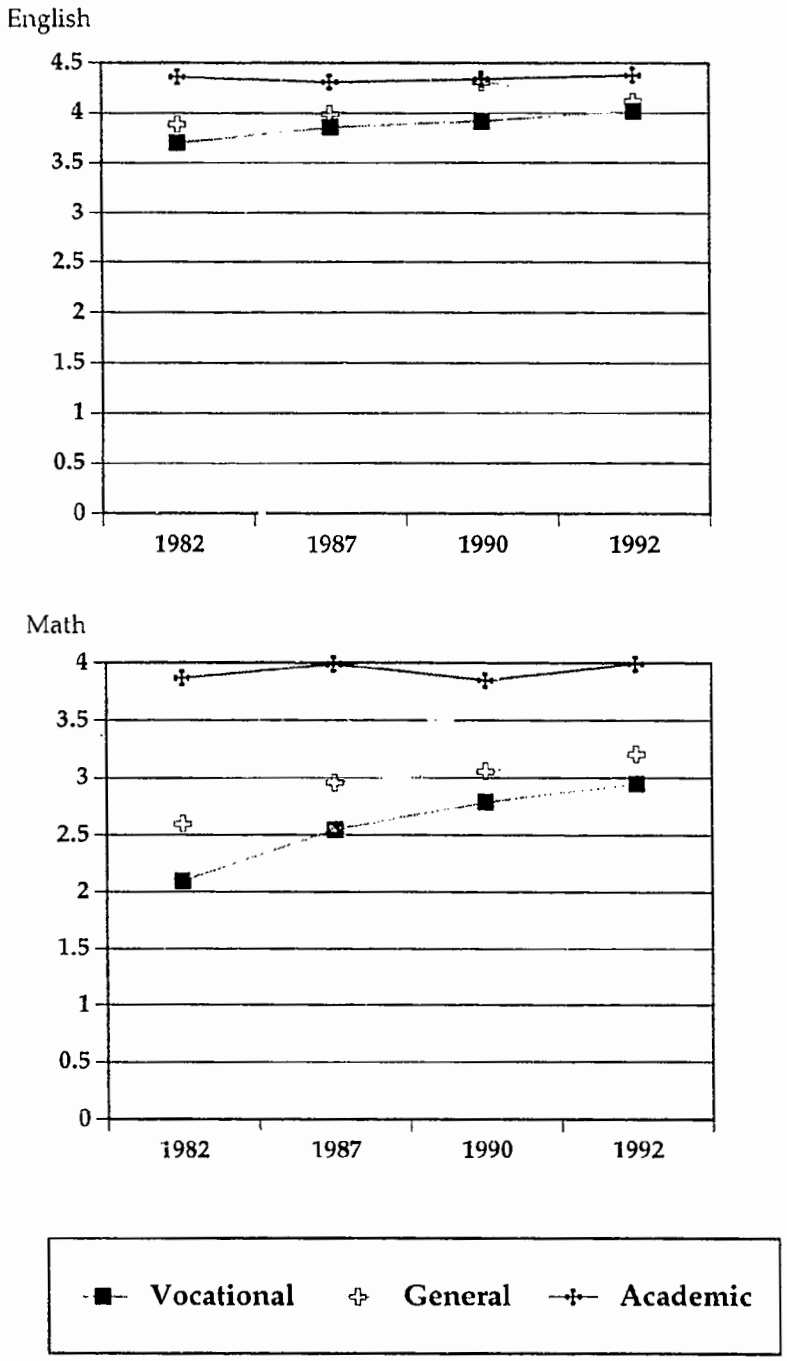


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Figure A-5.1 (continued)
Average Credits Earned in Different Academic Subject Areas by Vocational, General, and Academic Students, 1982, 1987, 1990, and 1992

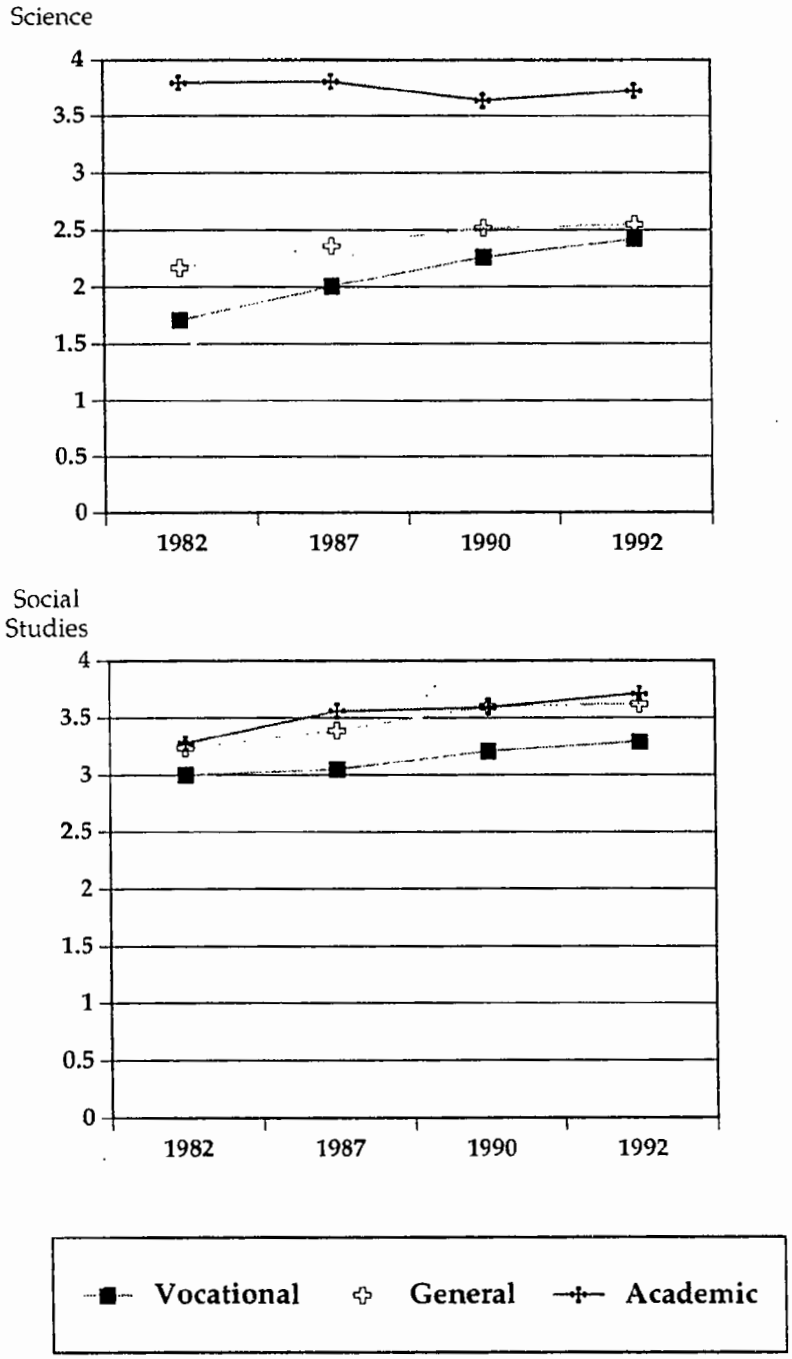

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Figure A-5.1 (continued)
Average Credits Earned in Different Academic Subject Areas by Vocational, General, and Academic Students, 1982, 1987, 1990, and 1992

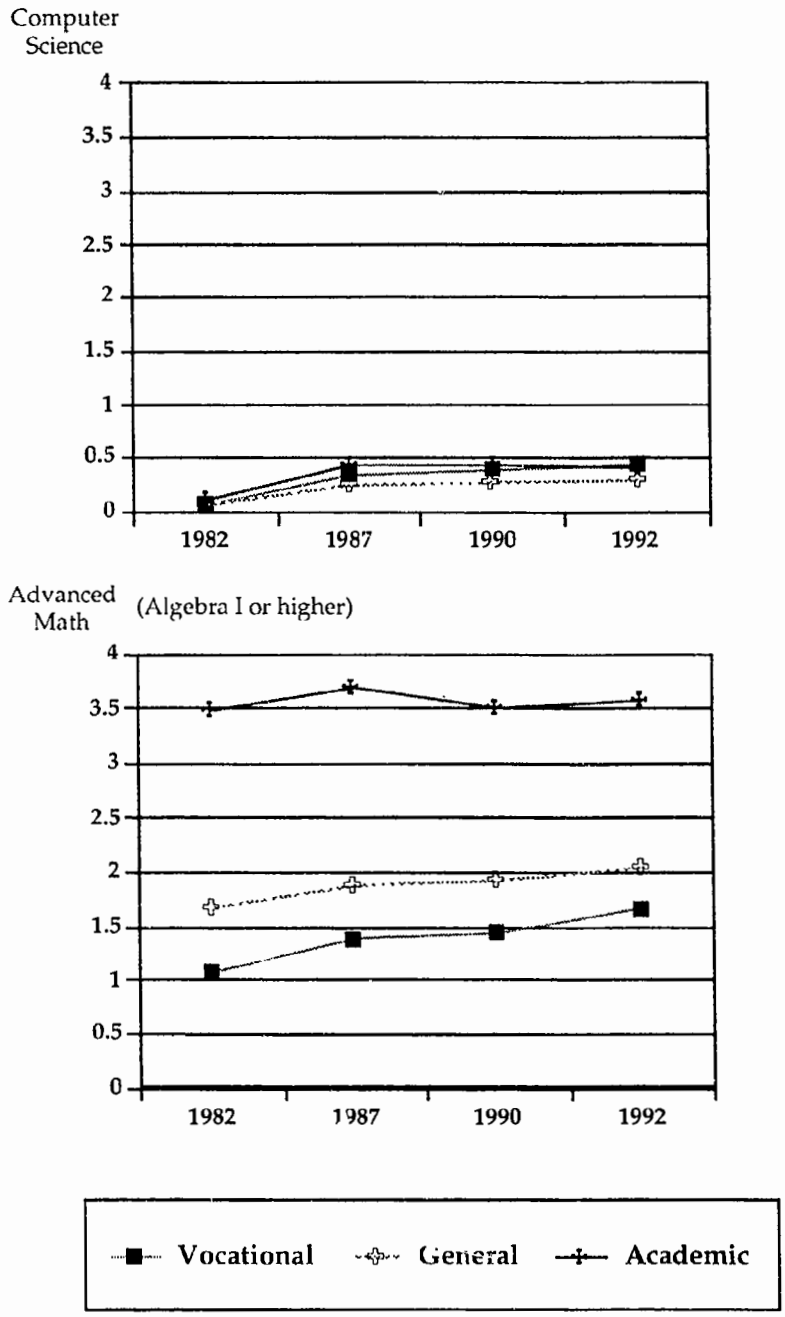

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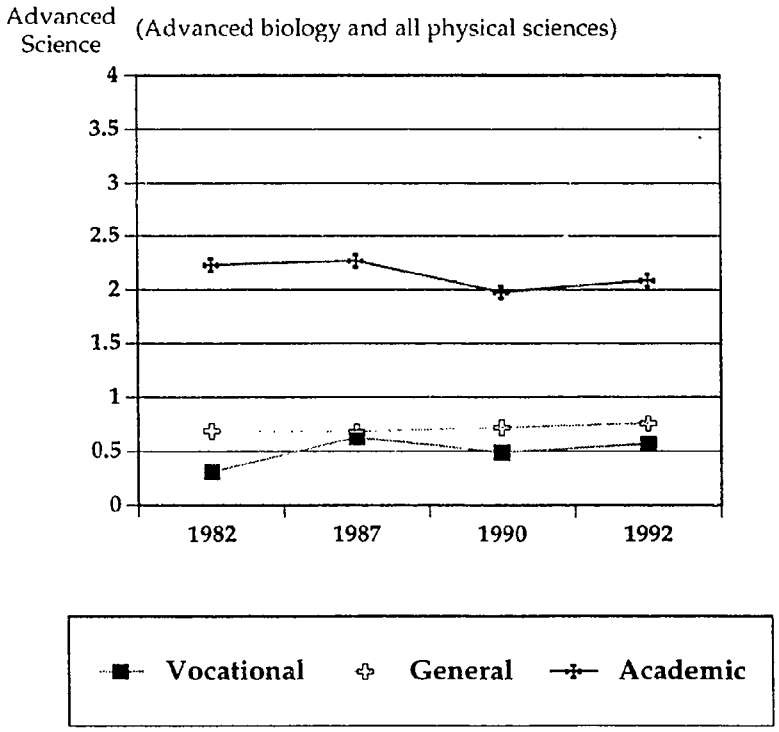
Figure A-5.1 (continued)
Average Credits Earned in Different Academic Subject Areas by Vocational, General, and Academic Students, 1982, 1987, 1990, and 1992



Sources: 1982 HSB, 1987 NAEP, 1990 NAEP, and 1992 NELS

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