Academic Education and Occupational Training

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Abstract
“Most of the young people entering professional, technical, and managerial occupations start their occupational training in a school. Higher education is predominantly occupational education and is becoming more 80 each year. In 1980-81, only 17 percent of master’s degrees and 33 percent of bachelor’s degrees were in traditional liberal arts fields. Many of those who get these degrees remain in school to get a Ph.D., M.D., D.D.S. or L.L.B., all of which certify three or more years of intensive occupational training. Consequently, almost all college graduates obtain training for a particular occupation before leaving school.”

Keywords
ILR, center, human resource, job, worker, advanced, labor market, satisfaction, employee, work, training, employ, model, industrial relations, teacher, student, parent, school, achievement, wage, degree, occupation, education, graduate

Disciplines
Education | Human Resources Management | Labor Relations | Training and Development

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ACADEMIC EDUCATION AND OCCUPATIONAL TRAINING

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Introduction

Most of the young people entering professional, technical, and managerial occupations start their occupational training in a school. Higher education is predominantly occupational education and is becoming more so each year (see Table 1). In 1980-81, only 17 percent of master's degrees and 33 percent of bachelor's degrees were in traditional liberal arts fields. Many of those who get these degrees remain in school to get a Ph.D., M.D., D.D.S. or L.L.B., all of which certify three or more years of intensive occupational training. Consequently, almost all college graduates obtain training for a particular occupation before leaving school.

What role should schools play in the training of the 70 percent of the labor force who do not get a bachelor's degree? These workers account for the bulk of the nation's blue collar sales, clerical, and technical workers. The training requirements and intellectual demands of many of these jobs are quite considerable. In clerical jobs, for instance, the time and resources devoted to training a new employee during the first three months on a job have a value equal to 45 percent of the output of a worker with two years of tenure at the firm. Training costs during the first three months are 36 percent of an experienced worker's potential output for retail sales jobs, 38 percent for blue collar jobs, and 25 percent for service jobs (Bishop, 1985). Should these workers receive their initial occupationally specific training in school or on a job? Should this training be offered by high schools as well as postsecondary institutions? By what criteria should these decisions be made?

The primary justification of occupationally specific education must be an economic one. It must make the students better off economically. Making them no worse off is not good enough. If the economic effects of taking academic and occupational courses in school were equal, the public would probably want to substitute academic for occupational course work. Their preference for the academic has a rational base:

- Academic courses are less costly to teach (because class sizes are larger and space and equipment needs smaller);
- Employers expect to teach occupational skills to new hires who have not received training in high
### Table 1

*Extent of Occupational Specialization In Secondary and Postsecondary Education*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1980-81</th>
<th></th>
<th>1967-68</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certificates or Degrees (000'0s)</td>
<td>Percent Occupational</td>
<td>Certificates or Degrees (000'0s)</td>
<td>Percent Occupational</td>
</tr>
<tr>
<td>High School graduates</td>
<td>3,026</td>
<td>25&lt;sup&gt;1&lt;/sup&gt;</td>
<td>2,702</td>
<td>24&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Completers or occupational programs of noncollegiate postsecondary schools&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1,109</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Associate degrees awarded&lt;sup&gt;3&lt;/sup&gt;</td>
<td>416</td>
<td>63</td>
<td>159</td>
<td>43&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bachelor's degrees awarded&lt;sup&gt;4&lt;/sup&gt;</td>
<td>935</td>
<td>67</td>
<td>632</td>
<td>51</td>
</tr>
<tr>
<td>Master's degrees awarded&lt;sup&gt;5&lt;/sup&gt;</td>
<td>296</td>
<td>83</td>
<td>176</td>
<td>79</td>
</tr>
<tr>
<td>Doctorate degrees awarded&lt;sup&gt;6&lt;/sup&gt;</td>
<td>33</td>
<td>100</td>
<td>23</td>
<td>100</td>
</tr>
<tr>
<td>First professional degrees awarded&lt;sup&gt;7&lt;/sup&gt;</td>
<td>72</td>
<td>100</td>
<td>34</td>
<td>100</td>
</tr>
</tbody>
</table>

1. Estimate of percent vocational is based on self reports of seniors from surveys of the Class of '72 and the Class of '80 (High School and Beyond).

2. *Enrollments and Programs in Noncollegiate Postsecondary School*, 1978. Some of the Associate degrees in occupational fields reported in Line 3 are also counted as completers in Line 2.

3. *Table i18, Digest of Educational Statistics*.

4. *Table 100, Digest of Educational Statistics*, 1983-84. A Ph.D. in any field was considered to be occupational preparation. The following fields were considered to be occupational preparation at the bachelor's and master's level: agriculture, architecture, business, computer and information sciences, communications, education, engineering, fine arts (performance), health professions, home economics, library science, military science, public affairs, and theology. The fields considered to be nonoccupational at the bachelor's and master's level were: area studies, biology, art history and music appreciation, foreign languages, letters, mathematics, physical science, psychology, social science, and interdisciplinary majors.

5. The source for number of earned degrees was the *1969 Digest of Educational Statistics*.

6. The associate degree breakdown is for 1970-71 and is taken from Table 124 of *1977-78 Digest of Educational Statistics*. 

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school, but they are unlikely to teach basic skills to their employees;

- Academic course work is better preparation for college than occupational coursework, so choosing an occupational curriculum inevitably reduces the ability of the student to change his/her mind about college and later go for a bachelor's degree;

- The public's educational goals are in part cultural and political, and nonvocational courses make greater contributions to these goals;

- Basic skills do not become obsolescent, while occupational skills do.

The key questions, then, are whether and to what degree those who receive occupationally specific training in school are actually more productive and require less training on the job than those who receive no such training. Are such students more likely to find employment? Are they paid higher wages? Which types of occupational training have the largest impacts? What are the economic tradeoffs between basic skills and occupational skills? What role should the federal government take in efforts to bring about improvements in the occupationally specific training provided by schools?

All of these questions need to be addressed by the National Assessment of Vocational Education. There is already a considerable body of research on some of these questions, so the first step in establishing a research agenda is to review what is already known. The second step is to define a set of options for federal policy that previous research suggests may be desirable. The final step is to identify what must be known (that can be feasibly learned within the time span of the Assessment) to set policy intelligently, and then to design studies that definitively answer the questions posed. The paper attempts to follow this three-step process for five critical issues affecting vocational education. The five critical issues that must be addressed are the following:

1. Priorities: basic skills vs. occupational skills? Are they complements or substitutes in use?

2. Does studying occupationally specific skills in school necessarily result in learning less basic skills?

3. Are the occupationally specific skills learned in school being used?
4. How large are the benefits of vocational education and what causes them?

5. Where are occupationally specific skills best learned?

The remainder of the paper is devoted to discussing each of these issues in turn. A short summary concludes the paper.

I. Priorities: Basic Skills vs. Occupational Skills. Are They Complements or Substitutes in Use?

Over the last 80 years, industrial psychologists have conducted hundreds of studies, involving over 100,000 workers, on the relationship between productivity in particular jobs and various predictors of that productivity. This enormous body of research has recently been reviewed and aggregated by Hunter and Hunter (1984), Reilly and Chao (1983), and others. Direct measures of both basic skills (aptitude tests) and vocational skills (job knowledge tests) have very large associations with reported productivity. This occurs regardless of whether productivity is measured directly or by supervisory ratings. Aptitude tests can be classified into three basic types, each measuring different abilities:

- **General mental ability**—General mental ability tests, such as the Scholastic Aptitude Test (SAT), focus on verbal, quantitative, spatial, and reasoning abilities. Thus, they test the competencies that are the prime objectives of schooling. School attendance has been shown to improve performance on these tests (Lorge, 1945). Improvements in education were probably responsible for the increase between World War I and World War II of one standard (the equivalent of 110 SAT points) in the average test scores of Army draftees.

- **General perceptual ability**—General perceptual ability is a combination of perceptual speed and spatial and mechanical ability. It includes the ability to perceive detail quickly, to identify patterns, to visualize objects, and to perform other tasks that rely on speed or accuracy in picking out an individual element from a mass of apparently undifferentiated elements. It also involves the ability to perceive spatial patterns and knowledge of mechanical and electronic principles and facts.

- **Psychomotor ability**—Psychomotor tests are used to determine the ability to manipulate objects physically. An example is a dotting test, which requires the test taker to place a single dot within each of a series of very small circles.
Table 2 presents correlations between each type of aptitude tests and job performance for a variety of specific occupations.

Table 2
Validity of Alternative Predictors of On-the-Job Performance by Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>General Mental Ability</th>
<th>General Perceptual Ability</th>
<th>Psychomotor Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers</td>
<td>.53</td>
<td>.43</td>
<td>.26</td>
</tr>
<tr>
<td>Clerical</td>
<td>.54</td>
<td>.46</td>
<td>.29</td>
</tr>
<tr>
<td>Higher level sales</td>
<td>.61</td>
<td>.40</td>
<td>.29</td>
</tr>
<tr>
<td>Protective services</td>
<td>.42</td>
<td>.37</td>
<td>.26</td>
</tr>
<tr>
<td>Services</td>
<td>.48</td>
<td>.20</td>
<td>.27</td>
</tr>
<tr>
<td>Skilled trades &amp; crafts</td>
<td>.46</td>
<td>.43</td>
<td>.34</td>
</tr>
<tr>
<td>Industrial (semiskilled)</td>
<td>.37</td>
<td>.37</td>
<td>.40</td>
</tr>
<tr>
<td>Vehicle operators</td>
<td>.28</td>
<td>.31</td>
<td>.44</td>
</tr>
<tr>
<td>Sales clerks</td>
<td>.27</td>
<td>.22</td>
<td>.17</td>
</tr>
</tbody>
</table>

Source: Summarized from Hunter and Hunter (1984)

The results provide important evidence that basic skills (the abilities measured by general mental ability tests) improve productivity in a great variety of jobs, including many of the jobs for which training is provided by high school vocational education programs.

The results summarized in Table 1 can be used to calculate the increase in productivity on a given job produced by a worker having a 110 point higher score on both the math and verbal SAT. Conservative calculations indicate that those with the higher scores are between 11 and 16 percent more productive in clerical jobs; 10 to 14 percent more productive in skilled trades, crafts, and service jobs; eight to 11 percent more productive in semi-skilled factory jobs; and six to eight percent more productive in vehicle operator and sales clerk jobs (Bishop, 1985).

Does the finding that basic skills are important to a worker's productivity imply that schools should deemphasize the teaching of skills specific to particular occupations? Not necessarily, for it is occupational and job-specific skills that make the worker more productive. When tests of job knowledge (occupational skills) compete with tests of general mental ability (basic skills) in

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predicting job performance measured by actual work samples, the job knowledge tests have by far the greater impact (Hunter, 1983). The finding that job knowledge had much larger direct effects on performance than cognitive skill per se implies that the major contribution of cognitive skills to productivity is that it helps the worker learn the job and occupationally specific skills that are actually being used to do the job.

Thus, basic skills and occupational skills are complements rather than substitutes. Occupational skills and knowledge are essential because they directly affect productivity. Basic skills are important primarily because they contribute to the learning of job specific and occupational skills.

It is sometimes argued that high school students should concentrate on basic skills rather than occupational skills because jobs are changing so rapidly that occupational skills learned in school quickly become obsolescent. This argument is sometimes preceded by the assertion that "we live in a new environment in which jobs are changing more rapidly than ever before." In fact, however, what evidence there is on changing skill requirements suggests that change is less rapid now than before. Rates of job turnover, rates of exit from agriculture, and overall technological progress are all lower now than in the first seven decades of the twentieth century. Workers have always had to learn new occupational skills. In most cases, new skills are learned as small modifications of old skills. Job-specific and occupational skills are generally hierarchical, and changes in skill requirements are typically incremental. Consequently, new skills generally cannot be learned until a foundation of job knowledge and older occupational skills has been developed. At some point every individual must start building his/her foundation of occupational skills. When the foundation building should begin is primarily a function of when the individual is able to decide which occupation he or she wants to pursue. Being able to make an intelligent, long-term choice about what to study is crucial because it is essential that knowledge and skills be used if they are not to deteriorate.

The rate at which people forget things they do not use is much greater than the rate at which knowledge becomes obsolete. The learning retention rates plotted in Figure 1 indicate that people forget much of what they learn if they do not use it (Pressey and Robinson, 1944). If a student studies French in high school (or college) but does not soon visit a French-speaking country or use the language in daily life, most of the language skills will be lost and the time devoted will have been largely wasted. Kohn and Schooler (1978) have demonstrated that even the very basic cognitive abilities tend to be lost if the worker's job does not call for their use. When we set priorities regarding what should be studied in school, we need to pay close attention to:
Figure 1

o Whether and how the skills and knowledge gained will be used within a few years of graduating;

o How the motivation to learn a particular subject is affected by the prospect of being able to use it;

o At what rate the skills and knowledge will be forgotten if they are not used;

o How easily the same material can be learned at some later time if it turns out to be needed and how much easier it is to relearn something than it is to learn it the first time.

Policy Implications

How specific skills and abilities influence productivity and employability is one of the most important factors that needs to be considered when deciding on curriculum requirements and the kinds of tests that should be used to certify competence and to help colleges make admission decisions.

Research Implications

The challenge facing both academic and vocational education is to prepare young people for a lifetime of on-the-job learning. To meet this challenge, educators need scientific evidence on issues like the following:

o What traits and abilities facilitate learning new skills on a job and becoming a productive worker? Is it study habits and self-discipline, reading and listening skills, reasoning (trouble shooting) skills, or specific knowledge bases (e.g., algebra, electronics, horticulture) that are essential to specific occupations?

o How are these traits and abilities developed in school and influenced by employment experiences and training on previous jobs?

There are many different opinions about these matters, not all of them equally valid. Opinion surveys of chief executive officers regarding what students should study in high school are of little value. These executives seldom have more than cursory interactions with employees with 12 or fewer years of schooling, and the information they might receive on these matters from first-line supervisors is anecdotal at best. Objective evidence can only be brought to bear on the issue by two kinds of studies: (1) studies of how wages depend on academic achievement, personality, educational background, occupational training, and work experience in large representative samples of workers and (2) studies of how productivity is affected by these same factors in samples of workers who do the same job and for whom measures of relative productivity are
available. Both types of research should be undertaken. The first
type of research is common, so it need not be discussed here. The
second type is uncommon, so some discussion is necessary.

Studies of the association between job performance and various
employment and training (E&T) inputs and outcomes are important
because they provide evidence of E&T's impact on productivity that
does not depend on the heroic assumption that an individual’s wage
equals his/her marginal product.¹ They also provide a test of the
hypothesis that the social benefits of educational quality and
achievement are considerably greater than the private benefits. In
most large firms, nonexempt workers occupying the same job are paid
essentially the same amount no matter how different their
productivity (Bishop, 1985). Thus, a finding that a particular kind
of educational achievement is associated with greater relative
productivity on a great variety of jobs implies that that kind of
achievement is under-rewarded by the labor market. Studies of the
correlates of the productivity of individual workers have
traditionally been the province of industrial psychologists. It will
therefore be necessary to recruit industrial psychologists to study
how the performance ratings of workers doing the same job depend on
their occupationally specific skills, generic abilities, personality,
and educational background and to suggest implications for vocational
educational policy. The objectives of this analyses would be:

- To identify which generic skills have the greatest effect
  on how well a worker learns new job skills and how
  productive that worker eventually becomes and whether and
  how they vary by the cognitive complexity and other
dimensions of the occupation.

- To determine whether these generic skills are teachable,
  where they are taught in school (e.g. math classes,
vocational classes), and where they should be taught.

The expected contribution will be a better understanding of how
generic skills, occupationally specific skills learned in a school,
and occupationally specific skills learned on a job interact to
produce more productive workers.

Research design, data and methods. The basic causal model that
could be employed in these studies is shown in Figure 2. Large

¹ When educational credentials are used to select people for
jobs and/or retention at the firm is correlated with job performance,
unbiased estimates of the causal impact of educational
characteristics on a person's potential productivity are not
obtainable through the analysis of data on job incumbents without
correcting for selection bias. This is a problem that needs to be
dealt with in the research.
nationally representative data sets such as the National Longitudinal Survey (NLS) youth cohort and High School and Beyond (HSB) are needed to estimate the left-hand side of this model, which examines how years of schooling, curriculum, quality of training, work experience, and family background influence the 10 subtests of the Armed Services Vocational Aptitude Battery (ASVAB) and HSB aptitude and personality scales. To estimate the right-hand side of the model, one needs two kinds of data: nationally representative longitudinal surveys for studies of how the abilities developed in school affect the sorting of people to jobs and to wage rates, and data on specific jobs for studies of the associations between skills and abilities developed in school and productivity on the job. Multivariate regression should be employed to examine which ASVAB subtests, which personality characteristics, and which E&T experiences are the strongest determinants of learning rates (measured by paper and pencil tests) and job performance (measured by work sample tests, supervisory ratings, promotions, and turnover). One of the important issues that could be addressed is whether we should increase the share of the classroom time devoted to math and science to something comparable to that in Japan. Two of ASVAB's subscales, automotive information and electronics information, measure skills that are specific to particular occupations, so the analysis would be able to contrast the payoff for occupationally specific knowledge to the payoff for general knowledge.
The data being collected for a mammoth Army contract, entitled "Improving the Selection and Utilization of Army Enlisted Personnel," are well adapted to addressing these questions. One of the data files that has been developed contains comprehensive data (e.g., ASVAB, Military Applicant Profile, skill qualification tests, end-of-training performance measures, and promotion data from the Enlisted Master File) on 196,287 FY 1981-1982 accessions into the Army. Most of the jobs to which enlisted personnel are assigned have close counterparts in the civilian economy, so the findings for this data base will have high transferability. Large size will make possible separate analyses for different occupations.

Still another extremely valuable data set is the highly detailed data on 12,000 soldiers across 19 military occupational specialties being collected in Project A of "Improving the Selection and Utilization of Army Enlisted Personnel." This data set "constitutes the most carefully scrutinized and broadest array of selection and classification tests ever used in selection and classification research" (Campbell and Eaton, 1984). It includes carefully designed work sample measures of productivity, computerized tests of psychomotor abilities, and both peer and supervisor ratings of a variety of performance dimensions. A study employing these data could assess the relative contribution of basic skills, occupational skills, and noncognitive factors in determining different dimensions of job performance, supervisor ratings, discharges, promotions, and work sample measures of output.

Still another data set that might be employed is a multi-firm selection validation study for entry-level clerical employees in the life insurance industry sponsored by the Life Office Management Association. The unique feature of this data set is its large size (6,500 employees at 91 companies) and the availability of data on personality traits, job turnover, and whether the firm would rehire employees who have left. Past research may have been unable to prove that personality influences job performance because those with real personality problems were not included in studies because they left the firm before job performance was assessed.

The fourth data set that is potentially available is the U.S. Employment Services General Aptitude Test Battery (GATB) revalidation data on 32,000 workers in 122 different jobs. This data file contains scores on all of the GATB subtests, education, work experience, and job performance. This data set can be employed to examine whether experience on a job is a substitute for or a complement of generic learning ability and whether there are diminishing returns to job experience and to learning ability.
II. Does Studying Occupationally Specific Skills in School Necessarily Result in Less Learning of Basic Skills?

Since the total number of courses that one can complete during high school is limited, an academic curriculum tends to restrict the number of vocational courses one can take, and vice versa. Does this mean that developing occupationally specific skills necessarily implies diminished basic and academic skills? Longitudinal data are essential to address this question because it is well known that students who have done poorly in academic courses in 9th and 10th grade are more likely to choose vocational courses in the 11th and 12th grade.

A longitudinal model was estimated in the sophomore cohort of the HS8 data predicting the change between sophomore and senior years in test scores, grades, career plans, key attitudinal variables such as self-esteem and locus of control, and an index of student depression (Bishop, 1985). The model included extensive controls for variables that may influence both curriculum and the outcomes. These include an array of socioeconomic background variables, base-year grades, test scores, attitudinal variables, base-year educational and occupational expectations, and parents' career expectations for their children. Numerous measures of curriculum were used to assess curriculum effects, including base-year self-reported curriculum track (vocational and academic), self-reported number of courses taken between the sophomore and senior year and a variety of subjects, and self-reports regarding whether the respondent had taken algebra II, trigonometry, calculus, physics, chemistry, biology, an honors English course, and an honors math course.2

The results of these analyses show that curriculum does, in fact, have a strong influence on many of these outcomes, but traditional measurement of curriculum by reference to track placement does not capture these effects. The traditional track variable (self-reported membership in the academic or vocational track) has little or no impact on any of the 11 outcomes. When, however, specific course descriptions are used (e.g. algebra II, physics), the effects of taking a college preparatory curriculum of calculus, trigonometry, algebra II, physics, and chemistry are striking (see Table 3).

Holding the total number of academic courses and their distribution across fields constant, taking the five college preparatory math and science courses listed above raised math and science performance by 3/4 of a grade equivalent, verbal test scores

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2 See Endnote No. 1, which includes specific formulae and model estimates.
Table 3

Effects of Selected Curriculum Variables
On Changes in Achievement, Attitudes, and Aspirations
(Percent of a Standard Deviation)

<table>
<thead>
<tr>
<th>Curriculum Variables</th>
<th>4 Yrs. Math &amp; Science in Jr. &amp; Sr. Yr. (not College Prep)</th>
<th>College Prep</th>
<th>3 Years of Prep</th>
<th>3 Years of Non-College Business/Technical Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal test score</td>
<td>M -9***</td>
<td>13***</td>
<td>7***</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>F -6***</td>
<td>10***</td>
<td>6***</td>
<td>0</td>
</tr>
<tr>
<td>Math test score</td>
<td>M 8***</td>
<td>29***</td>
<td>-4</td>
<td>6***</td>
</tr>
<tr>
<td></td>
<td>F 9***</td>
<td>22***</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>Science test score</td>
<td>M -5</td>
<td>30***</td>
<td>-4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>F -3</td>
<td>19***</td>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td>Civics test score</td>
<td>M -8***</td>
<td>17*</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>F -8</td>
<td>12</td>
<td>10***</td>
<td>-1</td>
</tr>
<tr>
<td>Grade point average</td>
<td>M -3</td>
<td>-19**</td>
<td>4</td>
<td>7**</td>
</tr>
<tr>
<td></td>
<td>F 3</td>
<td>-18**</td>
<td>13***</td>
<td>7</td>
</tr>
<tr>
<td>Internal locus of control</td>
<td>0</td>
<td>8</td>
<td>-3</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td>F 3</td>
<td>12</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Self esteem</td>
<td>M 5</td>
<td>21**</td>
<td>11***</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>F 3</td>
<td>11</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Work orientation</td>
<td>M 7</td>
<td>3</td>
<td>5</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>F -3</td>
<td>4</td>
<td>4</td>
<td>-2</td>
</tr>
<tr>
<td>Good deportment</td>
<td>M 9**</td>
<td>28***</td>
<td>-3</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>F 6</td>
<td>19***</td>
<td>12***</td>
<td>-3</td>
</tr>
</tbody>
</table>

*Statistically significant at the 95 percent level.
**Statistically significant at the 99 percent level.
***Statistically significant at the 99.9 percent level.
Table 3
(Continued)

Effects of Selected Curriculum Variables
On Changes in Achievement, Attitudes, and Aspirations
(Percent of a Standard Deviation)

<table>
<thead>
<tr>
<th>Curriculum Variables</th>
<th>4 Yrs. Math &amp; College</th>
<th>3 Years</th>
<th>3 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science in Jr. Prep v. Non of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; Sr. Yr. (not Non-College Business/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College Prep</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prep</td>
<td>Prep</td>
<td>Office</td>
</tr>
</tbody>
</table>

| Planned yrs. of schooling             |                       |         |         |
| M                                     | -1                    | 24***    | 9**     |
| F                                     | 12***                 | 11**     | -1      |

| Planned occupation                    |                       |         |         |
| M                                     | 11**                  | 25***    | -5      |
| F                                     | -9                    | 16**     | 2       |

*Statistically significant at the 95 percent level.
**Statistically significant at the 99 percent level.
***Statistically significant at the 99.9 percent level.

NOTE: Entries are coefficients scaled approximately as a percentage of a population standard deviation of the outcome being studied. For the test scores a one standard deviation improvement is roughly equivalent to a gain of three grade equivalents or a 110 point improvement on an SAT test. A one standard deviation improvement would cause an individual to move from the 50th to the 84th percentile on the characteristic, so impacts on percentile rank in class for grades or deportment can be calculated by dividing the coefficient by 3. The dependent variable was the change between the end of sophomore and senior years. The models used to derive these estimates contained a total of 75 control variables. Included among the control variables were the sophomore values on the 10 other outcome measures, a great variety of specific courses, years of courses in specific subjects taken during freshman and sophomore year and during junior and senior year, family background, self-assessed ability to succeed in college, and parental pressure to attend college.
by 1/3 of a grade equivalent, and civics test scores by 47 percent of a grade equivalent. If a student takes four additional year-long math and science courses but avoids the more rigorous courses listed above, math test scores increase by 1/4 of a grade equivalent but verbal and civics test scores decline by an equal amount.

The results also indicate that vocational courses sometimes contribute more to the development of basic skills than watered down courses in academic subjects. Holding the academic course load constant, taking three full-year business and office courses raised verbal and civics test scores by 20 and 15 percent of a grade equivalent respectively. Taking three full-year courses in the technical area raised math performance by 15 percent of a grade equivalent. Trade and industry courses and the residual category of vocational courses had small negative effects on test score gains.

Why does taking a college preparatory curriculum in math and science have such salutary effects on a whole range of tests? In my judgment, the crucial difference is that college preparatory classes are more demanding than other classes. This is clearly the case in our data. The students who took all five of the college preparatory classes got significantly lower grades than those who took other courses in these fields. Apparently the key determinant of learning is the rigor of the courses taken, not the total number of academic courses or the total number of hours spent in a school building during a year.

A very different approach to the question of the effect of curriculum—comparing the effects of school policies designed to increase/decrease emphasis on academic competencies—comes to a similar conclusion (Hotchiss, 1984). Controlling for school and location characteristics is, of course, crucial to the validity of this comparison. A total of 39 variables were used to control for curriculum, resources, climate, and teacher characteristics. The emphasis placed by the school on college preparatory courses rather than vocational or nonacademic courses was measured by: the distribution of sophomores between vocational, general, and academic tracks; the number of math and science courses offered; the number of vocational courses offered; and the number of nonacademic and nonvocational courses offered. (The courses that were included in this latter category were art, driver education, ethnic studies, family living, sex education, and home economics.) The results are presented in Table 4. Increases in the number of math and science courses offered by the school produced substantial increases in performance on the verbal test, the science test, and the civics test.

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3 Estimates of impact in terms of grade equivalents were made using the conservative assumption that at the 12th grade one standard deviation on the HSB tests was equivalent to three grade equivalents.

4 See Endnote No. 2.
**Table 4**

Impact of School Level Curriculum Variables on Ten Outcomes (Standardized Coefficients)

<table>
<thead>
<tr>
<th>Scores</th>
<th>Increase in Vocational Track at Expense of Academic</th>
<th>Increase in Vocational Track at Expense of General</th>
<th>Increase in Number of Vocational Courses</th>
<th>Increase in Number of Math &amp; Science Courses</th>
<th>Increase in Non-academic and Non-vocational Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal test</td>
<td>.005</td>
<td>-.003</td>
<td>-.011**</td>
<td>.018***</td>
<td>-.009</td>
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<tr>
<td>Math test</td>
<td>.000</td>
<td>-.005</td>
<td>.003</td>
<td>.003</td>
<td>.003</td>
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<tr>
<td>Science test</td>
<td>.005</td>
<td>.000</td>
<td>-.005</td>
<td>.026***</td>
<td>-.006</td>
</tr>
<tr>
<td>Civics test</td>
<td>.001</td>
<td>-.014*</td>
<td>.008</td>
<td>.020**</td>
<td>-.023***</td>
</tr>
<tr>
<td>Educational expectations</td>
<td>-.025***</td>
<td>.008</td>
<td>-.016*</td>
<td>.005</td>
<td>.002</td>
</tr>
<tr>
<td>Occupational expectations</td>
<td>-.001</td>
<td>-.016*</td>
<td>-.003</td>
<td>-.014</td>
<td>.005</td>
</tr>
<tr>
<td>Deportment index</td>
<td>-.0096</td>
<td>-.006</td>
<td>.008</td>
<td>.006</td>
<td>.008</td>
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<tr>
<td>Work values</td>
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<td>.008</td>
<td>-.008</td>
<td>.004</td>
<td>.009</td>
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<tr>
<td>Self esteem</td>
<td>-.0021</td>
<td>.006</td>
<td>-.003</td>
<td>1.004</td>
<td>-.001</td>
</tr>
<tr>
<td>Locus of control</td>
<td>.0089</td>
<td>-.002</td>
<td>-.015*</td>
<td>.010</td>
<td>-.004</td>
</tr>
</tbody>
</table>

* p ≤ .05.  
** p ≤ .01.  
*** p ≤ .001.

**NOTE:** Models control for socioeconomic background of the student, the social and racial composition of the student body, percent dropping out and attending college, and 35 other school characteristics.
Indeed, the number of math and science courses was the only school characteristic to have highly significant effects on three or more of the four measures of academic achievement. Increases in number of vocational courses offered by the school lowered educational expectations, internal locus of control, and verbal achievement but not math, science, or civics achievement. Increases in the number of nonacademic, nonvocational courses decreased the civics test score. The proportion of sophomores reported to be in academic, general, and vocational tracks did not have large effects on the basic skills.

These results are important for two reasons. First, they are further evidence that taking an advanced college preparatory curriculum does cause improvements in performance on the standardized tests. Second, they imply that a school's pattern of course offerings has important effects on learning, and that school boards and principals who choose to increase emphasis on academic coursework can achieve modest but real gains in academic achievement.

Policy Implications

The total number of academic courses taken does not matter nearly as much as the standards and content of courses that are taken. Legislated increases in the number of academic courses required for graduation will increase achievement only if the standards and content of the courses taken are upgraded.

If the increase in emphasis on math, science, and other college preparatory courses results in the noncollege-bound students taking fewer vocational courses, there will be a tradeoff, however. Noncollege-bound high school graduates who have taken many academic courses and no vocational courses and who do not go to college earn less in the years immediately after graduation than those who have taken vocational courses (Kang and Bishop, 1984; Kang, 1984; Campbell, Basinger, Dauner, & Parks, 1986). Ways must be found for the students who take a vocational concentration and plan not to attend college to get a solid grounding in basic skills and the math and science courses that are often considered to be solely for the students in a college preparatory curriculum. In order to develop the skills that will be essential for advancement in their careers, vocational students must be encouraged and perhaps required to take the more demanding math and science courses that they often avoid.

Clearly, almost everyone needs to be able to reason, solve problems, and communicate both verbally and in writing. Elementary/secondary education needs to place the highest priority on developing these abilities. The responsibility for achieving these objectives probably should not rest with English and math teachers alone; history, art, and vocational teachers should reinforce (i.e., demand) basic skills as well. In fact, however, vocational courses are often not organized in a way that requires students to employ basic skills. Students in vocational classrooms spend only three to
seven percent of their time applying basic skills to learning vocational skills (Halasz and Behm, 1983; Halasz, Behm, & Fisch, 1984). When these findings have been presented to vocational teachers, their reaction has often been "it is not my responsibility" (Halasz, personal communication). Time-on-task findings and teacher reactions would probably be similar in art, health, science, and many other courses. These attitudes should be changed. The newly developed principles of technology courses are a positive development but not sufficient on their own. Vocational students should be expected to learn some of their occupational skills from printed material. Verbal explanations and visual demonstrations by the teacher should not be the only mode of instruction. Vocational students need to get practice explaining job tasks to others and writing out instructions, for career advancement will depend as much on the ability to teach as on the ability to learn.

Research Implications

The studies reviewed earlier imply that the tradeoff between learning basic skills and learning occupationally specific skills is small. This average result may, however, hide important tradeoffs between the development of basic skills and certain modes of teaching occupational skills. Students who are taught math and language arts skills in vocational courses might be making great gains, while students who are taught hands-on skills using visual demonstration techniques might be losing ground in their basic skills. There might be tradeoffs between achieving a high placement rate and reinforcing basic skills. There is consequently a need for research on "what types of vocational education work best?" "Best" needs to be defined in a variety of ways: the development of basic skills, the development of occupational skills, training-related placement rates, earning gains, etc. Programs should be distinguished on a variety of dimensions:

- Comprehensive high schools versus vocational high schools;
- Full-time versus part-time attendance at area vocational-technical schools;
- Cooperative education versus classroom instruction;
- Competency-based instruction versus noncompetency-based instruction;

Basic skills time was defined as the use of reading, mathematics, and both oral and written communication skills by students in a vocational class. Examples were reading, writing, speaking, or calculating in conjunction with technical skills.
o The degree to which students have their specific individual competencies certified by the school rather than getting a diploma simply for attendance;

o Existence and vitality of vocational clubs;

o Amount of business community involvement in the program;

o Qualifications and business experience of staff;

o Vocational programs' emphasis on basic skills;

o Whether teachers or placement personnel are assigned responsibility for placing graduates in jobs;

o Whether and how students are taught job search techniques.

While analysis of HSB data will yield some insights into these questions, the data base does not really have sufficient numbers of vocational graduates to provide reliable estimates of the effects of many of the program dimensions mentioned above. Large samples are needed because field of study has large effects on outcomes and must be controlled when one examines program quality dimensions. A data set to address these issues must have the following qualities:

1. Large size (many tens of thousands of graduates).

2. Longitudinal data on labor market outcomes many years after graduation.

This is important because some program characteristics may have only temporary effects on labor market success and other program characteristics may have a payoff only in the long run. This creates problems, however, for longitudinal surveys are very expensive. The solution to this problem is described below.

3. Good data on the characteristics of the individual programs that students participated in.

Even at the same area vocational-technical school, program quality may vary considerably from field to field, so it is desirable to have detailed information on the characteristics of each program. Since it is costly to get information on the characteristics of programs, this implies that every student in the program should be studied.

4. An ability to control for the characteristics of individuals (such as ability and character) that influence
labor market success and that may confound estimates of the
effect of program characteristics.

This requirement means one needs access to transcript
information on grades, test scores, and deportment.

5. Data on educational outcomes that directly measure basic
skills and knowledge and competence in one's occupation—in
other words, competency tests in the occupation and in
basic skills.

The great advantage of this kind of data is that (1) it is
available quickly, (2) it is not influenced by labor market
demand factors, and (3) it allows a study of the impact of
student achievement on labor market outcomes.

It is also very desirable for the data set to include similar
longitudinal information on general track students who do not go to
four-year college. Those graduates are an important comparison
group. They enable one to control for differences among the labor
markets faced by the graduates of different schools. A successful
vocational education program is one that improves the labor market
prospects of those served relative to what they would have achieved
in the general or academic tracks at their high school. Comparisons
across schools of the labor market success of graduates of specific
programs are likely to be heavily influenced by labor market demand
factors. Having data on nonvocational students in these same labor
markets helps control for demand factors.

Research design. The high quality longitudinal study just
described is quite feasible. Five years of data on employment and
earnings can be obtained inexpensively from unemployment insurance
wage records in 39 of the 50 states. (The Targeted Jobs Tax Credit
(TJTC) study is making use of this data source and is analyzing data
on nearly one million people.) In Ohio, vocational and basic skills
competency exams are administered to the graduates of a large number
of vocational programs. Other states could be included in the study
by arranging for these exams to be administered there.
Alternatively, the occupational competency tests developed by
American Institutes of Research (AIR) or National Occupational
Competency Testing Institute (NOCTI) might be used. The study might
be conducted in approximately 100 area vocational-technical schools
and comprehensive high schools. In the first year, the nature of the
vocational programs would be described (based on interviews and in-
class observations of a sample); entering juniors would be surveyed
to obtain information on background and attitudes and Social Security
numbers. Information from transcripts on grades and performance in
basic skills and vocational competency tests would be obtained and
analyzed in the third year of the study. In the fifth year of the
project, wage record information would be collected, merged, and
analyzed.
III. Are the Occupationally Specific Skills Learned in High School Being Used?

During their four years in high school, 1982 graduates took an average 2.3 Carnegie units of exploratory vocational courses (industrial arts, home economics, typing I, etc.), 2.1 units of occupational vocational courses, and 17.2 units of other courses. The 27 percent of these graduates who described themselves as specializing in a vocational field obtained 2.8 units in exploratory vocational courses, 3.7 Carnegie units in occupational vocational courses, and 14.9 units in other areas (The Condition of Education, 1984).

This implies that the 73 percent of students who report they are not specializing in a vocational field account for 67 percent of the students in exploratory courses and 52 percent of the students in occupational courses. The heavy representation of nonspecialists in exploratory courses is understandable and appropriate. It is, however, quite puzzling that a major share of the students taking occupational vocational courses do not have career aspirations in the field. Even among the graduates who have taken two or more occupational vocational courses in a specific area (the concentrators, limited concentrators, and concentrator explorers of the typology developed in Campbell, Orth, & Seitz, 1981), many students apparently have career objectives that are not furthered by their vocational coursework. Twenty-eight percent of these student enter a four-year college or university after high school (unpublished tabulation of 1983 NLS Youth provided by Paul Campbell).

Why are so many noncareer-oriented students dabbling in occupational vocational education? Counselors and vocational teachers report that some of the students taking vocational courses are there to avoid more difficult academic subjects or to get permission to take a job during part of the school day. A more favorable interpretation of the dabbling is that it reflects uncertainty about career goals. However, the occupational courses offered by high schools are not really designed for career exploration. They generally require a large time commitment. The student learns about only one potential career, not about alternatives. The classroom/lab environment is quite artificial. Taking a job, an unpaid internship, or interviewing and shadowing workers in an occupation as in Experience-Based Career Education (EBCE) is probably a better way to learn whether one wants to pursue a particular occupation as a career.

Another indicator of the lack of career orientation among many vocational students is the low rates of training-related placement. Most studies of the training relatedness of the jobs obtained by graduates of vocational programs are based on questions like, "On your present job, how much do you use the vocational training you
received in high school or area vocational center?" (Bice & Brown, 1973). Typically, more than half of the respondents report they are using their training in their job. They may not, however, be referring to the occupationally specific component of their training when they report using their training. A more rigorous way of measuring training-related placement is to match a workers' current occupation against his/her field of training. By this definition, only 27.4 percent of the employed graduates who had been out of school between one and 10 years currently had a training-related job (very broadly defined) in the 1983 National Longitudinal Survey of Youths. Only 21 percent of employed vocational graduates had a training-related job two years after high school graduation in HSB data (Campbell et al., 1986). Felstehausen's (1973) study of 1971 vocational graduates in Illinois found training-related placement rates of 27 percent in business occupations, 17 percent in trade and industry, 52 percent in health, and 20 percent in agriculture. Conroy and Diamond's study (1976) of Massachusetts graduates obtained a training related placement rate of 29 percent for business and 37 percent for trade and industry. In contrast, six months after passing a German apprenticeship examination, 68 percent of those with civilian jobs were employed in the occupation (much more narrowly defined) for which they were trained (Federal Institute for Vocational Training, 1986).  

Policy Implications

A discussion of this issue is postponed to Section IV.

Research Implications

There is a great need for a thorough study of why training-related placement rates are so low when fields of study are matched against occupations and what can be done to increase them. Do the students seek work in their field of training and leave it only when they cannot find a related job? Or did many students never really plan to enter the field for which they were training? Does the quality of the training or the state of the local labor market have important effects?

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6 The U.S. rate of training related placement might have been somewhat higher if measured 6 months after high school graduation but if the German definitions of relatedness had been applied to the U.S. data, the training related placement rate would have been even lower. High unemployment rates no doubt contribute to the low rates of training related placement in the U.S. However, aggregate unemployment rates are now equally high in Germany so the differential between the countries in training related placement cannot be attributed to differentials in the general tightness of labor markets.
In metal working, electronics, and health areas, employers generally expect more training than most high schools can provide, and many of the students who pursue these programs continue their education at a junior college or technical school. Continuing one's education in the same field should be considered a positive outcome and be studied in its own right. To what degree are the students who pursue occupational training in high school able to place out of the beginning-level courses at postsecondary institutions and either complete their program early or achieve a higher level of competence?

One hypothesis that needs to be tested is that the low training-related placement rate in occupational training provided by American schools is a consequence of limited employer involvement in the training. Mangum and Ball (1986) have found in their analyses of NLS data that employer-controlled training institutions have much higher training-related placement rates. Using a procedure of matching training fields against jobs, they found that the proportion of male graduates who had at least one job in a related field was 85 percent for company training, 71 percent for apprenticeship, 52 percent for vocational-technical institutes, 22 percent for proprietary business colleges, and 47 percent for military trainees who completed their tour of duty. The rates for females were 82 percent for company training, 59 percent for nursing schools, 61 percent for vocational-technical institutes, 55 percent for proprietary business colleges, and 49 percent for military training. Clearly the problem of low training-related placement rates is not confined to high school vocational education.

The NLS and HSB data sets are clearly very well suited for analyzing these questions. Waiting time models would seem to be especially appropriate. In addition, however, there should be a review of past studies that have asked vocational program completers why they did not stay in the field for which they prepared.

Studies of the extent to which material learned in academic classes is used and/or remembered need to be sought out and reviewed. The next follow-up of HSB should ask questions about the use of material taught in vocational and academic classes, and an analysis of this issue should be commissioned.

IV. How Large are the Benefits of High School Vocational Education and What Causes Them?

Should we care whether students who pursue occupationally specific training during high school find jobs in the field for which they are trained? On the face of it, it would seem wasteful to train young people to do x, and then have them take a job in another field. Yet some of the leading experts on vocational education argue that the focus on training-related placement rates is misplaced. For
instance, Harry Silberman (1982) believes that the primary purpose of secondary vocational education is:

- to promote full human development through exposure of the learner to work experience as part of the education process.
- The purpose of the work is to further the education of the student; the work is subordinate to the education process; it is work for education (p. 299).

If this goal were being achieved, we would expect vocational students to benefit from their vocational education regardless of whether they find a job in the field for which they are trained. Sadly, however, there is no evidence that vocational education benefits its clients—the students who take occupational courses and the employers who hire them—when the student takes a job unrelated to the occupation for which training was received. In fact, there is considerable evidence that the students who take vocational courses do not benefit economically from the training if their job is in an unrelated field. This has been demonstrated by the work of Campbell et al. (1986), which has been summarized in Tables 5 and 6. The regressions from which these results are taken control for the following: sex, minority status, handicapping condition, limited English proficiency, test scores, grade point average, family background, attitudes, absenteeism, discipline problems, deportment, past and current college attendance, employment during high school, aspirations in 8th grade, region, and rural/urban location. The analysis of HSB also controlled for presence of a spouse and child.

Table 5 presents estimates of the impact of high school vocational education on labor force participation and the employment rate (probability of employment conditional on labor force participation). Relative to general track students, vocational concentrators have a 3.6 percentage point higher labor force participation rate and a 4.1 point higher employment rate in NLS data. Limited concentrators and concentrator explorers are somewhat less well off.

The analysis of HSB data examines whether the employment impacts of vocational education depend on wanting (or being able to find) a training-related job. Vocational graduates were divided into two groups: those whose present or most recent job was training-related and those whose job was not training-related. The concentrators and limited concentrators in the training-related category had a 2.7-3.3 percentage points higher employment rate. Vocational graduates working outside their field of training often had lower employment rates than those who took a general curriculum in high school. The association between training relatedness and the labor force participation rate is particularly strong. Concentrators and limited concentrators working in related jobs had a 9.6-11.5 percentage point higher probability of being in the labor force than the high school.
### Table 5

**Impact of Vocational Education on Employment**  
(Percentage Point Effects)

<table>
<thead>
<tr>
<th></th>
<th>National Longitudinal Survey Data</th>
<th>High School and Beyond Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Time in Labor Force</td>
<td>% Employment/Labor Force</td>
</tr>
<tr>
<td>Concentrator</td>
<td>3.6*** (2.87)</td>
<td>4.1*** (4.18)</td>
</tr>
<tr>
<td>Limited concentrators</td>
<td>2.3* (2.20)</td>
<td>1.6* (1.93)</td>
</tr>
<tr>
<td>Self report vocational</td>
<td>1.4 (1.08)</td>
<td>3.4*** (3.43)</td>
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<tr>
<td>Self report academic</td>
<td>.1 (1.28)</td>
<td>2.5* (1.51)</td>
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<tr>
<td>Academic</td>
<td>-3.7*** (3.23)</td>
<td>-.7 (.76)</td>
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<tr>
<td>$R^2$</td>
<td>.162</td>
<td>.126</td>
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<tr>
<td>Number of observations</td>
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<td>809</td>
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<tr>
<td>Mean of dependent variable</td>
<td>74.5</td>
<td>85</td>
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Table 5  
(Continued)

Impact of Vocational Education on Employment  
(Percentage Point Effects)

<table>
<thead>
<tr>
<th></th>
<th>High School and Beyond Data</th>
<th></th>
<th>% Time in</th>
<th></th>
<th>Employment * Labor Force</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>% Time in Labor Force</td>
<td></td>
<td>Training</td>
<td></td>
<td>Related</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not Training</td>
<td></td>
<td>Related</td>
</tr>
<tr>
<td>Self report academic</td>
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<td></td>
<td>0.31</td>
<td></td>
<td>-.20</td>
</tr>
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<td>Transcript defined</td>
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<td></td>
<td>(3.01)</td>
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<tr>
<td>R²</td>
<td>.127</td>
<td></td>
<td>.067</td>
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<td>Number of observations</td>
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<td>5414</td>
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<td>Mean of dependent variable</td>
<td>47.1</td>
<td></td>
<td>92.3</td>
<td></td>
<td></td>
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</tbody>
</table>

Source: Table 14 of Campbell, Basinger Dauner & Parks, Outcomes of Vocational Education for Women Minorities, the Handicapped, and the Poor. All equations controlled for sex, minority, status, handicapped, limited English proficient, socioeconomic status, region, rural-urban location, test scores, current enrollment, postsecondary education, employment during high school, and grade point average. The HSB models contain additional controls for occupation, presence of a spouse or child, aspirations in 8th grade, attitudes, absenteeism, and discipline problems.
graduates who took a general program.\textsuperscript{7} Those not working in related jobs had only a 1.8 to 2.3 point higher labor force participation rate.

Table 6 examines the effect of vocational education on wages. High school graduates who took a vocational concentration obtain significantly higher wage rates and higher monthly earnings only when their job is related to their training. When their job is not related to their training, they do not receive higher wage rates than students who have pursued an academic or general program of study in high school.

High training-related placement rates are also important because vocationally trained workers are more productive and less costly to train than other workers doing the same job only when the job is related to their training. The evidence for this statement comes from statistical comparisons of two workers doing the same job.\textsuperscript{8} The data are presented in Table 7, which has been summarized from Bishop (1982). Compared to those without vocational training, new hires who had received school-provided vocational training that is relevant to their job required 6 percent more. Those with relevant training were 4 percent more productive in the first two weeks, 6 percent more productive during the next 10 weeks, and 6.6 percent more productive after a year or so at the firm. Those with nonrelevant vocational training were less productive initially and insignificantly 1.4 percent more productive after a year at the firm.

These findings imply that the private and social benefits of vocational education derive from the occupationally specific skills that are developed. Some of the skills taught in vocational classes are transferable—useful in a great variety of occupations—but skills taught in nonvocational classes are transferable as well. Vocational classes are no better at instilling valuable transferable skills than nonvocational classes. In other words, vocational education as now practiced is not a better way of preparing youth for generic jobs than more academic forms of education. Those who justify vocational education as an alternative method of teaching generic skills are describing an educational program that probably exists in only a few schools. From my observation of vocational classrooms and conversations with vocational teachers, the present-day reality is that outside of the career exploration and principles of technology courses, most vocational teachers are concentrating on

\textsuperscript{7} One has to be in the labor force at least one week to be in a training related job, so the association between the two reflects both directions of causation.

\textsuperscript{8} See Endnote No. 2, which shows the formulae and model estimated.
Table 6
Impact of High School Vocational Education
By Training Relatedness of Job
(Percent Difference from General Curriculum)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hourly Wage</th>
<th></th>
<th></th>
<th>Monthly Earnings</th>
<th></th>
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<td>TR</td>
<td>NTR</td>
<td>TR</td>
<td>NTR</td>
<td></td>
</tr>
<tr>
<td>Concentrator</td>
<td>9.8***</td>
<td>.8</td>
<td>9.8**</td>
<td>5.8**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.77)</td>
<td>(.49)</td>
<td>(2.44)</td>
<td>(2.25)</td>
<td></td>
</tr>
<tr>
<td>Limited</td>
<td>8.5***</td>
<td>.2</td>
<td>10.1***</td>
<td>.1</td>
<td></td>
</tr>
<tr>
<td>concentrators</td>
<td>(3.37)</td>
<td>(.17)</td>
<td>(2.62)</td>
<td>(.05)</td>
<td></td>
</tr>
<tr>
<td>Concentrator</td>
<td>9.0***</td>
<td>-.4</td>
<td>1.08**</td>
<td>2.3</td>
<td></td>
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<tr>
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<td>(.26)</td>
<td>(2.01)</td>
<td>(.93)</td>
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<tr>
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<td>3.6*</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(1.76)</td>
<td></td>
<td></td>
<td>(1.03)</td>
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</tr>
<tr>
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<td>$R^2$</td>
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<td>.232</td>
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National Longitudinal Survey Youth Cohort

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hourly Wage</th>
<th></th>
<th></th>
<th>Monthly Earnings</th>
<th></th>
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<td></td>
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<td>NTR</td>
<td>TR</td>
<td>NTR</td>
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</tr>
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<td>17.2**</td>
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<td>(2.85)</td>
<td>(1.31)</td>
<td>(3.98)</td>
<td>(.44)</td>
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<tr>
<td>Limited</td>
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<td>(.59)</td>
<td>(2.03)</td>
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<td>(.84)</td>
<td>(.02)</td>
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<td>2.6</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(.68)</td>
<td></td>
<td>(.67)</td>
<td></td>
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<tr>
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<td>2.2</td>
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<td>3.5</td>
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<td></td>
<td>(1.08)</td>
<td></td>
<td>(1.14)</td>
<td></td>
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Table 6
(Continued)

Impact of High School Vocational Education
By Training Relatedness of Job
(Percent Difference from General Curriculum)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hourly Wage TR</th>
<th>NTR</th>
<th>Monthly Earnings TR</th>
<th>NTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcript defined</td>
<td>-.6</td>
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<td>3.8*</td>
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<tr>
<td>academic</td>
<td>(.15)</td>
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<td>(1.46)</td>
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<tr>
<td>$R^2$</td>
<td>.275</td>
<td></td>
<td>.336</td>
<td></td>
</tr>
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</table>

Source: Table 16 of Campbell, Basinger Dauner & Parks, *Outcomes of Vocational Education for Women Minorities, the Handicapped, and the Poor*. Coefficients from regressions predicting the log of the hourly wage rate and the log of monthly earnings have been multiplied by 100 to approximate percentage impacts. The regressions included controls for the following: sex, minority status, handicapped, limited English proficient, test scores, grade point average, family background, attitudes, absenteeism, discipline problems, department, past and current college attendance, employment during high school, aspirations in 8th grade, region, and rural/urban.

Occupationally specific skills even when many of their students have no desire or realistic chance of getting a job in the field.

Policy Implications: Local

Some have proposed eliminating occupationally specific programs from the high school and telling students to get occupationally specific training at a postsecondary institution. However, many of those being served by high school vocational education have no desire to spend another one or two years in school. Postsecondary vocational programs also have their own problems—very high dropout rates and unimpressive training-related placement rates (better than those for secondary vocational education to be sure but not in any way satisfactory) (Mangum & Ball, 1986). Furthermore, for high school vocational graduates who find training-related jobs, the payoff is quite large—a 20 to 30 percent increase in earnings.

The solution is to attack the training-related placement problem head on. Rates of placement in jobs or further schooling related to one’s training should remain as one of the key evaluation yardsticks.
Table 7
Impact of Vocational Education (At All Levels) On Training Costs and Productivity (In Percent)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Received Vocational Training in a School Relevant to Job</th>
<th>Not Relevant to Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training time</td>
<td>-7.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Productivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in first 2 weeks</td>
<td>8.6**</td>
<td>-3.0</td>
</tr>
<tr>
<td>in next 10 weeks</td>
<td>6.1**</td>
<td>-.5</td>
</tr>
<tr>
<td>Current or most recent</td>
<td>6.6***</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**Impact of relevant vocational education is significantly larger than the impact of nonrelevant vocational education at the .05 level (two-tail test)

***Impact of relevant vocational education is significantly higher at the .01 level (two-tail test)

Source: Table 5 of Bishop, The Social Payoff from Occupationally Specific Training. High school vocational graduates account for only about 30 percent of the vocationally trained workers in the sample. Most of the rest received their training at a 2-year postsecondary institution.

for vocational education. One of the main objectives of any reform of vocational education at both the secondary and postsecondary levels should be an increase in the share of its graduates who get and stay in jobs or further education in a field which makes use of the training received in school. To accomplish this objective, the following reforms are recommended:

- Students should not be allowed to overspecialize. Vocational programs should be for broad occupational areas such as electronics rather than in narrow fields such as robotics. The goal of broad occupational training should not be achieved by diluting what is taught. With respect to the pace of instruction and time on task, most vocational classrooms are similar to academic classrooms. A good deal of time is wasted. Much more could be accomplished if standards were raised.
Cooperative placements during summers and the final school year should be a part of every vocational student’s program. This would both increase rates of training-related placement and force the contraction of programs for which there is little employer demand. The primary reason for this suggestion is the belief that work habits and most occupation-specific skills are better taught in the context of an actual job. (Exceptions might have to be made to this principle in rural communities in which a large share of the students leave the community after graduating.)

During the first year of the program, five to 10 hours of class time should be devoted to how to search for work and how to make a good impression in an interview. Each student should receive video tape feedback of a practice interview.

Vocational teachers should be expected to keep in touch with their former students over the phone. They should keep records of each student’s employer, wage rate, future plans, a detailed description of the student’s job, the on-the-job training (OJT) being received, and the skills taught in school that are being used on the job (matched against the student’s competency profile). During these conversations the teacher could ask for suggestions about what should be added to and/or dropped from the curriculum. These conversations would identify which graduates need assistance in finding training-related jobs and might also yield job leads for new co-op placements and for other graduates.

The vocational teacher should be responsible for placing his/her students, not a placement director. McKinney et al. (1982) found that schools with placement officers actually had lower training-related placement rates than schools that did not. Leaving the responsibility for placement with the vocational teacher forces more involvement with local employers and helps to foster a mentor relationship between teacher and student.

Teachers should assist their students, current graduates, and past graduates to find training-related jobs, and their success in this area should be evaluated and rewarded. (They might receive $100 for each time they find a training-related job for a graduate and $100 for each year beyond the first year the student stays in that job.) Larger awards might be made for placing handicapped students.

Rewarding teachers for placing their graduates in a job or further schooling that is training-related is appropriate because the outreach work takes time and deserves compensation, and because an
incentive to devote time to the task is necessary. It is, however, also a reward and incentive for setting high standards in the classroom and being an effective teacher, for high training-related placement rates are much easier to achieve when past graduates have done well on the job and the program has developed a local reputation for quality.

- The strength of a student's commitment to a particular occupation should be an important consideration in choosing which students are admitted to programs for which there is excess demand. Programs which have high placement rates and excess demand should be expanded and teachers should be compensated for taking extra students.

Occupational (as distinct from exploratory) vocational courses should not be treated as just another of a student's course options. Students should be allowed to take these courses only when:

- They have participated in a systematic career selection program and discussed the choice with a guidance counselor.

- They have had a part-time job in the field or have interviewed and shadowed people who work in the field.

- Both parents and the student have had at least two conferences with a guidance counselor on the subject of career choice.

- A "contract" has been signed between students, parents, vocational teacher, the school, and employer representatives. The student would need to state an intent to seek employment in the field after graduating and promise to complete a certain amount of training in the field and achieve a particular standard. The school and employer representatives would promise to find the student a training-related cooperative placement for the senior year and a job after graduation if the student fulfills his part of the bargain.

Screening students for interest might initially reduce the number of students in occupationally specific educational programs. But if it succeeds in raising the economic payoff to occupationally specific training (as I am confident it will), additional students will be attracted into the field in much the same way that high wages for computer programmers have attracted students into that field.

Policy Implications: State

One of the causes of the poor fit between occupational plans and occupational enrollment choices is the practice of recruiting or assigning students to occupational programs in order to achieve state-mandated enrollment targets. Teachers in need of bodies to
meet the target are often willing to accept and sometimes actively recruit into their program students who they know do not want or have only a low probability of getting a job in the field. State reimbursement of the costs of occupational education should not be keyed to October enrollments. A formula should be devised that recognizes outcomes rather than inputs and that focuses on students rather than programs. The formula should promote the discontinuation of training programs that do not place a respectable number of graduates in jobs or further education related to the training.

The outcomes that would be included in reimbursement formulas could include some combination of the following: cooperative job placements, graduations, checklists of behavioral objectives achieved, placements of graduates in jobs or further education that is training related, earnings gains, and scores on occupational competency exams or state licensing exams. All of these measures would need to be adjusted for the capabilities of the students entering the program (e.g., nature of learning disability, or scores on standardized tests) and for labor demand conditions in the local labor market. They should also probably be adjusted for field of study (e.g., expected rates of training-related placement might be higher for distributive education and for office education). Since costs vary by field, state reimbursement per placement might also vary across fields. The use of training-related placement rates in reimbursement formulas is clearly feasible, for it has been implemented in two states, Florida and South Carolina.

The primary objection to this suggestion is that the placement rates that are currently reported to state departments of vocational education are not comparable across districts and programs, are subject to manipulation, and suffer from a nonresponse problem. There is no reason, however, why a more reliable reporting system cannot be developed. The Department of Labor is requiring all states to establish a wage-reporting system keyed to a worker's Social Security number. This system identifies the name, address, and industry of the student's employer and could be the basis of a follow-up system providing valid measures of training-related placement rates and, without any follow-up, could provide estimates of the earnings impact of the vocational education.9

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9 In many cases the match between the industry and the field of training will be close enough to require no follow-up at all. Where the nature of the job is not clear from the industry code, a card could be sent to the employer requesting a description of the employee's job and possibly also asking for an evaluation of the training the employee had received. If no response is received from the card, an independent survey firm could be contracted to telephone the employer. Where no match turned up in the system, an effort could be made to call the student's parents. The list of students and their job classifications would be sent to the vocational teacher and the school district. This would give the teacher the opportunity...
Local districts might be given the option of allowing students who have not signed a contract and who do not have career plans in the field to take vocational courses alongside the "contract" students. These students would not, however, be reimbursable and should probably be required to demonstrate some minimum competency in basic skills area before being allowed to take the elective.

**Policy Implications: Federal**

At present, federal policy pays lip service to the objective of high training-related placement rates, but does little to achieve the goal. It continues to fund programs with poor placement records. Serious consideration should be given to (a) limiting the federal dollar contribution to local programs that meet or exceed a target rate of placement in training-related jobs or further education and (b) keying the federal contribution to the number of students so placed and the length of time they stay in a training-related job.

This could be done by establishing a national system for measuring training-related placement rates and other desired outcomes, adjusting these placement rates for local labor market conditions, and then allocating federal dollars directly to school districts (rather than to the states) on the basis of their performance. If one does not want to bypass the states, an alternative approach would be to adopt the Job Training Partnership Act (JTPA) model: make the entire federal payment to the state conditional on the state's establishing a performance standards system that meets certain minimum standards. The dollars allocated on the basis of performance standards would need to exceed 10 or 20 percent of the total instructional cost of occupationally specific education.

**Research Implications**

If performance standards are to receive serious consideration, it would be desirable to undertake a study of how they could be implemented and the distributional consequences of alternative federal funding formulas. The study would have two objectives:

- Developing and demonstrating a system of generating valid and reliable measures of performance for vocational training programs that adjusts both for local labor market conditions and for the abilities and background of the students served; and

- Improving our understanding of how to make occupational training programs more effective.

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to appeal and correct misclassifications.

Both secondary and postsecondary schools in six to 12 wage-reporting states would be randomly sampled. Schools that keep reasonably good records (including Social Security numbers) on their past students could be assigned to a retrospective study in which school records on 1984 graduates would be merged with five or more years of wage records from the Unemployment Insurance wage reporting system and a survey of the current employers of the youth. Schools that do not have such records would be assigned to a prospective study in which all students scheduled to graduate in 1987 would be surveyed and tested and their Social Security numbers would be obtained. The wage reporting system would be used to follow up on these students nine months after graduation and every 24 months thereafter for six years. All follow-ups would include students who enrolled in occupational vocational courses and a sample of students who did not take such courses. The telephone interviews with employers would ask for information on the graduate’s initial and current job responsibilities, wages, skill level, job performance, and about any on-the-job training, turnover, or promotions that may have occurred. After this information had been obtained, the employer would be asked whether he/she was aware that the worker had received vocational training, when and how he learned of this training, what he thought of it, and how the worker had been recruited initially.

The validity of other program performance measures would be evaluated by comparing employer reports to industry classifications obtained from the wage reporting system and to school reports of training-related placement rates. The reliability and validity of employer reports of job performance and skill level could be studied through an in-person reinterview of a small subsample of the employers and parallel interviews of the worker and coworkers.

The schools would be asked to provide detailed descriptions of each of their vocational programs. For each student in the study, information would be obtained on courses taken, grades, extracurricular activities, family background, and scores on tests of basic skills taken both before and after the vocational training. In the analysis, the outcome variables would be regressed on the characteristics of the student, local labor market conditions, dummies for the vocational field, and various indices of the character of the vocational program. The coefficients on the first two categories of variables (and possibly on the third category, the field dummies) would be used to generate performance standards targets. The coefficients on the fourth category of variables would yield important insights into which types of vocational training are most effective and how this varies with the performance outcomes considered. Finally alternative federal funding formulas and performance measures could be simulated to see how they would change the distribution of federal dollars.

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Selection bias. All past research on the effects of vocational education and of training-related placement are subject to various forms of selection bias. As Willis and Rosen have pointed out, the students who self-select into vocational programs probably have a comparative advantage in that form of training and the jobs for which they prepare. This, of course, biases the estimates of the effect of vocational training. State-of-the-art studies should be commissioned that attempt to deal with this issue using a variety of statistical models of the selection problem. One should not, however, expect to obtain robust answers to critical policy questions from such studies. Experience with the Continuous Longitudinal Manpower Survey (CLMS), evaluations of the Comprehensive Employment and Training Act (CETA), and other studies has demonstrated that results are often quite sensitive to minor changes in specification and are sometimes completely unreasonable (Job Training Longitudinal Survey Research Advisory Panel, 1985; Lalonde, 1986). The Department of Labor has decided to evaluate JTPA by running a massive classical field experiment with random assignment of JTPA clients to experimental and control status. This was a wise choice, and the Department of Education should pursue the same strategy.

The only way to find out for sure how vocational education should be delivered is to undertake field experiments. Such experiments need not create ethical problems. First, there are many vocational schools and programs with long queues of young people trying to get in (e.g., the specialized schools in New York and Chicago) and where random selection of a portion of the entering class is both feasible and ethical. Studies of these schools, using those denied entry as the control group, would tell us the overall effect of occupationally specific education. Other field experiments would focus on the impacts of different ways of delivering vocational education (cooperative vs. noncooperative or competency-based instruction and credentials vs. traditional). Everyone in a school or program would receive the same treatment, and comparisons would be made with earlier graduating classes and with other schools not adopting the new approach. The major disadvantage of the experiments is that it is doubtful that such experiments could be mounted and analyzed within the three-year time frame of the Assessment. I would recommend that the Assessment staff start a series of field experiments of the type described above and ask Congress to appropriate money for the follow-ups of graduates that are implied.

In the absence of field experiments utilizing random assignment, policy must be based on the analyses of nonexperimental data. The currently available set of estimators that correct for selection bias are subject to severe multicollinearity problems and are consequently not very robust. Most policymakers are legitimately suspicious of such estimators. In my opinion, the best hope for sound policy advice comes from standard analyses of high-quality longitudinal data sets (baseline surveys conducted before entry into vocational training which contain measures of a variety of abilities, skills, and attitudes). The studies using HSB and NLS data cited earlier are
of this type, and in my view are good enough to support the very
gross policy recommendations offered in this paper.

V. Where are Occupationally Specific Skills
    Best Learned?

A strong case can be made that the occupationally specific
skills that many high school vocational programs are trying to teach
in a lab or shop setting are best learned on a job. Work habits are
also best learned on a job. Evidence of the great value of on-the-
job learning comes from the success of the German apprenticeship
system and from longitudinal studies of American youth. Students who
worked while in high school are generally much more successful in the
labor market than those who did not hold down a job. Figure 3
summarizes the results of one such study by Kang and Bishop (1984).

Holding a job during the summer between the junior and senior
years had large effects on wages, employment, and earnings. For
boys, 30 hours of work per week during the summer between the junior
and senior years led to 8 percent higher wage rates, 12.5 percent
more employment, and 11 percent higher earnings in the period
immediately following high school. An equivalent total number of
hours worked during the senior year (i.e., averaging 10 hours a week)
raised the wage rate of boys by 1.5 percent, employment by 3 percent,
and earnings by 8 percent. Holding a job during junior year in high
school had practically no effect on labor market success after
school. The wage rates of girls were not affected by whether they
worked during the summer or during the school year. There were
employment and earnings effects, however, which were larger for
summer than for during-year work.

The strongest effects of work experience in high school appear
right after graduation and in the succeeding two years (Kang, 1984).
Their magnitude and importance diminish over time. Those who worked
10 hours per week through the last two years in high school, for
example, earned 8 to 20 percent more in the first three months after
graduation than the students with no work experience in high school.
But this relative advantage declined to about 5 percent during the
16th through 21st month after graduation.

Are these labor market benefits bought at the expense of any
undesirable effects of having a job while in school? A good way to
isolate the effect of work is to examine its effects on changes in
test scores, GPA, deportment, and educational plans between sophomore
and senior year. This was done with the HSB survey. The effects
that were found are summarized in Table 8. Work did not have effects
on internal locus of control, self-esteem, work orientation, or
planned occupation.
Figure 3. Effects of work during high school on labor market success in the two-year period after graduation.
Table 8

Effect of Work During High School
On Changes in Achievement, Attitudes, and Aspirations
(Standard Deviation)

<table>
<thead>
<tr>
<th>Average Hours per Week</th>
<th>Junior 10 hrs./wk.</th>
<th>Senior 10 hrs./wk.</th>
<th>Summer 30 hrs./wk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal test score</td>
<td>M -4***</td>
<td>1***</td>
<td>-6***</td>
</tr>
<tr>
<td></td>
<td>F -3***</td>
<td>0</td>
<td>-4***</td>
</tr>
<tr>
<td>Math test score</td>
<td>M -4***</td>
<td>0</td>
<td>-3*</td>
</tr>
<tr>
<td></td>
<td>F -3***</td>
<td>-1</td>
<td>-3*</td>
</tr>
<tr>
<td>Science test score</td>
<td>M -4***</td>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>F -1</td>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>Civics test score</td>
<td>M -3***</td>
<td>1</td>
<td>-5*</td>
</tr>
<tr>
<td></td>
<td>F -2</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Grade point average (SD=.7)</td>
<td>F -4***</td>
<td>1</td>
<td>-5*</td>
</tr>
<tr>
<td>Good deportment</td>
<td>M -4***</td>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>F -3*</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Planned yrs. of schooling</td>
<td>M -3***</td>
<td>0</td>
<td>-5</td>
</tr>
<tr>
<td>(SD=2.5 yrs.)</td>
<td>F -2**</td>
<td>-2**</td>
<td>1</td>
</tr>
</tbody>
</table>

*Statistically significant at the 95 percent level.
**Statistically significant at the 99 percent level.
***Statistically significant at the 99.9 percent level.

NOTE: Entries are coefficients scaled approximately as a percentage of the population standard deviation of the outcome being studied. For the test scores a one standard deviation improvement is roughly equivalent to a gain of three grade equivalents or a 110 point improvement on a SAT test. A one standard deviation improvement would cause an individual to move from the 50th to the 84th percentile on the characteristic, so impacts on percentile rank in class for grades or deportment can be calculated by dividing the coefficient by 3. The dependent variable was the change between the end of sophomore and senior years. The models used to derive these estimates contained a total of 75 control variables. Included among the control variables were the sophomore values on 10 other outcome measures, dummies for a great variety of specific courses, years of courses in specific subjects taken during freshman and sophomore year, and during junior and senior year, family background, self-assessed ability to succeed in college, and parental pressure to attend college. The models employed a first difference specification.
Working during the junior year had small negative effects on test scores, grades, and aspirations. Working during the summer also had somewhat smaller negative effects on test scores (particularly verbal scores) but not on aspirations. In contrast, working during the senior year had no effects except very small negative ones on verbal scores and on planned years of education.

Working during the senior year had minimal effects on test scores and on educational plans. These, when combined with the very large positive effects on the employability of graduates who did not go to college, imply that students who are not planning full-time college attendance should be encouraged to get part-time employment during their senior year. The clear indication is that such experience helps them prepare for full-time entry into the labor market.

Policy Implications: Cooperative Education

A major implication of these results is that cooperative education should be greatly expanded at both secondary and postsecondary institutions. (A fuller description of the rationale of cooperative education is provided in Ruff et al., 1982; Lewis and Fraser, 1982; and Barton, 1981). My specific recommendations are the following:

- All vocational students who achieve a minimum performance standard in the first year of their occupationally specific education should be placed in a cooperative job related to their training during summers and the final year. In order to ensure that high school students have enough time to complete a strong program in the basics, release time from school for a cooperative job should not exceed about 12 hours a week except in extraordinary circumstances.

- The minimum performance standard should be set at a level such that (1) at least 80 percent of entrants can expect to attain the standard and (2) all students who meet these standards can get and keep a cooperative job.

- Handicapped students would have their own individualized performance standard.

- Students who do not meet the standard would be dropped from the program unless they found a job on their own that was related to their training.

There will be no difficulty finding cooperative placements for clerical and distributive education students. There may, however, be
difficulties in placing health, trades, and technical students. In order to help place these students and ensure that the jobs really offer training, co-op staff should facilitate applications for learners' waivers that allow co-op students to be paid 75 percent of the minimum wage. The training costs in these jobs are significant, and the lower wage during the training period is quite justified. In Germany, for example, first-year apprentices are generally paid only one-fourth of what they will make when the apprenticeship is completed. Paying below the minimum wage in the training slots is also desirable because it ensures that the students are in the program because of the opportunities to learn a skill rather than just to earn money and get out of school.

A comprehensive list of competencies would be developed for each broad occupational category. The teacher and the employer advisory committee would decide which of these competencies need to be taught in school prior to entering a cooperative placement, which are best taught on a job, and which are best taught at school during the final year of the program. The co-op contract would specify the competencies the employer is to teach. The student would receive a competency profile checklist at the beginning of the program and the competencies developed would be recorded on this document as they are learned. The competency profile would also serve as a credential that assists in the placement of students in jobs and further training.

Policy Implications: Subsidize Increases in Employer Training

If on-the-job training is a more effective way of developing many occupational skills than classroom training, why not turn most occupational training over to firms? The answer is that employers will probably not do the training that schools do not do. The social rate of return to employer-provided training is extremely high (Bishop et al., 1985), but the private rates of return to employer investments in training are much smaller. Private rates of return for employers are low because much of the training is useful in other firms and workers cannot be prevented from going to work for a competitor. To forestall this turnover, employers are forced to pay high wages to trained workers so many of the benefits of the training inevitably go to the trainee, not the trainer. This suggests that trainees should pay for the training by accepting a lower wage in the years right after leaving school or when entering a new occupation. However, young workers cannot borrow to finance this training (Hubbard and Judd, 1986) and cannot afford to work at extremely low wages while they are training. The progressivity of the income tax

10 Employers who train handicapped and disadvantaged youth are eligible for Targeted Jobs Tax Credits. The co-op coordinator should aggressively market these tax credits as a way to induce employers to train the students who are most difficult to place.
means that young trainees will pay high marginal tax rates on the benefits of the investment but receive little tax subsidy of the costs of the investment. They will not make the large sacrifice of current income to undertake the training unless extremely high rates of return are promised. A further source of externalities is the difficulty employers have in assessing the general training provided by other employers and the resulting lack of reward for such achievements (Bishop, 1985).

As a result, from a social point of view, employees and employers are underinvesting in on-the-job training yielding skills useful in many firms. The appropriate policy response is stimulation of employer-provided training rather than cutbacks in funding of school-based occupational training. If efforts to stimulate on-the-job training are successful, a gradual scaling back of school-based occupational training might be contemplated. Customized training is one possible approach to stimulating employer training, but it suffers from some inherent limitations. The transaction costs of arranging such programs are relatively high, and much of the customized training apparently substitutes for training that employers would have provided anyway (David Stevens, personal communication). The most effective way to stimulate an increase in on-the-job training is to subsidize increases in their training investments.

A marginal training subsidy (MTS) would offer a partial subsidy of a firm's training expenditures above a threshold level. It is an idea whose time may be coming. Congressional interest in the concept is growing and has resulted in bill HR-1219, sponsored by Congresswoman Johnson and 33 other members of the House, that offers a 25 percent credit for increases in "aggregate amount of expenses paid or incurred by the taxpayer during the taxable year in connection with the training of employees." Approved training programs are defined to include (a) registered apprenticeship programs, (b) cooperative education (as defined by section 521 (7) of the Carl Perkins Vocational Education Act), (c) training programs carried out under supervision of an institution of higher education (as defined by section 1201(a) of the Higher Education Act of 1985), (d) "any employer-designed or sponsored program which meets such minimum requirements with respect to supervised on-the-job experience and classroom instruction as the Secretary of Labor shall prescribe by regulations," and (e) "any other program for improving job skills directly related to employment which the Secretary of Labor may approve" (HR-1219, 1986).

The bill leaves a great deal to the discretion of the Secretary of Labor. One of the major issues that would need to be decided would be whether to subsidize the 90 percent of all training that is informal or to limit the subsidy to formal training programs. Measuring the costs of informal training is difficult, but an attempt should be made because subsidizing only formal training will distort...
choices between formal and informal training. The subsidizable costs of informal training would be limited to trainee time and trainer time during the first year of employment or during the first three months before or after a major promotion and change in job responsibility. If the training is formal, certain additional expenses—books and materials, rental on teaching machines and equipment or office space dedicated entirely to training, and payments to training vendors—would be eligible for subsidy. Formal training might be subsidized regardless of length of tenure or whether the worker received a promotion.

The line between production and training is difficult to draw. The French have been dealing with this definitional problem for many years as a result of the legal obligation they place on firms to spend at least 1.1 percent of their wage bill on training if they are to avoid paying a penalty tax. Their most effective mechanism for ensuring that the training expenses claimed are indeed legitimate has been the requirement that all companies with more than 100 employees have a training advisory committee with worker representation. A similar requirement might be placed on large firms receiving subsidy from a MTS.

Another way to insure the legitimacy of the training would be to require that trainees be given a written description of the purposes and nature of the training at its outset and award a certificate describing the number of hours of formal or informal training, skills taught, and, where appropriate, the competence achieved at its completion. These certificates would be more than audit trails. They would encourage both trainer and trainee to take the training more seriously, provide a recognition and reward for the worker's growing competence, and help the worker find a job that makes use of the new skills should he or she leave the firm.

11 A trainee would be considered to be engaged in formal or informal training if he or she is receiving group instruction, being instructed by a computer, reading manuals or instruction booklets, watching other do the work, or being shown the work. A trainer, supervisor, or coworker's time would be considered to be engaged in a training activity only if 100 percent of the trainer's attention is devoted to the training purpose. If any output is produced during a training activity, it would have to be given to the trainee, discarded, or given away. The following tests could be used to define a promotion for purposes of calculating subsidizable training expenses: there would have to be a new job title, noticeably different job duties, a wage increase of at least 6 percent above the standard seniority or cost of living increment, and the individual could not have held that particular job before. In order for new employee training to be subsidizable, it would have to be associated with a wage increase by the end of that year of at least 10 percent over and above the rise in the cost of living.
The key to a cost-effective MTS is setting a threshold that minimizes windfall payments—tax credits for training expenditures that would have occurred regardless of the existence of the subsidy. The approach taken by HR-1219 is to offer a tax credit for training expenses that exceed the average of the preceding five years. During the phase-in period, the firm's tax year containing December 31, 1984, would be the threshold. The marginal research and development (R&D) credit defines its threshold in basically the same way. There are some difficulties in using past training expenditures as the threshold in a marginal credit, but these were surmounted in the R&D credit and can no doubt be surmounted in a training credit.

The primary disadvantage of using a lagged five-year running average as the threshold is that increases in training this year reduce the firm's eligibility for subsidy during each of the following five years. This reduces the value of the tax credit to the firm. Once it is fully in operation in 1990, a $100 increase in training in 1990 provides the firm with a $25 tax credit but it also lowers the tax credit by $5 in 1991, 1992, 1993, 1994, and 1995. The present value of the tax credits generated by this $100 increase in training is only $10.05 not $25 (assuming a 20 percent discount rate). Even worse, the running average updated threshold creates an artificial incentive to reduce training expenditures in a recession (exactly when society would like firms to hoard and train labor for the future). When a firm is not hiring, training costs are reduced and its training expenditures will often fall below the threshold. Once the threshold is pierced on the downward side, the tax credit creates an incentive for further reductions in training expenditures because by doing so, the firm lowers the thresholds it will face in each of the succeeding five years. If the firm anticipates being above its threshold during the next five years, the present value of the tax credits generated by a $100 reduction in training during a recession year is $14.95. This last problem can be avoided by only using years in which training exceeded its threshold to update the threshold.

The political realities are such that any new tax credit is likely to have an expiration date. This increases its incentive

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12 The problem is even more severe during the phase in period. Assume the firm pays taxes based on fiscal years starting in October. If it increases training by $100 in FY 1986, it gets the $25 tax credit but its 1987 threshold is raised by $50, its 1988 threshold is raised by $33, its 1989 threshold raised by $25, and its 1990 and 1991 thresholds are raised by $20. This can reduce future tax credits by as much as $37 (twelve dollars more than the benefit received in FY 1986). This problem can be avoided by basing the threshold more heavily on expenditures in the year that precedes the initiation of the subsidy.
effect, for the fact that future thresholds will be higher takes on reduced importance if the continuation of the program is uncertain. The disadvantage of temporary credits, however, is that it is costly for a firm to redesign training, so a tax credit with a short life will not have as powerful an effect as one with a long life.

The way to maximize incentive effects is to base thresholds on the training expenditures of years prior to the announcement of the tax credit and update this threshold with statistics that the firm's own behavior does not affect (e.g., a wage index or growth of training expenses in the industry) or that are not particularly influenced by the firm's response to the training credit (firm's wage bill). If there is concern about the reliability of estimates of the costs of informal training for years like 1964 and 1985, there could be a separate threshold for informal training expenditure at a percentage of the firm's wage bill that rises with the firm's rate of turnover.

A subsidy above a threshold has some important advantages over an obligation to spend a minimum amount on training:

- Firms that are big trainers (and therefore probably efficient trainers) of skilled workers would always face an incentive to expand their training.

- In France, where there is an obligation to spend 1.1 percent of the wage bill on training, the great majority of employees work at firms which exceed their obligation to spend, so at the margin, there is no public encouragement of additional training for the majority of French workers. A subsidy above a threshold avoids this problem.

- Paperwork is reduced because some firms would not apply for a subsidy in most years. Year-to-year variations in training expenditures are likely to be large at small firms. Such firms would most likely spend above the threshold only in years in which there is a major expansion of employment or the installation of new equipment.

- Employers who feel the administrative burdens of the subsidy are too high are free not to participate.

All employers—profit making, nonprofit and governmental—should be eligible for the marginal training subsidy if their training

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13 For more on the French mandate to spend, see Benedick (1983).
expenditures exceed the threshold defined for their organization. In order for incentive effects to be maximized, employers must feel they are assured a larger subsidy payment if they increase their training investment. Together, these two considerations imply that the MTS should be administered as a subsidy entitlement, as a tax credit against a broad-based tax on the firm's wage bill like Federal Unemployment Insurance Tax (FUTA) or Social Security tax, or as a tax credit against income taxes that can be sold to other firms. The MTS would be financed either out of general revenue or a special training tax on the wage bill of all employers.

The MTS has a number of important advantages:

- The social benefits of on-the-job training are probably just as large as the social benefits of occupationally specific training provided by schools. The MTS would create an incentive for firms and workers to generate more of such benefits, and would reduce currently prevailing distortions of the choice between these two modes of providing occupationally specific training.

- Since the employer pays 67 to 90 percent of the cost of training, there is always an incentive to be efficient.

- The choice of which jobs to train for and how to do the training is made by the employer not by a school or government official or the trainee. The employer is the person best able to project the firm's future need for skilled workers and to select the best method of training for those skills.

- The certificates awarded at the end would be a source of pride for employees. By signalling to other employers what had been learned, the certificates would improve the trainee's marketability.

- The inclusion of the costs of informal training in the definition of subsidizable training expenses is fair to

14 To insure that employers who receive an MTS subsidy were aware of the program at the time it might influence their behavior, it could be required that the employees make a preliminary application before July 1 of the calendar year for which a subsidy is sought.

15 If the MTS is a subsidy, subsidy payments would be taxable income. If the MTS is a tax credit, the firm would have to reduce its reported Social Security or FUTA tax payments by the amount of the tax credit.
small business, and reduces the tendency of the subsidy to distort choices between formal and informal training.

- While the MTS is not directly targeted on the unemployed dislocated worker, it will reduce unemployment nevertheless. The MTS reduces unemployment in two ways:
  - It encourages firms to hire and train new workers, and to retrain rather than lay off workers whose skills were becoming obsolete.
  - It encourages the firm to expand the supply of skilled workers rather than engaging in a bidding war for the limited supply of already trained workers, thus producing an acceleration of inflation.

The MTS has as its objective expansion and intensification of on-the-job training. Only two small reforms of current practice are proposed—training advisory committees at firms with more than 100 employees and providing trainees with a certificate describing the training that has been received. All the really important decisions—who is to be trained, what is to be taught, and how it is to be taught—are made by the employer and to a lesser extent by the worker. Workers influence these decisions by bidding for jobs that require training, by selecting an employer who provides the desired training, and by the commitment that is given to learning the material that is presented.

Expenditures on formal training in the workplace have been estimated to be $30 billion annually. Informal on-the-job training has been estimated to cost $180 billion annually (Carnevale, 1986). Consequently, covering all employers and all kinds of training means costs can be kept down only if the subsidy rate is set relatively low, the definition of subsidizable expenditure is restrictive, and the threshold is set relatively high. With a threshold set equal to base-year training expenditures, about 10 percent of training expenditures would probably be eligible for tax credits in the first year and about 30 percent in the fourth and fifth years. If training tax credits must be deducted from training expense in calculating tax liability, a 15 percent subsidy rate on formal training may be roughly estimated to cost $300 million the first year and $900 million in years four and five—(.15) (1− marginal tax rate) $3 billion = $300 million. If the elasticity of demand for training were only .5, the increase in training that would be generated would be $1.5 billion.

16 To the extent that the accounting rules used to distinguish training activities from production activities affect the way training is conducted, this is an unfortunate, unintended consequence of the necessity of defining a dollar quantity of training expenditure for each firm.
Research Implication

The research needed to back up an increased emphasis on cooperative education has already been described in the previous section. If a direct subsidy of employer training were to be given serious consideration, the primary need would be for a classical field experiment in which a randomly selected group of 50 small establishments were offered a subsidy like the one described above and their behavior were compared to a control group.

VI. Summary

In my view, school-based occupationally specific education must get serious about raising the rates of training-related placement if it is to achieve its economic potential. Entry into these courses should be limited to those serious about pursuing the occupation, and teachers and programs need to be evaluated on the basis of their ability to achieve high rates of placement in related jobs. Employers should become much more involved in delivering occupational training. Teachers would no longer be sole instructors for occupationally specific skills. Cooperative employers might in fact become the primary instructors for these skills. The teacher's role would become one of mentor and facilitator of learning and job placement.

A comprehensive program of research for the National Assessment of Vocational Education would include the following:

- A conference on what traits and abilities facilitate learning new skills on a job and becoming a productive worker, with industrial psychologists as the paper givers and economists and vocational educators as the reactors;
- Longitudinal research on what types of vocational education work best, using competency tests and wage record files;
- Study of why training-related placement rates are low;
- Development of valid and practical performance measures for vocational education;
- Classical field experiments testing alternative delivery mechanisms; and
- Classical field experiment testing the effect of a marginal training subsidy.
I. These courses were selected from a more complete list of courses to represent math and science coursework generally taken during or after the sophomore year in high school. The specific model estimated was:

\[ Y_{it} - Y_{it-1} = X_{it-1} + \phi C + \theta Y_{ji} + \epsilon_{it} \]

where

- \( Y_{it} \) = the "i"th outcome variable measured at the end of senior year. (e.g. math test score)
- \( Y_{it-1} \) = the sophomore year measure of the "i"th outcome variable
- \( Y_{ji} \) = a vector of sophomore year measures of outcome variables other than the "i"th
- \( X_{it-1} \) = a vector of variables characterizing background and curriculum coursework variables measured in the sophomore year
- \( C \) = a vector of variables describing the courses taken in junior and senior year
- \( \phi \) = a vector of coefficients measuring the impact of coursework on learning and career aspirations
2. This analysis of longitudinal data from the sophomore cohort of High School and Beyond predicted the level of the 10 outcome variables listed in Table 4 measured at the end of the senior year as a function of a long list of variables characterizing the student's background and behavior measured at the end of the sophomore year (including the 10 outcome variables) and 39 variables describing the character of the high school. The 5 variables measuring course offerings and the academic versus vocational emphasis of the school are described in the text. The other 34 school characteristics included the following: percent Hispanic, percent Black, percent not speaking English at home, mean family income, dropout rate, control (Catholic, other private vs. public), housing, court orders, unionization, teacher strikes, facilities, whether the last school levy passed, teacher student ratio, ratio of teachers aides to teachers, percent of teachers with M.A. or Ph.D. or with more than 10 years of experience, teacher absences, entry pay, school participation in Upward Bound and co-op ed, competency test, ability grouping, average daily attendance, school department index, school problem index based on principal reports, school mean of sophomore reports of school quality index, school mean of student school rating index, and number of class hours per year.

3. The data employed in the analysis provided information using 550 pairs of recently hired workers employed in the same or a very similar job. The following model was estimated:

\[ Y_1 - Y_2 = A(D_1 - D_2) + B(X_1 - X_2) \]

where

- \( Y_1 - Y_2 \) = is the difference between the productivity or required training of person 1 and person 2
- \( D_1, D_2 \) = a dummy indicating that person 1 or 2 had obtained vocational training from a school that was relevant to the job for which he/she was hired
- \( X_1, X_2 \) = a vector of control variables for circumstances of the hire, and the new hires other credentials. When current productivity is \( Y \), tenure and tenure squared are included in the \( X \)’s.

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