

Table of Contents

Editor’s Notes
James R. Stone III..... 272

A Question of Balance: CTE, Academic Courses, High School Persistence, and Student Achievement
Stephen B. Plank 279

The Relation of High School Career- and Work-Oriented Education to Postsecondary Employment and College Performance: A Six-Year Longitudinal Study of Public High School Graduates
James Griffith and Julie Wade..... 328

Employment During High School: Consequences for Students’ Grades in Academic Courses
John Robert Warren, Paul C. LePore, and Robert D. Mare..... 366

Partnerships for Career-Centered High School Reform in an Urban School System
Martha Abele Mac Iver and Nettie Legters 412

A New, Old Vision of Learning, Working, and Living: Vocational Education in the 21st Century
Robert Shumer 447

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Editor's Notes

James R. Stone III
University of Minnesota

This issue comes as the reauthorization of vocational legislation is coming before the Congress. The current national assessment of vocational education shows that :

96% of secondary students take at least one CTE course.

25% of students take at least three credits of CTE in one area.

44% of students take at least three credits of CTE, but not all in one area.

CTE participation declined in the 1980s, but appears to have held steady in the 1990s. In 1982, students on average took 4.7 CTE credits. In 1992, students on average took 4 CTE credits and in 1998 that number remained the same.

Even though CTE credits are holding steady academic credits are going up, so CTE has a declining share of the secondary experience.

CTE students may be taking more academic credits, but they still are not taking as rigorous of courses as the rest of secondary students (US Department of Education, 2002). One can conclude from these data that secondary CTE is valued by many students in high schools today.

However, hard questions are being asked about the role of vocational education (CTE) in today's high school. With the current administration's focus on core academics, does vocational education and processes associated with it belong in today's high school? There are some who believe the answer is yes, but only in a narrowly defined role. For example, the Co-Director, American Youth Policy Forum stressed the impor-

Stone

tance of academics and argued that CTE is a strategy that can help to improve academic achievement (National Association of State Directors of Career Technical Education Consortium, 2002). She stated that at the secondary level CTE should be viewed as pedagogy that helps kids achieve academically. At the meeting of the National Association of State Director's of Career and Technical Education, the US Department of Education Assistant Secretary for the Office of Vocational and Adult Education (OVAE) cautioned that there appears to be limited data to support a strong link between vocational education and academics, improving drop out rates, or more effective transitions to postsecondary education and training. She argues that vocational education can be a viable option for helping students meet the new academic standards set by the administration. Another OVAE official stated that, "CTE needs to focus only on high quality programs that support the academic foundation" (For details on the remarks of all presenters, see National Association of State Directors of Career Technical Education Consortium, 2002).

The present thinking in Washington is out of balance with long held beliefs that the "world of school" and the "world of work" should be more fully integrated in order to properly educate and train young people for their adult roles in the work force (Byrne, Constant, & Moore, 1992; Carnegie Council on Policy Studies in Higher Education, 1979; Congressional Research Service, 1994; National Panel on High School and Adolescent Education, 1976; President's Science Advisory Committee, 1974). The current Washington-think also ignores the research evidence about the value of high school CTE.

In this issue of the JVER, we explore some of the evidence about the value of secondary CTE. We begin with Plank's analysis of the impact of CTE on increasing high school engagement and reducing drop outs, on post high school trajectories, and on grade point average. Plank's analysis of the NELS:88 data shows that CTE has a pronounced effect on re-

ducing the probability of dropping out of high school especially for low ability learners. He also shows that in the year following high school graduation, about 60% of CTE concentrators are attending post secondary education. His analysis demonstrates that dual concentrators perform about as well as academic concentrators on standardized tests.

Griffith and Wade studied a cohort of CTE students exiting from a suburban Washington DC school system for six years following graduation. They find that CTE program participants fared better on many employment outcomes than non-program participants, and as well as non-program participants on college performance. And, importantly, they performed nearly the same on college outcomes as did non-CTE participants.

Work and work-based learning, an integral part of high school CTE and emphasized in the school to work movement has long been assumed in many quarters to harm students academic performance, especially when it surpasses a 15 hour per week threshold (Stone & Josiam, 2000). Warren, LaPore, and Mare in their analysis of high school employment, find no evidence that working during high school has either long or short term effects on grades. It is pre-existing differences that differentiate those who work more or less intensively and it is the pre-existing differences that fully account for the association between employment intensity and grades in academic courses.

We then turn to MacIver and Legters examination of school to work partnerships. This work is instructive to those who seek to improve education by creating stronger links between the business community and the school community. They identified organizational, cultural, financial, and political conditions that severely limited the effort to effect change. They find that tensions in the initiative's core partnership between the school system and the employment development agency, due in part to unstable leadership in the school system; the persistence of multiple and divergent high school improvement efforts; and, confusion about how school-to-work activities fit into the state-

Stone

level standards and accountability system all conspire to limit the effectiveness of this school improvement strategy.

Finally, Shumer provides the final in our series of invited discussions on the future of CTE. He offers a vision of CTE teachers working with their colleagues developing curriculum to ensure that young people have ample opportunity to do real things in the world. CTE educators can provide the settings that maximize the educational technology without sacrificing our understanding that electronic learning should never replace real-world environments. In the 21st century, CTE educators will wrestle with instructional design issues that attempt to take advantage of the power of computers, without sacrificing the power of experiential learning.

What value does CTE add to the high school experience? Evidence shows that it keeps youth in school. Evidence shows that a majority of CTE concentrators attend college and do nearly as well as the academic concentrators. Evidence shows that dual concentrators perform as well on standardized tests as academic concentrators. Evidence shows that working during high school does not cause poor academic performance. Evidence shows that building effective school-business partnerships is fraught with difficulty.

To this body of evidence, I add one more study. Mane (1999) analyzed three cohorts of students spanning the last quarter of the 20th century. He found that high school vocational education helped the non-college bound student start their work life more successfully. His analysis shows that economic returns to occupationally specific coursework rose substantially between 1972 and 1980 and remained high in 1992. Academic coursework for the non-college bound had a much smaller labor market payoff. He concludes that these findings contradict the often repeated claim that employers seek workers with a good general education and will teach the occupational skills necessary to do the job.

Endnote

With this issue, I conclude my tenure as editor of the JVER. I wish to thank the many people who have helped me over the past two years and wish the new editor, Jim Flowers, success. The JVER is an important outlet for vocational educators to share their work and engage in scholarly debate. I encourage you to support Jim and the JVER by thinking first of the JVER when you are seeking an outlet for your scholarly work.

I wish to publicly acknowledge the many professionals who have supported the JVER through their service as reviewers. Their contribution of time and talent ensure that you continue to receive a quality journal.

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A Question of Balance: CTE, Academic Courses, High School Persistence, and Student Achievement

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Abstract

Educators, researchers, and policymakers are currently examining the ways that career and technical education (CTE) is—and could be—coupled with core academic education in U.S. high schools. This study discusses how CTE and academic curricula can, or should, co-exist. The study examines the relationship between (a) the balance struck between CTE and academic course-taking during the high school years, and (b) academic achievement and persistence in high school. Data come from the National Education Longitudinal Study of 1988. The balance between CTE and academic course-taking is shown to have some influence on both test scores and the likelihood of dropping out, with effects being most dramatic and noteworthy for likelihood of dropping out. Specifically, the analyses suggest that a ratio of approximately three CTE credits to every four academic credits was associated with the lowest likelihood of dropping out for this sample. Implications for policy, practice, and future research are discussed.

As a society, we ask a lot of our high schools. We ask them to promote students' proficiency in multiple core academic areas. We ask them to prepare individuals for postsecondary endeavors, whether participation in the labor force, continuing education, or both. We ask high schools to develop or encourage certain socially desired behaviors, attitudes, and capacities in students, while discouraging or sanctioning other traits and behaviors. And—as we ask schools to pursue these varied and

sometimes competing goals—we hope they will make the experience engaging and rewarding enough to convince students to remain within the formal educational system at least until high school graduation; we hope students will persist to graduation rather than dropping out of school.

Not only does society present high schools with a diverse set of goals; our demographic and social make-up also presents high schools with a diverse set of students to be guided and educated. Individuals enter high schools with different levels of academic preparation, a variety of home and neighborhood backgrounds, varying degrees of commitment to formal educational endeavors, and a wide range of desires and expectations for the years after high school.

Not surprisingly, in the face of multiple societal mandates and diverse student populations, high schools in the United States have come to offer multiple and varying curricular paths for students to follow (Hallinan, 1994; Oakes, 1994; Oakes, Gamoran, & Page, 1992; Powell, Farrar, & Cohen, 1985). Which path a student will follow—what balance of specializations and subject areas he or she will be exposed to—is partly a matter of individual choice and partly a matter of being guided or placed by the adults and sorting mechanisms of schools as organizations (Garet & DeLany, 1988).

Career and technical education—or vocational coursework—is a notable part of the mix. For many decades, high schools seemed to focus on preparing students for *either* entry-level jobs *or* postsecondary education. Students who were being guided toward labor force entry immediately after secondary school often completed many of their high school credits in areas such as trade, industry, business, agriculture, marketing, and distribution. Students who were being prepared for postsecondary education generally took fewer of these vocational courses and instead completed more credits in mathematics, science, English, social studies, and foreign language.

These two distinct trajectories of vocational concentration

A Question of Balance

and college preparation (and others that completed the menu of available paths) have not ceased to exist. However, a couple of trends have altered the landscape of the U.S. high school. First, during the 1980s and into the 1990s, the amount of high school vocational course-taking declined while academic course-taking increased (Hoachlander, Kaufman, Levesque, & Houser, 1992; Levesque et al., 1995; Levesque, Lauen, Teitelbaum, Alt, & Librera, 2000). The reasons for this shifting balance are surely complex, but contributing factors include changes in high school graduation requirements and changes in the skill sets and training levels demanded by the labor market (National Center for Education Statistics, 2000).

Second, explicit attempts to combine vocational education with a solid academic grounding have become increasingly common. One central goal of such integrated programs is to keep individuals' options open until after high school. If high-quality preparation in core academic subjects can be coupled with a strong foundation in work skills and applications, it is hoped that upon high school graduation individuals will have attractive options available in multiple arenas: in two- or four-year colleges, within the paid labor force, or in pursuing post-secondary education and paid employment simultaneously.

Advocates of combining vocational concentration with college preparation also suggest motivational benefits. In light of increasingly stringent high school graduation requirements in most states, we can assume that almost all high school students will be exposed to more core academic subjects (in particular, English, mathematics, science, and social studies) than would have been typical 10 or 20 years ago. Given this fact, are there reasons to expect that students will perceive greater relevance in academic subjects, apply greater effort to their academic courses, or develop firmer commitment to school, generally, if academic studies are coupled with career and technical education (CTE)? Many argue that indeed there are reasons to expect these motivational benefits.

Positing such potential benefits, Crain et al. (1998) studied students' experiences in career-focused magnet high schools. In describing an ideal in career magnet design and implementation, Crain and his colleagues seem to hypothesize the greatest potential benefits for students exhibiting average or somewhat below-average achievement levels upon entering high school. Their comments about potential benefits of career magnet programs can logically be extended to efforts to combine CTE and academic course-taking more broadly. They wrote the following:

Abstract academic education not connected to a specific career can be satisfying only to those students who are certain they will get a four-year college degree that will meet their career-preparation needs. Contrasted with the traditional high school, career magnets can command the loyalty of their students and offer them an opening to a future career that does not require them to be part of the academic elite (Crain et al., 1998, p. 4).

Extending the ideas of Crain and his colleagues to more general efforts to combine CTE and academic courses simply requires the following perspective: For students who do not see a four-year college degree as a definite desire or a certainly attainable goal, academic courses isolated from CTE exposure would be likely to seem irrelevant or frustrating. A student who did not feel sure that he or she would be able to enter a four-year college, or that he or she would want to enter a four-year college, would be likely to find limited meaning and excitement in studying solely core academic subjects. On the other hand, if academics were properly integrated with career-focused courses, such a student might see practical applications of the mathematics, science, reading, writing, and cultural studies contained within academic courses. Such a student with dual CTE and academic concentrations might apply greater effort to his or her academic studies than would a student encountering only academic courses.

A Question of Balance

According to this perspective, a student's cognitive growth in the core academic subjects could be expected to be augmented when CTE and academic course-taking were featured jointly, as compared to when an academic concentration was featured alone. This might be especially the case for low-achieving students. Further, a student's general enthusiasm and attachment to high school could be expected to increase—and, thus, his or her risk of dropping out to decrease—when CTE and academic course-taking were coupled. These, of course, are hypotheses. They are hypotheses that have been investigated in some previous research (Boesel & McFarland, 1994; Boesel, Hudson, Deich, & Masten, 1994; Crain et al., 1999; Delci & Stern, 1999; Levesque et al., 2000; National Center for Education Statistics, 1999a; Rasinski & Pedlow, 1998), and they will be explored further in this article.

There are reasons to temper these hypotheses. Specifically, regarding effects on cognitive growth in academic subjects, some educators worry that combining CTE with an academic course load dilutes the quality and quantity of academic coverage. Indeed, there are limits to the total number of courses students can take during their high school careers. If CTE occupies a significant portion of a student's schedule, this limits the hours remaining available for core academic subjects. Thus, even if a dual CTE/academic concentration has motivational benefits that lead students to apply greater effort to academic courses, the limits that the dual concentration places on overall exposure to academic topics might have countervailing effects on achievement growth. Within this article, attention will be paid to these issues.

Another caveat that should be attached to the hypothesized benefits of a dual CTE/academic concentration involves the precise nature or character of an integrated curriculum. For any possible benefits to accrue, do the teachers of CTE and academic courses in an integrated program need to prepare lessons and teach in close collaboration with one another? Must mathe-

Plank

matics and science teachers make explicit efforts to illustrate linkages between their subjects and career applications in order for potential motivational and achievement benefits to accrue? Must CTE teachers forge explicit connections to the academic subjects in their instruction for benefits to be realized? Or, will benefits be realized simply by exposing students to both types of course-taking, without radical changes in classroom practices or fundamental efforts at integrated planning and instruction? The questions posed in this paragraph are beyond the capacity of this study's data set. Crain and his colleagues (1998, 1999) have offered some evidence suggesting that some benefits can be realized even without radical changes to classroom and school organization, and without much joint planning and integrated instruction. This initial evidence is important, and as future research is conducted on dual CTE/academic concentrations, more attention should be paid to these matters. Within the present study, however, there is much to analyze and summarize without even broaching these nuances.

Research Questions

Within the context of the multiple missions of high schools, diverse student populations, and evolving curricular organization, this study aims to increase our understanding of the relationship between (a) the balance struck between career and technical course-taking and academic course-taking during the high school years, and (b) academic achievement and persistence in high school.

More specifically, this study addresses a series of interrelated questions for a nationally representative sample of public high school attendees who had been eighth graders in 1988. The study asks the following:

1. For this sample, what balance was struck between CTE and academic course-taking?
2. Can we detect effects of the balance between CTE and

A Question of Balance

academic course-taking on achievement growth, as measured by standardized tests in the areas of mathematics, science, reading, and history?

3. Can we detect effects of the balance between CTE and academic course-taking on the likelihood of dropping out of high school (or, conversely, persisting in high school)?

Data and Methods

The data for this study come from the National Education Longitudinal Study of 1988 (NELS:88), supported by the National Center for Education Statistics of the U.S. Department of Education. NELS:88 provides a rich source of information on adolescents and young adults as they progress through high school and into postsecondary education and the labor force. The NELS:88 base-year design employed a two-stage stratified random sample of approximately 25,000 eighth graders in more than 1,000 schools in 1988, who were then re-surveyed at two-year intervals through 1994 (Ingels, Abraham, Spencer, & Frankel, 1989; National Center for Education Statistics, 1996). In addition to student surveys and cognitive tests, the database includes survey responses from parents, teachers, and school administrators. Also, of central importance to the present study, NELS:88 includes transcript data, collected after the 1991-92 school year and covering all of a student's high school years.

In order to understand what the NELS:88 (hereafter identified simply as NELS) data can tell us about the effects of CTE and academic course-taking on high school persistence and academic achievement, it is important to note that most of the sample members graduated from high school in 1992. As such, their secondary school careers took place while the nature and quantity of vocational and college preparatory course-taking were still very much in transition in the United States. The 1990 Perkins Act, which encouraged a more integrated approach to

CTE and college preparatory education, was probably just beginning to affect curricular organization. Legislation of the 1998 Perkins Act—which further encouraged the integrative approach—was still several years away. Thus, we should think of this longitudinal data set as one that can give us insights into trends and relationships as they existed in the earliest stages of the current wave of CTE reforms. Analyses of more recent data sets will be important as complements to studies such as the present one. The National Longitudinal Study of Youth 1997 promises to be one valuable source of comparisons, and analyses of vocational programs using that data set have begun (e.g., Delci & Stern, 1999). Other studies of these data are part of the current work of the National Research Center for Career and Technical Education.

In the present study, all analyses are limited to students who attended public high schools, because very little CTE course-taking was reported within the private high schools of the NELS sample. This data trend and sample selection decision are consistent with other recent studies of CTE experiences in U.S. high schools using nationally representative data. Analyses of twelfth-grade academic achievement are further limited to students who remained in school for four years of high school (and, correspondingly, had four years of transcript data available). This screening decision was made due to the requirements of the variables used to indicate course-taking patterns, as will be described later in this article.

All analyses are weighted by the NCES-provided longitudinal panel weights for students participating in the transcript component of NELS. The use of these weights allows for projections to the population of American youth who were in the eighth grade in spring of 1988, subject to the caveats on sample screening provided in the preceding paragraph.

Models of 1992 cognitive achievement are presented for the following subject areas: reading comprehension, mathematics, science, and history/citizenship/geography. The test battery

A Question of Balance

was developed by the Educational Testing Service. For the 1992 data collection (the NELS second follow-up), multiple forms of the cognitive test battery were produced, each comprising a different combination of mathematics and reading difficulty levels. Each sample member's test form was determined by his or her scores on the base-year and/or first follow-up mathematics and reading tests. The analyzed scores are based on Item Response Theory. Additional details on the NELS cognitive tests, including the strategies employed to minimize ceiling and floor effects, are provided in Ingels et al. (1994) and Rock and Pollack (1995).

The models of cognitive achievement in each of the four subject areas utilize multiple ordinary least squares regression, which is appropriate given the continuous dependent variable and the fact that we must include numerous contextual variables as regressors in order to control for potentially confounding factors as we focus on the effects of CTE and academic course-taking. In the tables that summarize the results of these models, unstandardized regression coefficients will be presented. These unstandardized coefficients reflect the number of test score points (or the portion of a test score point) that is added to, or subtracted from, an individual's predicted achievement level if a given independent variable increases by one unit, holding constant all other independent variables in the model.

The models of dropping out—which involve a nominal, dichotomous dependent variable and multiple independent variables—utilize logistic regression. In the table that summarizes the results of these models, the estimated coefficients will reflect the additive effect of the independent variables on the log-odds $[\ln(p/1-p)]$ of an individual dropping out of high school. While this log-odds metric is necessary for the estimation of the models, it is admittedly a somewhat difficult metric to interpret. Therefore, the estimated parameters in the log-odds metric will be used primarily to identify which independent variables have

statistically significant associations with the likelihood of dropping out. More precise quantification and interpretation will be accomplished with reference to predicted probabilities, not predicted log-odds.

That is, the results in the log-odds metric will be used to highlight substantively important relationships. When we want to quantify and discuss the magnitude of these relationships more precisely, the appropriate mathematical transformations will be completed in order to translate predicted log-odds into predicted probabilities (p). A graph will be utilized to display the predicted probability of a hypothetical individual (e.g., a white male, who matches the sample means for eighth-grade test scores, grade point average, and SES, and who had a particular mix of CTE and academic course-taking during high school) dropping out of high school. To understand the origins of that graph, the reader should keep in mind that the predicted probabilities will be based upon the estimated logistic regression models.

Results

Distribution of Course-Taking

Before considering multivariate models of the two main outcomes to be studied, we should gain an understanding of the distribution of CTE and academic course-taking in the NELS sample. Table 1 is a cross-tabulation of whether or not an individual fulfilled a CTE concentration during high school and whether or not he or she fulfilled an academic concentration. The definitions used here for CTE (or, interchangeably, vocational) concentration and academic concentration follow those used in a recent pair of reports from the U.S. Department of Education (National Center for Education Statistics, 1999b, 1999c). Specifically, in Table 1 and throughout this study, a CTE concentration is defined as having earned at least 3 credits (Carnegie units) in a single Specific Labor Market Preparation

A Question of Balance

Table 1
*Cross-Tabulation of Academic Concentration and CTE Concentration, for Public High School Students with Four Years of Transcript Data (n=10,408)**

Academic Concentration	CTE Concentration		
	No	Yes	Total
No, did not complete	3985	1971	5956
4E+3SS+3S+3M	38.29	18.94	57.23
	66.91	33.09	100.00
	51.17	75.25	57.23
Yes, did complete	3804	648	4452
4E+3SS+3S+3M	36.54	6.23	42.77
	85.44	14.56	100.00
	48.83	24.75	42.77
Total	7789	2619	10408
	74.84	25.16	100.00
	74.84	25.16	100.00
	100.00	100.00	100.00

* Format of each cell within the cross-tabulation is:
 frequency (number of cases)
 percent of total
 percent within row
 percent within column

(SLMP) vocational area. Those readers familiar with the 1998 revision of the Secondary School Taxonomy may also know the SLMP vocational areas as the “2_C categories” (National Center for Education Statistics, 1999b, 1999c). These SLMP vocational areas are the following:

- a. agriculture and renewable resources,
- b. business,
- c. marketing and distribution,
- d. health care,
- e. public and protective services,
- f. trade and industry,
- g. technology and communications,
- h. personal and other services,
- i. food service and hospitality,
- j. child care and education, and
- k. unidentified subject (limited to course titles “Cooperative education 1,” “Vocational cooperative program,” “Cooperative training, diversified,” “Cooperative education 2,” and “Off-campus voc/tech training - unspecified”).

An academic concentration is defined as having fulfilled a somewhat lenient version of the ‘New Basics’—four Carnegie units of English and three Carnegie units each of mathematics, science, and social studies. (This is called a “somewhat lenient version” of the New Basics because descriptions of the New Basics sometimes include requirements for computer studies and foreign language, in addition to English, mathematics, science, and social studies). These definitions of CTE and academic concentrations have a basis in previous educational writing and research. The concept of the New Basics was first articulated in the influential report *A Nation at Risk* (National Commission on Excellence in Education, 1983). The New Basics have subsequently had a strong influence on high school

A Question of Balance

curricular policies and have been the subject of some research (e.g., Alexander & Pallas, 1984).

Note that Table 1 includes only public high school students and only those sample members for whom four years of transcript data were available. The thresholds defined for CTE and academic concentrations are levels that generally will be reached only cumulatively, over an entire high school career. Thus, neither dropouts nor sample members with incomplete transcript data are represented in Table 1. In fact, for the analyses of dropping out later in this article, we will need to introduce a different technique to represent the balance of CTE and academic course-taking.

Table 1 shows that, of 10,408 weighted cases, 38.29% had completed neither a CTE concentration nor an academic concentration during four years of high school. Supplemental analyses (not shown here) confirm that all of these individuals completed some courses in the core academic areas, and some of these individuals completed some CTE courses, but neither of the thresholds defining concentrations was met.

Just under 19% of the sample members ($n=1,971$) completed a CTE concentration but not an academic concentration. A larger group, 36.54% of the sample, fulfilled an academic concentration but not a CTE concentration. Finally, a relatively small group (6.23% of the sample) —but one that is very important to our analyses—fulfilled both CTE and academic concentrations. This distribution of cases across the four cells of Table 1 is generally consistent with patterns reported elsewhere—based on both NELS and other nationally representative samples—for U.S. high school students in the first half of the 1990s (Levesque et al., 2000; National Center for Education Statistics, 1999a).

Table 2 summarizes eighth-grade achievement levels, gender and racial composition, and socioeconomic status (SES) for students in each of the four categories established in Table 1. The variable measuring socioeconomic status is a composite of

Table 2
Mean 8th Grade Test Scores, Gender Composition, Racial Composition, and Socioeconomic Status, by Cross-Classification of CTE Concentration and Academic Concentration, for Public High School Students with Four Years of Transcript Data (n=10,408)

	CTE (no), Acad (no)	CTE (yes), Acad (no)	CTE (no), Acad (yes)	CTE (yes), Acad (yes)
8 th grade mathematics mean	34.3	31.7	41.5	37.9
8 th grade science mean	18.4	17.2	20.7	19.6
8 th grade reading mean	26.2	23.6	30.7	27.4
8 th grade history mean	29.2	28.0	31.4	30.0
Male (proportion)	0.48	0.58	0.46	0.55
Asian (proportion)	0.033	0.026	0.048	0.029
Hispanic (proportion)	0.116	0.111	0.075	0.076
Black (proportion)	0.120	0.123	0.112	0.116
Native American (proportion)	0.012	0.013	0.006	0.011
White or other (proportion)	0.719	0.728	0.760	0.768
SES (composite mean)	-0.080	-0.306	0.254	-0.056

A Question of Balance

parents' education, parents' occupational prestige, and family income. It is named "F2SES1" in the NELS database. Details on its construction can be found in "Appendix H" of Ingels et al. (1994). The four columns of Table 2 correspond to the four cells of Table 1. Across the four subject areas tested in eighth grade (mathematics, science, reading, and history), a consistent pattern is revealed. That is, those who would become purely academic concentrators in high school consistently scored the highest on the eighth-grade tests, followed by those who would be dual concentrators, followed by those who would concentrate in neither area. Finally, the purely CTE concentrators had the lowest average test scores in each subject area. These differences in pre-high school achievement levels alert us to the fact that prior achievement should be controlled statistically in our predictive models of high school achievement and persistence. Similarly, the four groups differ enough in terms of gender composition, racial composition, and socioeconomic status to require that we control for these variables in our multivariate models.

1992 Test Performance

We begin our examination of the multivariate models by considering 1992 test performance in four core academic subject areas. Tables 3 through 6 show estimated regression coefficients for models of 1992 achievement on standardized tests of mathematics, science, reading, and history, respectively. Each table summarizes four estimated models which add predictors successively, building to the final models (Model 3D in Table 3, Model 4D in Table 4, Model 5D in Table 5, Model 6D in Table 6). Each table's Model A includes just an intercept and a prior test score from eighth grade. Each Model B adds dummy variables indicating gender and race/ethnicity. Each Model C adds socioeconomic status as a predictor. Having entered these background controls, each of which has quite consistently proven to be correlated with academic achievement in the a-

mulative body of education research and in these models of Tables 3 through 6, we can focus on the effects of CTE and academic course-taking in each Model D.

Three dummy variables and an excluded reference category are used to indicate an individual's balance of CTE and academic course-taking. The first of these dummy variables included in the models is "CTE (no), Acad (no)," which takes the value "1" if an individual fulfilled neither concentration; it takes the value "0" otherwise. The second dummy variable is "CTE (yes), Acad (no)," which takes the value "1" for individuals who were purely CTE concentrators; it takes the value "0" otherwise. Finally, the third dummy variable is "CTE (yes), Acad (yes)," which equals "1" for dual concentrators and equals "0" otherwise. The excluded reference category represents purely academic concentrators.

For each of the four subject areas (in each of Tables 3 through 6), the block of three dummy variables improves the fit or explanatory power of the model, as measured by improvements in adjusted R^2 statistics. Over and above the background control measures introduced in the earlier models, the course-taking indicators of each Model D have significant associations with student achievement. While these models are not growth models, *per se*, they are models of 1992 achievement that control for 1988 achievement. Thus, we can interpret the coefficients as estimated differences in 1992 achievement for two hypothetical individuals who shared the same pre-high-school achievement levels, gender, race, and SES, but who differed in their high school course-taking trajectories.

For each of four subject areas, the rank ordering of the four course-taking categories—in terms of estimated effects on achievement—is the same. Specifically, the purely academic concentrators are estimated to show the highest achievement. Significantly behind this group, but ranked second, are the dual concentrators. Ranked third is the group that fulfilled neither concentration. The lowest-ranked group, in terms of estimated

A Question of Balance

Table 3
OLS Regression Models of 1992 Mathematics Achievement
 (n=8,570)

	Model			
	3A	3B	3C	3D
Intercept	13.31***	14.07***	15.18***	19.52***
8th grade math test	0.96***	0.94***	0.91***	0.86***
Male		0.86***	0.78***	1.14***
Asian		2.05***	2.00***	1.71***
Hispanic		-1.10***	-0.31	-0.56
Black		-2.74***	-2.26***	-2.75***
Native American		-2.74**	-2.31**	-2.23**
SES			1.56***	1.01***
CTE (no), Acad (no)				-3.77***
CTE (yes), Acad (no)				-5.71***
CTE (yes), Acad (yes)				-0.91**
Adjusted R ²	0.671	0.677	0.683	0.706

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 4
OLS Regression Models of 1992 Science Achievement
 (n=8,511)

	Model			
	4A	4B	4C	4D
Intercept	6.25***	7.38***	8.11***	9.80***
8th grade science test	0.90***	0.84***	0.80***	0.76***
Male		1.13***	1.12***	1.28***
Asian		0.03	-0.04	-0.19
Hispanic		-1.40***	-0.80***	-0.89***
Black		-2.74***	-2.34***	-2.52***
Native American		-1.98***	-1.61***	-1.57***
SES			1.10***	0.87***
CTE (no), Acad (no)				-1.44***
CTE (yes), Acad (no)				-1.99***
CTE (yes), Acad (yes)				-0.60**
Adjusted R^2	0.494	0.524	0.539	0.554

* $p < .05$ ** $p < .01$ *** $p < .001$

A Question of Balance

achievement, is the group of purely CTE concentrators.

To illustrate the case of mathematics, parameter estimates in the final column of Table 3 reveal that dual concentrators are estimated to score 0.91 points behind the purely academic concentrators. Those who fulfilled neither concentration are estimated to score 3.77 points behind the purely academic concentrators (and 2.86 points behind the dual concentrators, which is not shown in the table but can be computed directly from the tabulated coefficients). The purely CTE concentrators are estimated to score 5.71 points behind the academic concentrators, 4.80 points behind the dual concentrators, and 1.94 points behind those who fulfilled neither concentration. To reiterate, these effects of course-taking patterns are estimated after controlling for 1988 test performance and the other variables in the models.

The asterisks indicating significance levels show that each of the three course-taking statuses represented by the included dummy variables ranks significantly behind the academic concentrators. Results of additional *t*-tests (not shown) confirm that every pair of statuses is significantly differentiated in these models for each of the subject areas. In reporting these significance levels, it is important to compare the findings with results reported in the recent report by Levesque and her colleagues (2000). Those analysts presented descriptive tables that compared mean growth in mathematics and reading between 1988 and 1992 for various subgroups derived from this same NELS data set. They used a course-taking categorization of (a) college preparatory only, (b) vocational concentration only, (c) both vocational concentration and college preparatory, and (d) other/general that very nearly corresponds to the categorization used in this article's models. For gains between 1988 and 1992, they found the same rank ordering among the course-taking categories that is being reported here. However, their comparisons of subgroup means showed that the differences between the college preparatory group and the dual concentrators were statisti-

cally insignificant, or indistinguishable.

It appears that the discrepancy in significance levels between the two analyses has to do with the difference between estimating multiple regression models and comparing subgroup means in descriptive tables. With a sample as large as we have available in the present analyses, even fairly small regression coefficients can prove to be statistically significant. In addition to assessing statistical significance, then, one should consider substantive significance.

Appendix Table A1 shows descriptive statistics for the variables and samples of Tables 3 through 6. From this appendix table, we can see that 1992 mathematics achievement for this sample had a mean of 48.953 and a standard deviation of 13.688. In light of these facts, what should we make of the estimated difference between the academic concentrators and the dual concentrators of 0.91 test score points? Well, at some level the difference simply is what it is; 0.91 divided by 13.688 is about 0.07, which would generally be deemed a fairly modest effect. For each of the other subject areas, this version of an effect size is of a similar magnitude. It seems sensible to conclude that the dual concentrators definitely lagged behind the purely academic concentrators in achievement growth, but not by especially large margins.

What might explain this advantage for the academic concentrators, and the differences among the four course-taking trajectories more generally? A small part of the explanation may be revealed by Table 7. This table shows mean Carnegie credits earned in various curricular areas during the high school career for students from each of the four course-taking categories. In this table, higher mathematics includes geometry, Algebra 2 through pre-calculus, and courses classified as advanced mathematics (calculus, AP/IB courses, and a few other courses including SAT review, actuarial sciences, and matrix algebra)—courses classified as “higher mathematics” are those listed in the 1998 revision of the Secondary School Taxonomy

A Question of Balance

Table 5
OLS Regression Models of 1992 Reading Achievement
 (n=8,569)

	Model			
	5A	5B	5C	5D
Intercept	10.67***	12.23***	12.99***	15.04***
8th grade reading test	0.83***	0.80***	0.77***	0.73***
Male		-0.67***	-0.79***	-0.67***
Asian		1.14**	1.05**	0.84*
Hispanic		-1.02***	-0.43	-0.57*
Black		-2.80***	-2.40***	-2.61***
Native American		-2.47**	-2.14**	-2.10**
SES			1.12***	0.82***
CTE (no), Acad (no)				-1.61***
CTE (yes), Acad (no)				-2.99***
CTE (yes), Acad (yes)				-0.62*
Adjusted R ²	0.514	0.524	0.530	0.540

p<.05 ** *p*<.01 *** *p*<.001

Table 6
OLS Regression Models of 1992 History Achievement
 (n=8,452)

	Model			
	6A	6B	6C	6D
Intercept	11.20***	12.24***	13.35***	15.10***
8th grade history test	0.80***	0.77***	0.73***	0.69***
Male		0.25**	0.25**	0.40***
Asian		0.31	0.25	0.12
Hispanic		-0.92***	-0.42**	-0.50***
Black		-1.75***	-1.39***	-1.49***
Native American		-1.52***	-1.26**	-1.25**
SES			0.89***	0.70***
CTE (no), Acad (no)				-1.08***
CTE (yes), Acad (no)				-1.82***
CTE (yes), Acad (yes)				-0.65***
Adjusted R^2	0.465	0.478	0.492	0.507

* $p < .05$ ** $p < .01$ *** $p < .001$

A Question of Balance

under 1_15, 1_16, and 1_17 (National Center for Education Statistics, 1999c). Higher science includes regular, advanced, honors, and specialized courses in biological sciences; regular, advanced, honors, and specialized courses in chemistry; and regular, advanced, honors, and specialized courses in physics—courses classified as “higher science” are those listed in the 1998 revision of the Secondary School Taxonomy under 1_22B, 1_22C, 1_22D, 1_23B, 1_23C, 1_23D, 1_24B, 1_24C, and 1_24D (National Center for Education Statistics, 1999c).

From Table 7, one can see that the purely academic concentrators and the dual concentrators were fairly similar in the amount of total mathematics, total science, English, and social studies they completed during their high school years, on average. For each of these subject groupings, the means for the academic concentrators and dual concentrators are within 0.2 Carnegie units of one another. In higher mathematics and higher science, however, the academic concentrators distanced themselves from the dual concentrators slightly more. In higher mathematics, for example, the academic concentrators completed 2.5 Carnegie units, on average, during their high school careers while the dual concentrators completed only 2.1 credits. This difference of just under a semester’s worth of higher mathematics course-taking may begin to explain the differential achievement effects estimated in Table 3.

As we examine Table 7, we should understand a likely reason for the discrepancy in higher mathematics and higher science credits: The dual concentrators were (partly, by definition) completing much more CTE course-taking during their high school careers than were the academic concentrators. The dual concentrators completed 6.5 units of career and technical education while the academic concentrators completed only 2.4 units of CTE. Given the finite amount of time in a student’s course schedule each semester, the relatively high levels of CTE course-taking among dual concentrators would have necessarily cut into some other potential course-taking. Appar-

ently, for many of these dual concentrators, advanced topics in mathematics and science are a part of what received diminished priority.

Table 7
Mean Course Credits in Various Areas During High School Career, by Cross-Classification of CTE Concentration and Academic Concentration, for Public High School Students with Four Years of Transcript Data (n=10,408)

	CTE (no), Acad (no)	CTE (yes), Acad (no)	CTE (no), Acad (yes)	CTE (yes), Acad (yes)
All mathematics	2.9	2.6	3.8	3.7
Higher mathematics	1.2	0.7	2.5	2.1
All science	2.4	2.1	3.7	3.6
Higher science	1.4	1.0	2.6	2.2
English	4.0	4.0	4.4	4.4
Social Studies	3.4	3.1	3.8	3.6
CTE	3.4	7.0	2.4	6.5

To summarize the analyses of 1992 test performance in the four core academic subjects, there is a small but statistically significant effect of choosing to pursue two concentrations in high school. Even if there are some motivational benefits associated with a dual concentration for some students, the zero-sum nature of time in a student's course-taking schedule may partially explain the fact that purely academic concentrators ex-

A Question of Balance

hibited higher 1992 achievement levels—controlling for 1988 achievement—than did dual concentrators. Additionally, there may be other important differences in the nature and quality of instruction for the two groups that have not been explicitly modeled in these analyses as well as other unmeasured differences between these students. Any such differences merit future research attention.

Dropping Out of High School

Table 8 summarizes logistic regression models of the log-odds of dropping out of high school prior to graduation (at any point between March, 1989, and the spring of 1992). Appendix Table A2 shows descriptive statistics for the variables and cases of Table 8. That appendix table shows that, overall, 12.28% of this public school sample dropped out of high school at some point. (Some of these dropouts later returned to pursue high school completion; this dependent variable literally measures whether the individual “ever dropped out” between 1989 and 1992.)

Similar to what was presented for 1992 test scores, a series of models is built successively across the columns of Table 8, culminating in the final Model 8F. The preliminary models introduce an intercept, dummy variables for gender and race/ethnicity, a measure of SES, an eighth-grade test score composite measure, and high school grade point average. Grade point average is calculated from transcript data and, in the case of dropouts, is calculated based on grades earned during the time the individual was enrolled in high school.

Two variables—different from the dummy variables used in Tables 3 through 6—capture an aspect of the balance between CTE and academic course-taking for the models of Table 8. In Model 8E, the ratio of CTE credits earned to academic credits earned is entered as a predictor. In constructing this CTE/academic ratio variable, CTE courses include all courses listed under 2_A, 2_B, and 2_C in the 1998 revision of the

Table 8
 Maximum Likelihood Estimates of Effects on Log-Odds of Dropping Out of High School (n=11,352)

	Model					
	8A	8B	8C	8D	8E	8F
Intercept	-1.97***	-1.99***	-2.11***	1.98***	3.19***	3.62***
Male		-0.13*	-0.09	-0.57***	-0.57***	-0.58***
Asian		-0.43*	-0.46*	-0.08	-0.19	-0.20
Hispanic		0.49***	-0.09	-0.31**	-0.46***	-0.45***
Black		0.22**	-0.23*	-0.85***	-1.05***	-1.06***
Native American		0.88***	0.44	-0.07	-0.28	-0.30

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 8 (continued)
 Maximum Likelihood Estimates of Effects on Log-Odds of Dropping Out of High School (n=11,352)

	Model					
	8A	8B	8C	8D	8E	8F
SES			-0.93***	-0.59***	-0.69***	-0.70***
8 th grade tests				-0.02***	-0.03***	-0.03***
High school GPA				-1.83***	-1.91***	-1.89***
CTE/Acad ratio					-2.06***	-4.57***
(CTE/Acad ratio) ²						2.97***

* p<.05 ** p<.01 *** p<.001

Table 8 (continued)
Maximum Likelihood Estimates of Effects on Log-Odds of Dropping Out of High School (n=11,352)

	Model					
	8A	8B	8C	8D	8E	8F
-2 log-likelihood	8415.47	8354.79	7862.48	6434.93	6243.92	6203.90
Improvement in Chi-Square		60.67	552.99	1980.54	2171.55	2211.57
Degrees of freedom		5	6	8	9	10
Percent concordant		44.4	68.1	84.4	85.1	85.2
c statistic		.569	.685	.846	.852	.854

* $p < .05$ ** $p < .01$ *** $p < .001$

A Question of Balance

Secondary School Taxonomy. Academic courses include all mathematics, science, English, and social studies (including history) courses; these are all courses listed under 1_1, 1_2, 1_3, and 1_4 in the 1998 revision of the Secondary School Taxonomy (National Center for Education Statistics, 1999c). For this particular analysis, this predictor is preferable to a series of dummy variables such as those used in Tables 3 through 6 because of censoring issues. As was stated earlier, the thresholds defined for CTE and academic concentrations in the models of academic achievement are levels that generally could be reached only cumulatively, over an entire high school career. For dropouts, the high school career is by definition truncated before graduation. Thus, we would expect few or no dropouts to have exceeded the New Basics threshold or—most likely—the CTE concentration threshold. The use of the CTE/academic ratio is intended as a solution to the censoring problem. Regardless of how many high school semesters a student completed—perhaps 2 or 4 or 5 for an eventual dropout, generally 8 for an on-pace graduate—the ratio of CTE credits to academic credits can be calculated.

The research question of interest is this: Is there a significant relationship between this CTE/academic ratio and an individual's likelihood of dropping out? Figure 1 shows the distribution of CTE/academic ratio levels for this sample. The histogram illustrates that just under 19% of the sample had ratios between 0 and 0.1. Another 21.36% had ratios between 0.1 and 0.2. Cumulatively, 81.61% had ratios somewhere below 0.5, which is the point at which an individual is taking one CTE course for every two academic courses.

Figure 1 is presented partly to illustrate the small but noteworthy number of cases in the right-hand tail of the distribution. Approximately 1.6% of the cases have ratios between 1.2 and 6.0. A more detailed examination of the distribution suggested that, substantively and empirically, a distinct breakpoint exists in the data somewhere around 1.2. Cases with ratios

above this level are truly special cases. These are probably either individuals in very specialized vocational academies or individuals with transcript data of questionable accuracy. In either case, their extreme values on this important explanatory variable give these cases the potential to have undue influence on model estimation. It is probably best to eliminate them from the analyses.

Accordingly, the analyses of Table 8 are limited to cases with CTE/academic ratios between 0 and 1.2. Interpretations of the model estimations should not be extended to cases with values above 1.2. Even at levels between 0.8 and 1.2, we should make inferences with some caution due to the sparseness of the data in this range.

There are interesting and important findings regarding gender, race, and SES in the models that precede Model 8E. Some of these findings are best understood by reading across the models of Table 8. Most notable, perhaps, is the way black and Hispanic students are shown to be significantly more likely to drop out than white students in Model 8B, but then significantly less likely to drop out than white students in later models. The change in direction of association appears and becomes more pronounced as SES, prior achievement, and high school GPA are introduced in succession. A likely explanation, or interpretation, of the changes across successive models is that the high dropout rates observed for black and Hispanic students in the sample—before controlling for various background characteristics—are driven by the relatively low levels of SES and scholastic achievement that characterize these groups on average. Their low levels of SES and achievement place them at relatively high risk for dropping out. If we compare black, Hispanic, and white students at common (shared) levels of SES and scholastic achievement, however, the black and Hispanic students are at lower risk than their white counterparts for dropping out. On one hand, this interpretation highlights a distressing situation for black and Hispanic students, as their lesser so-

A Question of Balance

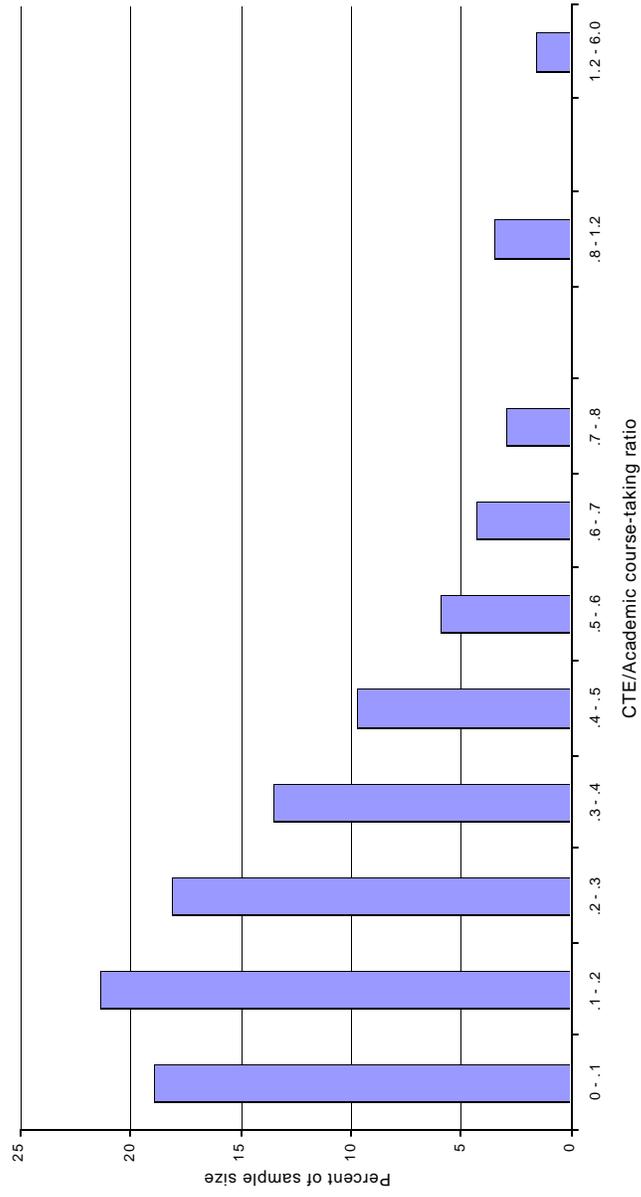


Figure 1. Distribution of CTE/Academic course-taking ratio, for public high school students including dropouts (n=12,303)

socioeconomic resources and educational disadvantages have serious consequences for their life-course trajectories. On the other hand, this interpretation also could prompt one to ask about positive messages or influences regarding persistence in school being received by black and Hispanic students of a given socioeconomic status and achievement level—relative to white students of the same SES and achievement level. These interesting and important findings are not given further attention here, in the interest of article length and focus, but they certainly merit future investigation.

Let us return more directly to the estimated models of Table 8. By entering the CTE/academic ratio as a first-order effect in Model 8E, we are testing whether there is a linear relationship (whether positive or negative in sign) between the CTE/academic ratio and the log-odds of dropping out. And, in fact, a negative and significant relationship is estimated (See coefficient of -2.06.). Model 8E does offer a significant improvement in fit over each of Models 8A through 8D. The substantive implication of Model 8E is that, if we constrain the relationship between the CTE/academic course-taking ratio and the log-odds of dropping out to be linear, a greater representation of CTE courses in an individual's high school experience reduces the likelihood of dropping out. This finding is tentative support for the idea that a coupling of career-related courses with an academic load may increase a student's commitment or attachment to high school.

Before we go too far with this interpretation, however, we should consider Model 8F. In this model a squared term is added as a predictor. This polynomial functional form allows us to investigate whether a significant curvilinear relationship exists between the CTE/academic ratio and dropping out. With this functional form, we can ask: Is too much CTE too much of a good thing? Is there a point of inflection, after which the risk of dropping out begins to rise?

Model 8F suggests that indeed there is a significant curvi-

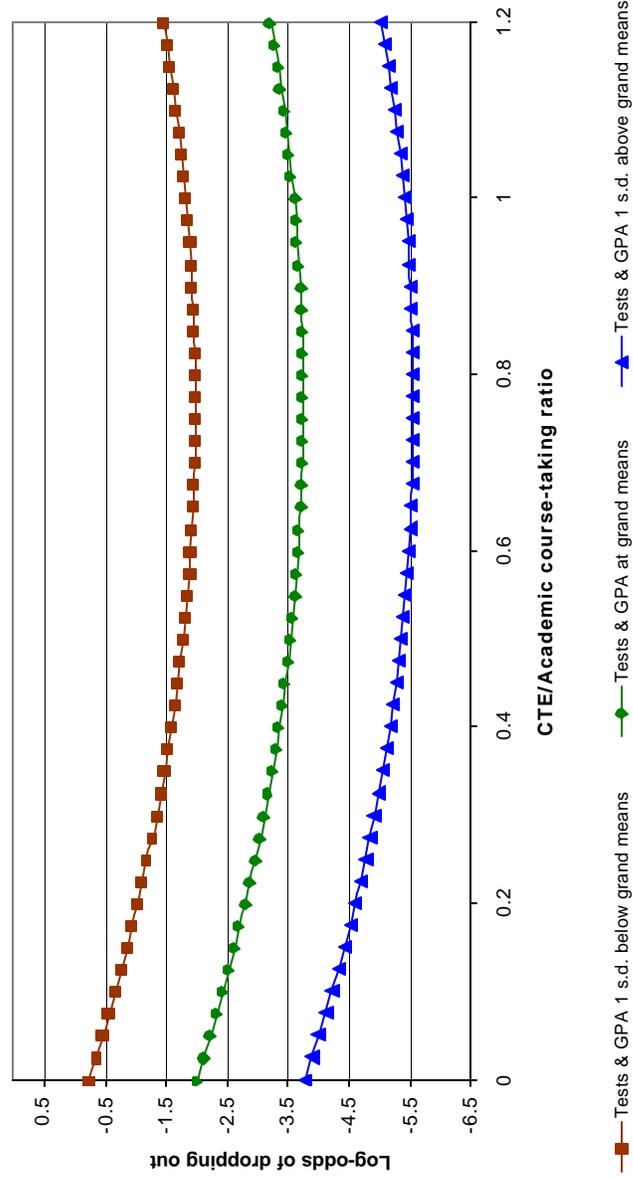
A Question of Balance

linear relationship between the probability of dropping out and the ratio of CTE credits to academic credits. Specifically, controlling for prior achievement, grades, and student background characteristics, a student's probability of dropping out appears to be lowest when approximately 3 Carnegie units of CTE are completed for every 4 Carnegie units of academic subjects. That is, the point of inflection for this polynomial function comes when the CTE/academic ratio is about 0.77. This is the point at which the risk of dropping out is estimated to be at its lowest.

To help us visualize the nature and magnitude of this effect, Figure 2 depicts predicted log-odds of dropping out for three hypothetical sets of students, as the CTE/academic ratio ranges from 0 to 1.2. All three curves in the figure are plotted using the estimated coefficients of Model 8F, and for white males of average SES. Distinguishing the curves beyond those commonalities, however, are the facts that the top curve plots estimates for individuals whose eighth-grade test scores and high school grade point average were both one standard deviation below the sample's grand means. The middle curve plots estimates for individuals who were at the sample means for test scores and grade point average. The lowest curve represents individuals whose tests and grade point average were one standard deviation above the grand means.

The fact that the individuals with above-average tests and grade point averages have the lowest log-odds of dropping out (the most negative log-odds) reflects the fact that higher test scores and grades provide a buffer against the risk of dropping out. The shapes of the three curves in Figure 2 are the same. What differs are their orientations along the vertical axis. These differences are driven by their differing test scores and grades. Movement up or down the CTE/academic ratio scale affects all three hypothetical populations equally in terms of log-odds.

In terms of estimated probabilities of dropping out, however, a more complex and intriguing pattern exists. Figure 3



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Figure 2. Predicted log-odds of dropping out, as "CTE/Academic course-taking ratio" varies, for a white male of average family SES

A Question of Balance

presents predicted probabilities of dropping out, for the same hypothetical populations as were depicted in Figure 2 and across the same range of CTE/academic ratios. Again, the plotted curves of Figure 3 are derived from the parameter estimates of Model 8F, with appropriate mathematical transformations completed to express outcomes in terms of probabilities rather than log-odds.

Figure 3 reflects the fact that a fixed change in the CTE/academic ratio has a greater effect on the probability of dropping out when we are considering a set of individuals whose other risk factors place their overall probability of dropping out near the middle of its possible range (approaching 0.5) rather than near 0 or 1 (Agresti, 1990, p. 84). This fact is inherent in the properties of logistic regression and does not represent an interaction term, *per se*, as some might be tempted to claim. For example, we are not witnessing an interaction between the CTE/academic ratio and grade point average as these variables affect the log-odds of dropping out. Rather, we are witnessing the fact that a unit change in the log-odds of dropping out implies a greater change in the probability of dropping out when the probability of dropping out is near the middle of its possible range rather than being near 0 or 1.

Let us not get lost in these methodological details, however, but instead let us focus on the substantive implications of Model 8F, and Figures 2 and 3. Substantively, the estimated model implies that there is a healthy middle-range mix of CTE and academic course-taking that may maximize students' attachment and perseverance in high school. The implications of this curvilinear trend are most salient for students who are already at relatively high risk of dropping out (due to low prior test scores or low grades, for example). For these students, especially, it may be that a high school experience that is purely academic presents them with courses that do not seem highly relevant to their goals or worldviews. Further it is possible (but not investigated in the present analyses) that a high school ex-

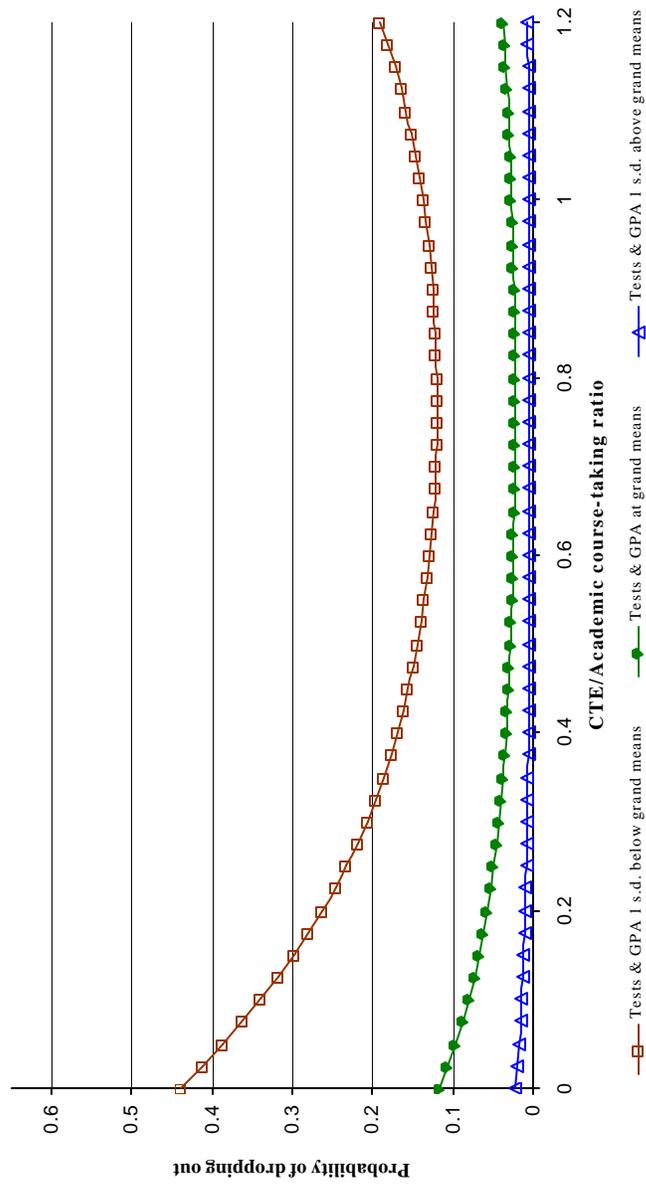


Figure 3. Predicted probability of dropping out, as "CTE/Academic course-taking ratio" varies, for a white male of average family SES.

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A Question of Balance

perience that is purely academic but aimed at students whose achievement levels place them at low or middle-range levels may be characterized by unengaging, watered-down versions of more challenging and inspiring courses offered to higher achieving students.

If the preceding paragraph offers possible explanations for the left-hand part of the curvilinear function (for CTE/academic ratios between 0 and 0.77), how might we explain the estimated effects for the right-hand part of the function (as CTE/academic ratios grow beyond 0.77)? As we approach this other end of the CTE/academic ratio distribution, it appears that a high school experience that tips too far toward career and technical education, to the exclusion of a solid academic grounding, also increases the risk of dropping out. We can speculate that this finding might be due to educational experiences that are relegating students to the periphery of the high school's culture and mission. Further investigations are warranted to discover more about why a certain middle-range mix of CTE and academic course-taking may minimize the frequency of students dropping out.

As a final point on the analyses of dropping out, readers might be curious about whether the relationship between the CTE/academic ratio and the likelihood of leaving school varies for different racial or ethnic groups. Relatedly, some might wonder what Figures 2 and 3 would look like if plotted for, say, Hispanic or black students instead of white students. Several things can be said about these topics.

First, as Model 8F is specified, there are no interaction terms between the race/ethnicity indicators and the first-order or squared terms representing the CTE/academic ratio. Therefore, based on this model, a plotting of Figure 2 for black or Hispanic students instead of white students would simply show the three plotted curves shifted further down the figure's vertical axis (refer back to Table 8 and the explanation on gender and race for Table 8 above to review the fact that black and

Hispanic students are estimated to have a lower likelihood of dropping out than white students once SES and academic achievement are statistically controlled). The shape of the curves—and the distance between curves defined by varying grades and prior test scores—would remain as they appear in the current Figure 2. Based on Model 8F, a plotting of the probability of dropping out—that is, the translation to a plotting of Figure 3—for black or Hispanic students would still show a point of inflection at 0.77, and functions that were more dramatically curved for students with low grades and prior test scores than for students with high grades and prior test scores. So, in summary, based on the current Model 8F, the estimated relationship between the CTE/academic ratio and the likelihood of dropping out holds uniformly for all racial or ethnic groups (and, by the same logic, for groups defined by gender or SES).

Would our statistical models fit the data better—and tell a more accurate story—if they included interaction terms between the race/ethnicity indicators and the first-order or squared terms representing the CTE/academic ratio? To address this question, several alternate model specifications were tried (but are not shown in Table 8). When interaction terms between race/ethnicity and the first-order CTE/academic ratio effect were added to Model 8E, these interaction terms were not statistically significant; the expanded model did not offer a significant improvement in fit over Model 8E.

When interaction terms between the race/ethnicity indicators and both first-order and squared CTE/academic ratio variables were added to Model 8F, there was a slight improvement in goodness-of-fit. There was some suggestion that the relationship between the CTE/academic ratio and the likelihood of leaving school was somewhat different for blacks and Hispanics, as compared to whites. Specifically, the estimated coefficients suggested that the point of inflection (the mix of CTE and academic course-taking that minimized the likelihood of dropping out) was located at lower point on the CTE/academic

A Question of Balance

ratio scale for blacks and Hispanics, as compared to whites. The estimated coefficients also suggested that the functions (as plotted in Figures 2 and 3) were more dramatically concave for blacks and Hispanics than for whites. However, it seems unwise to give these interaction terms much credence due to sparseness of data at the upper extremes of the CTE/academic ratio scale. Specifically, once we disaggregate by race/ethnicity, problems of sparse data at the upper extremes of this scale become amplified.

Examining unweighted cases within the data set, only 52 of 1,065 black students had CTE/academic ratios above 07. The comparable numbers were 66 of 1,368 for Hispanic students, 11 of 722 for Asian students, 6 of 113 for Native American students, and 583 of 8,084 for white students. These small numbers of cases at the high end of the CTE/academic ratio scale make it very problematic to estimate separate polynomial functions for each racial or ethnic group. Each case at the high end of the scale is potentially a very influential outlier, and the resultant estimates of polynomial functions are very unstable or suspect in the sense that different outcomes for just a few students would have dramatically changed the estimated functions. This is a case where there is probably safety in numbers: When we draw upon the strength of all racial and ethnic groups combined, to estimate a single polynomial function as in Model 8F, we can probably have a fair amount of confidence in the estimate. Based on this data set and its distribution of cases it seems unwise to trust polynomial functions estimated separately for each racial or ethnic group. Investigation of differing curves for various racial or ethnic groups should wait for a different, purposively selected, sample.

Conclusions

This study has examined the balance struck between CTE and academic course-taking during the high school years for

members of a nationally representative sample of individuals who were eighth graders in the United States in 1988. Further, the study has examined the relationship of this CTE/academic balance with (a) test scores and (b) the likelihood of dropping out. The balance between CTE and academic course-taking appears to have some influence on both outcomes.

This study found that dual and academic concentrators differed only slightly on standardized tests of mathematics, science, reading, or history. The small, but statistically significant, advantage enjoyed by purely academic concentrators may be partly attributable to the additional coursework in advanced subjects. These analyses suggest that a middle-range integration of CTE and academic scheduling has significant potential to reduce the likelihood of dropping out. Specifically, a ratio of approximately three CTE credits to every four academic credits was associated with the lowest likelihood of dropping out. Figure 3 showed that this finding is especially salient for individuals who are otherwise at risk of dropping out—due to low prior grades, or low prior test scores, or other risk factors.

If a middle-range mix of CTE and academic course-taking can lower the risk of dropping out for some students, educators and policymakers might be wise to encourage such a mix, even if it brings slight reductions in standardized test scores in core academic subjects. Given the importance of a high school diploma in our society, slight reductions in test scores might be found acceptable in exchange for higher graduation rates.

This article raises several issues deserving of further investigation. For example, even if these analyses have convinced us of the benefits of a middle-range mix of CTE and academic course-taking for some students, many unanswered questions remain about the best ways to integrate CTE and academic offerings. The current National Assessment of Vocational Education (NAVE) is attempting, among its other goals, to assemble case studies and qualitative accounts based on effective programs that integrate academic and vocational education. Impor-

A Question of Balance

tant questions include the following: Within integrated programs, are students' academic and motivational outcomes affected by the extent to which their teachers of CTE and academic courses prepare lessons and teach in close collaboration with one another? What are some of the most effective ways for teachers of academic subjects to illustrate linkages between their subjects and career applications? How can CTE teachers forge explicit connections to the academic subjects in their instruction? What sorts of professional development or specialized training do teachers need to support their attempts at integrating academic and vocational education?

It will also be important to attempt to replicate—and build upon—the findings we have generated from the NELS data with more recent data. The NELS subjects attended high school just as the 1990 Perkins Act was beginning to affect the organization of secondary education. Would cross-tabulations of CTE and academic course-taking from the late 1990s or the first years of the 21st Century look similar to those from the early 1990s? Would associations between the CTE/academic balance and (a) test scores or (b) the likelihood of dropping out remain stable? Or have changes occurred? If changes have occurred, can these be traced to influences of the 1998 Perkins Act, with its further encouragement of academic and vocational integration?

Finally, if we accept this article's suggestions about the curvilinear relationship between the CTE/academic balance and the likelihood of dropping out, many questions arise about why course sequences that are too heavy in either academics or CTE are associated with relatively high rates of school-leaving. Are students at the two extremes of the continuum experiencing pushes away from high school or pulls toward non-high school endeavors (Gambetta, 1987)? Is it true that, for students who are already at relatively high risk of dropping out, a high school experience that is purely academic offers courses that do not seem highly relevant to their goals or worldviews? Is it the case

Plank

that a high school experience that is purely academic but aimed at students with low or middle-range achievement is often characterized by unengaging, diluted versions of more challenging and inspiring courses offered to higher achieving students?

At the other extreme, what characteristics of a high school experience that focuses too exclusively on career and technical education seem to increase the risk of dropping out? Is such a CTE-intensive experience convincing students that they should join the world of full-time paid employment as soon as possible, even if this entails leaving high school prior to graduation? Are a substantial number of students who concentrate heavily in CTE already somewhat disengaged from formal education before the high school years? Do they seek CTE courses in an effort to find their niche within larger high schools, but find that even this niche does not bring the rewards they are seeking? Or is a student's "seeking" not even the relevant part of the phenomenon to explore? Rather, should we focus our attention on the ways that adults and guidance systems within high schools sort and place students, separate from the students' preferences and decisions?

The preceding paragraphs have posed many questions. Most of these are not questions addressed by the present study, but rather are prompted by the study's findings. It would be premature to make strong policy recommendations based on the findings of this research. But, clearly, with the current NAVE, the work of the National Research Center for Career and Technical Education, and many state and local initiatives, we are in the midst of ongoing debate and investigation into the ways that CTE and academic education can best be integrated. It is hoped that this study has offered some new information to this debate, and that future research will provide answers to many of the remaining questions.

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Appendix

Table A1
*Percentages, Means, and Standard Deviations for the Variables
 Used in Models of 1992 Achievement (Tables 3 through 6)**

	%	Mean	S.D.
8 th grade (1988) math achievement		36.969	11.633
1992 math achievement		48.953	13.688
8 th grade (1988) science achievement		19.256	4.695
1992 science achievement		23.667	6.041
8 th grade (1988) reading achievement		27.703	8.480
1992 reading achievement		33.528	9.763
8 th grade (1988) history achievement		29.967	4.441
1992 history achievement		35.065	5.187
SES		0.004	0.749

* All variable summaries are based on the sample of Table 3 ($n=8,570$) except for science scores ($n=8,511$, as in Table 4), reading scores ($n=8,569$, as in Table 5), and history scores ($n=8,452$, as in Table 6).

A Question of Balance

Table A1 (continued)
*Percentages, Means, and Standard Deviations for the Variables
Used in Models of 1992 Achievement (Tables 3 through 6)**

	%	Mean	S.D.
Male	49.50		
Female	50.50		
White or other	74.33		
Asian	3.57		
Hispanic	9.54		
Black	11.65		
Native American	0.91		
CTE (no), Acad (no)	37.81		
CTE (yes), Acad (no)	17.85		
CTE (no), Acad (yes)	37.90		
CTE (yes), Acad (yes)	6.44		

* All variable summaries are based on the sample of Table 3 ($n=8,570$) except for science scores ($n=8,511$, as in Table 4), reading scores ($n=8,569$, as in Table 5), and history scores ($n=8,452$, as in Table 6).

Table A2
*Percentages, Means, and Standard Deviations for the Variables
 Used in Models of Dropping Out (Table 8) (n=11,352)*

	%	Mean	S.D.
Ever dropped out	12.28		
Never dropped out	87.72		
Male	49.18		
Female	50.82		
White or other	72.48		
Asian	3.48		
Hispanic	10.24		
Black	12.65		
Native American	1.15		
SES		-0.058	0.755
8 th grade test composite		50.799	9.797
High school g.p.a.		1.910	0.789
CTE/Acad ratio		0.297	0.222
(CTE/Acad ratio) ²		0.138	0.198

A Question of Balance

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The Relation of High School Career- and Work-Oriented Education to Postsecondary Employment and College Performance: A Six-Year Longitudinal Study of Public High School Graduates

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Abstract

The employment and college enrollment history of high school graduates (N = 4,476) of a large, suburban school district was examined, with particular interest in how the postsecondary employment and school of graduates who had completed a career- and work-oriented secondary educational program (N = 399) compared with that of other graduates (N=4,476). Overall, program participants fared better on many employment outcomes than non-program participants, and as well as non-program participants on college performance. They worked more quarters and had more continuous employment than non-program participants. Program participants also earned more over the 6-year follow-up and each year from 1994 through 1998. They were also less likely to be employed in areas traditionally considered short-term or temporary in their first jobs than were non-program graduates, and more were employed in trades than were non-program participants. Finally, program participants performed nearly the same on college outcomes as did non-program participants. Results call for adjusting thinking about the benefits of career- and work-oriented secondary education for all students, whether their postsecondary plans are to enroll in college or to enter employment.

Griffith & Wade

Lack of Work Skills Preparation in the Midst of a Changing Workforce

Recently, there have been increased national, regional, and local concerns about the perceived inadequacy of preparing youth for the workplace. News media have speculated that American youth are not qualified to meet the demands of the increasingly competitive workplace and, in fact, lack basic job entry-level skills (Harwood, 1997; Swoboda, 1991). Employers, in particular, have criticized public education for not providing a skilled and educated workforce (Weisman, 1991). This criticism gains validity when considering the increasing number of high school graduates who lack entry-level job skills and who need remedial education in the basic skills of reading, writing, and math before taking postsecondary college courses and employment (Beyers, 1995; Commission on the Skills of the American Workforce, 1990).

Labor market data on American's youth have been viewed by some as indicating the inadequate preparation of high school graduates for entry-level jobs and decisions about career fields and occupations (Harwood, 1997; Pham, 1992; Swoboda, 1991; Weisman, 1991). Young adults between the ages of 18 and 25 years have changed occupations, employers, or jobs on the average of six times (Stern, Finkelstein, Stone, Latting, & Dornisife, 1995, p. 5; U.S. Department of Labor, 1993). Young adults, 18 to 19 years old, also have among the highest rates of unemployment (Stern et al., 1995). One explanation of these statistics, among others, is that a lack of preparation by the public educational system has resulted in graduates "floundering" after high school, i.e., going from job to job, school to work, or work to school, with little sense of purpose and career direction (Hamilton, 1990; Osterman & Iannozzi, 1993).

Further contributing to this view are the demands for America's high school graduates to attend 4-year colleges and universities irrespective of labor market trends and the career and vocational interests of graduates. A large majority of the par-

High School Career & Work Oriented Education

ents of today's high school seniors believe that their children should enroll in colleges and earn college degrees. Indeed, a recent survey of parents of high school students in the school district in which the present study was conducted showed that 91% of the parents expected their children to receive at least a 4-year college degree (Montgomery County, 2000). Nationally, about two-thirds of high school seniors planned to attend 4-year colleges immediately after high school (Bureau of Labor Statistics, 2000). While these percentages have fluctuated, they have remained high and have generally increased over the past years despite emerging technologies in the workplace and changes in industry that have resulted in many more technical jobs, not necessarily requiring workers who have obtained 4-year college degrees, but rather workers who have obtained more applied, technological skills. To illustrate, recently published data from the Bureau of Labor Statistics showed that more than 65% of all jobs in the year 2000 require specialized education (i.e., more than a high school diploma but less than a 4-year college degree), nearly tripling since the 1950s (Brustein & Mahler, 1994). Curiously, the percentage of jobs in the labor market requiring 4-year degrees has remained the same for the past 50 years, around 20%.

Given the emerging technologies in the workplace and changing industry standards to compete in the global economy, the perceived lack of a qualified workforce has caused great consternation among employers, educators, students, and the general public. According to some, this situation has resulted from schools having inadequate mechanisms that relate high school education to the workplace (Harwood, 1997; Pham, 1992; Swoboda, 1991; Weisman, 1991). Without these connections, public schools have not kept pace with the needs of the changing work force and required job skills.

The School-To-Work Opportunities Act (STWOA)

The situation described above prompted federal and state

Griffith & Wade

legislatures to enact policies that provide career- and work-oriented education for young adults, particularly in public school settings, in order to better equip students to meet the challenges posed by the transition from high school to post-secondary employment and education. In 1994, the federal government passed the School-To-Work Opportunities Act (STWOA). The broad aim of the legislation was to reduce “floundering” and “trial behavior” among young adults (described earlier) and develop in them marketable job skills and career goals. STWOA provided federal support for state and local jurisdictions to design and implement career- and work-oriented secondary education to assist graduates in making successful transitions from high school to post-secondary employment and education.

Following the passage of the STWOA, many state and local governments enacted policies to develop and implement school-to-work (STW) activities. These activities encompassed a broad range of secondary school activities, including career awareness classes, work readiness classes, development of individual student career plans, student use of career centers, instruction on pathways to careers, extended workplace activities, internships, summer jobs, work site job shadowing, workplace mentoring, and community service (Olson, 1996; Stern et al., 1995).

Shortcomings in STW Research

Despite the growth and the importance placed on STW initiatives, there have been few empirical studies evaluating their presumed effects on students’ post-secondary employment and education. Instead, much of the existing literature on STW can be characterized as being concerned chiefly with (a) implementation issues, and (b) the collection and reporting of aggregate data on the numbers and types of STW activities offered to high school students.

Regarding the first issue, abundant in the STW literature

High School Career & Work Oriented Education

are descriptions and discussions of program implementation rather than program evaluation. Prominent in discussions of implementation are questions on how best to integrate academic and vocational curriculum to make STW programs accessible to all students, to establish linkages between school curriculum and structured work experience, to create more formal pathways from secondary education to post-secondary employment and education, and to generate incentives for employers to provide student work placements (Urquiola, Stern, Horn, Dornsife, & Chi, 1997, p. iv - v).

A second prominent issue of STW literature is the collection and reporting of aggregate data on various STW program activities, such as the number of employers who collaborate with schools to offer work-based training, the number and types of student work placements (paid vs. unpaid; employer-, student-, or school-initiated), the number of student participants, etc. (National School-To-Work Office, 1998; Wieler & Bailey, 1997). Few, if any, quantitative studies in this literature document and relate the student's participation in career- and work-oriented secondary education to expected outcomes of the STWOA. To illustrate, Baker and Taylor (1998), in their meta-analysis of the effects of career education interventions, identified only 12 evaluation studies between 1983 and 1996. These studies were characterized by relatively small sample sizes (only two were over 250), by short duration of implementation, by meeting the needs of specific student populations (e.g., minority, offenders), and by limited career training (e.g., writing, decision-making, videos, role plays). Baker and Taylor (1998) concluded "The relatively small number of published studies that were located may very well indicate that this is an under-represented area of applied or field evaluation research" (p. 383). Similarly, in their literature search of vocational psychology articles from 1987 to 1996, Worthington and Juntunen (1997) found very few empirical studies that examined STW activities or related issues.

Griffith & Wade

Research Regarding Benefits of Vocationally- and Work-Oriented Secondary Education

What empirical evidence exists regarding effects of high school career- and work-oriented education on graduates' post-secondary employment and education is mixed. Some studies have shown that high school participants of vocationally-oriented secondary school programs perform better than non-participants on several outcomes, such as being employed and earning higher wages (e.g., Orr, 1996). Conversely, other studies have reported no program effects (e.g., U.S. General Accounting Office, 1991). Stern, McMillon, Hopkins, and Stone (1990) reviewed research before 1990 and made two general observations. The first observation was that students who participated in high school vocationally-oriented programs fared no better in work than did non-participants; however, participants had more positive attitudes toward high school and perceived a stronger relation between their high school curriculum and work (Herrnstadt, Horowitz, & Sum, 1979; Leske & Persico, 1984; Lewis, Gardner, & Seitz, 1983; Walsh & Breglio, 1976). The second observation was that high school vocationally-oriented programs had adequately prepared students for college, even though the programs were primarily vocationally-based (see also, New York State Department of Education, 1990; U.S. General Accounting Office, 1991). More recently, a study conducted by the National Center for Research in Vocational Education (cited in Stern et al., 1995, pp. 45-52) showed short-term benefits of high school vocationally-oriented programs in terms of higher wages (see also, Bishop, Blakemore, & Low, 1985; Campbell, Elliott, Laughlin, & Seusy, 1987; Walsh & Breglio, 1976) but alluded to long-term negative effects, namely, lower likelihood of program participants to complete 4-year college degrees, thereby lessening their future career upward mobility.

Study Purpose

The purpose of the present study was to analyze the impact of the career- and work-related secondary education programs. In order to do that, we approached this study from the three areas identified in the literature as constituting the major research gaps: (a) the need for outcome evaluations as opposed to process evaluations of high school career- and work-oriented educational programs; (b) the need to employ large sample sizes in such evaluations; and (c) the need to include all graduates, not only those from special populations.

The present study employed a large sample of graduates and obtained quarterly employment data and annual college enrollment data during 6 years following high school graduation in spring 1993. Some graduates had completed a career- and work-oriented educational program during high school. Despite having participated in the program almost a decade ago, the essential program characteristics have remained generally the same, namely: (a) Content: Students were required to complete a specific sequence of high school courses instructing students on the knowledge, skills, and abilities required of entry-level jobs in occupational fields; (b) Method: Classroom instruction related course content to actual work situations; (c) Workplace experiences: Students completed at least one semester of supervised work placement or internship; (d) Knowledge of careers: Course content instructed students of specific jobs available in the chosen occupational field.

The career- and work-oriented program examined in the present study shared many of the characteristics of initiatives called for and funded under the STWOA. To be supported by the 1994 STWOA, school-to-work initiatives required three elements: (a) integration of school-based and work-based learning, and the grounding of students' coursework in work-based learning experiences; (b) combined academic and vocational curriculum in which academic instruction is presented in real-world contexts that gives practical meaning to theories and ab-

Griffith & Wade

stract information; and (c) linking secondary and postsecondary education to provide access to careers requiring postsecondary education (Stern et al., 1995, pp. 12-14).

The overlap in characteristics of the present study's career- and work-oriented secondary educational program and elements of the STW initiatives permitted examining the extent broad characteristics common to both career- and work-oriented education and school-to-work activities were associated with graduates' post-secondary employment and education activities. Positive effects would then provide empirical support to current high school career- and work-oriented activities falling under STW initiatives.

Specific research questions to be answered in this study were:

1. Do graduates who participated in career- and work-oriented secondary education show more positive results in their postsecondary employment, such as being employed, having more continuous employment, obtaining higher earnings, and less likely to enter short-term, temporary jobs after high school graduation than non-program participants?
2. Do graduates who participated in career- and work-oriented secondary education show positive results in their postsecondary education in terms of the number of years to receive college degrees, the percentage who received college degrees, the first-year grade point average, and the percentage who were enrolled in remedial education, compared with graduates who did not participate in the program?

Method

Sample Description

The sample of graduates was obtained from all students

High School Career & Work Oriented Education

who graduated from high schools in a large, suburban school district outside a major metropolitan area on the eastern seaboard of the United States. Students, numbering 6,284 graduating seniors, completed the state's high school graduate survey during the spring semester of the twelfth grade. The survey asked students their social security numbers. Of all graduates (N=6,284) 4,476 or 71% had complete social security numbers.

Graduates' social security numbers permitted appending to each graduate case data from two separate archival data sets: (a) employment data supplied by the state's department of labor, and (b) college enrollment data supplied by the state's higher education commission. Initially, the data set containing each graduate's social security number, background characteristics, and high school curriculum data was sent to two state agencies. The state agencies appended employment and college enrollment data to each graduate case. The state agencies returned the final data set without social security numbers to protect the confidentiality of each graduate's employment or college records.

Each data set is described below.

Employment Performance Outcomes

Employment outcomes were derived from data on the quarterly earnings of people who worked in the state. The present study considered quarterly earnings of the 1993 graduates from the third quarter of 1993 through the third quarter of 1999. The state's earnings file does not contain earnings obtained from other states. Therefore, only graduates who had worked for wages in the state during the 6-year period could be matched with the earnings data. Of the initial sample of all graduates, 3,925 or 62% had earnings data from at least one quarter during the 6-year period.

Earnings data for each individual indicated the total earnings for each quarter and the general area in which earnings were obtained (or the Standard Industry Code, SIC). Five em-

Griffith & Wade

ployment performance outcomes were derived from these earnings data:

- (1) quarters worked during the 6-year period (cumulative count of quarters for which there were earnings);
- (2) continuous quarters worked or “spell of employment” during the 6-year period (cumulative count of consecutive quarters for which there were earnings);
- (3) total adjusted earnings across the 6-year period;
- (4) annual adjusted earnings for each of the 6 years; and
- (5) first and most recent area of employment based on the SIC.

All earnings data were adjusted to 1999 dollars. This was accomplished by using a standard procedure recommended by the Bureau of Labor Statistics. That is, quarterly earnings for each individual were multiplied by the ratio of the Consumer Price Index in 1999 to the Consumer Price Index of the year in which the quarterly earnings were reported.

College Performance Outcomes

College performance outcomes were derived from annual college enrollment data. The present study considered public college and university enrollments of the 1993 graduates from academic year 1993-1994 through academic year 1998-1999. Enrollments in private colleges and universities and colleges and universities outside the state were not included in the college enrollment data. Of the initial sample of all graduates, 2,645 had enrolled in public colleges or universities within the state during at least one year during the 6-year period, representing 59% of those graduates with valid social security numbers, or 42% of all graduates in the class.

Enrollment data also included: the student’s first-year grade point average (GPA), the highest degree earned, year of degree, type of degree (e.g., certificate, associate, and bachelor), major of the degree granted, and the need for math and Engl

Table 1
Background and High School Curriculum Characteristics of all 1993 Graduates, Graduates with Valid Identification Numbers, and Graduates with Earnings

Background or High School Curriculum Characteristic	A 1993 All Graduates (N = 6284) M	B Graduates with Valid IDs (N = 4476) M	C Graduates with Earnings (N = 3925) M	Univariate t-value A-B	Univariate t-value A-C
<i>Background Characteristic</i>					
% African American / Hispanic	24.5	23.3	23.5	1.44	1.15
% Free and Reduced Price Meals (FARMS)	20.3	18.8	19.2	1.94	1.87
% English for Speakers of Other Languages (ESOL)	16.2	14.5	14.4	2.42*	2.33*

Table 1 (continued)
Background and High School Curriculum Characteristics of all 1993 Graduates, Graduates with Valid Identification Numbers, and Graduates with Earnings

Background or High School Curriculum Characteristic	A 1993 All Graduates (N = 6284) M	B Graduates with Valid IDs (N = 4476) M	C Graduates with Earnings (N = 3925) M	Univariate t-value A-B	Univariate t-value A-C
<i>High School Curriculum</i>					
% completed Algebra 1	76.3	80.5	80.2	-5.26***	-5.06***
% completed 12 th grade English or higher	92.4	94.7	94.9	-4.86***	-4.70***
Mean number of honors courses §	5.53 (7.06)	6.21 (7.29)	5.97 (7.10)	-7.39***	-4.72***

*p < .05. **p < .01. ***p < .001

§ Number in parenthesis is Standard Deviation

High School Career & Work Oriented Education

rived from enrollment data:

- (1) type of degree earned (if any);
- (2) years to receive college degree;
- (3) first-year GPA; and
- (4) enrollment in remedial education.

Overlap Between Employment and College Enrollment Data

There was considerable overlap between graduates having employment data and graduates having college enrollment data. Among the 4,476 graduates with social security numbers, 2,498, or 56% had both employment and college enrollment data. Of the 3,925 graduates with employment data, 64% also had college enrollment data. Of the 2,645 graduates with college enrollment data, 94% also had employment data. Overlap between the employment and college enrollment data would likely have been even greater if college enrollment data had been available from institutions other than public post-secondary schools within the state.

Comparability of the Analytic Samples to the Entire Class

The two matches of all graduates having valid social security numbers with the employment data and with the college enrollment data yielded two analytic samples. Table 1 displays background and high school characteristics of the analytic sample resulting from the match with the employment data (column C). Also shown are the background and high school curriculum characteristics of all 1993 graduates (column A) and graduates who had valid social security numbers for purposes of matching with other data bases (column B).

The analytic sample of graduates with employment data closely resembled the entire class in terms of the background and high school curriculum characteristics. Statistically significant differences between the entire class and this analytic sample (column A-C) were largely the result of large sample sizes.

Table 2
Background and High School Curriculum Characteristics of 1993 All Graduates, Graduates with Valid Identification Numbers, and Graduates with College Enrollment Data

Background or High School Curriculum Characteristic	A 1993 All Graduates (N = 6284) M	B Graduates with Valid IDs (N = 4476) M	C Graduates with College Data (N = 2645) M	Univariate t-value A-B	Univariate t-value A-C
<i>Background Characteristic</i>					
% African American / Hispanic	24.5	23.3	23.4	1.44	1.12
% Free and Reduced Price Meals (FARMS)	20.3	18.8	21.6	1.94	-1.37
% English for Speakers of Other Languages (ESOL)	16.2	14.5	17.9	2.42*	-1.93

Table 2 (continued)
Background and High School Curriculum Characteristics of 1993 All Graduates, Graduates with Valid Identification Numbers, and Graduates with College Enrollment Data

Background or High School Curriculum Characteristic	A 1993 All Graduates (N = 6284) M	B Graduates with Valid IDs (N = 4476) M	C Graduates with College Data (N = 2645) M	Univariate t-value A-B	Univariate t-value A-C
<i>High School Curriculum</i>					
% completed Algebra 1	76.3	80.5	81.7	-5.26***	-5.85***
% completed 12 th grade English or higher	92.4	94.7	94.2	-4.86***	-3.19**
Mean number of honors courses	5.53 (7.06)	6.21 (7.29)	5.00 (6.40)	-7.39***	3.33**
Mean grade point average (GPA)	2.88 (.56)	2.93 (.55)	2.87 (.51)	-4.60***	0.79

*p < .05. **p < .01. ***p < .001

Griffith & Wade

The magnitude of differences indicated little practical significance.

Table 2 displays background and high school characteristics of the analytic sample resulting from the match with the college enrollment data (column C). Table 2 is similar to Table 1, with the exception of column C and statistical comparisons of data in columns A and C. The main interest here is to determine the extent to which the analytic sample for college enrollment (column C) resembled all graduates (column A) on key background and high school curriculum characteristics.

The two groups of graduates statistically differed on variables relating to academic background but not on sociodemographic characteristics (see column A-C). The magnitude of these differences was fairly small, suggesting the sample of graduates having college enrollment data was similar to all graduates on the variables of comparison.

Analytic Groups

For analyses, two groups of graduates were defined based on their participation in career- and work-oriented secondary educational program and post-secondary college and work activities.

Career- and work-oriented education (CWE). Graduates in the class of 1993 who had completed the high school career- and work-oriented educational (CWE) program were compared with the remaining graduates, or non-program participants, on the employment and college performance outcomes. The CWE program involved a prescribed sequence of courses leading to state-certified diplomas. Courses helped students acquire specialized knowledge, skills, attitudes, and work habits required for postsecondary vocational education, training, and employment. Areas of study in the CWE program included: business education (marketing, hospitality, and food production), business operations (secretarial, typing, data processing, accounting, etc.), health (allied health and child care), trades (masonry,

High School Career & Work Oriented Education

carpentry, plumbing, etc.), automotive, and horticulture. Throughout high school, CWE participants took several semester-long job placements that combined classroom instruction and work experiences. With the help of school staff, students identified and selected work experiences relevant to their school and career plans. Students worked at local businesses, government agencies, industries, or service industries. Employers of students and school staff worked collaboratively and served as role models in developing appropriate and relevant job competencies for students. Nine percent (399 out of 4,476) of the 1993 graduates had completed the CWE program.

Post-secondary college / work groups. Employment patterns are often associated with college attendance and the type of college attended. Too, college performance, such as years to complete degree, GPA, need for remedial education, etc., is often associated with type of college attended. Therefore, CWE and non-CWE graduates were compared on the employment and college performance outcomes, overall and then within groups of graduates with similar post-secondary college and work status.

Employment data in combination with college enrollment data were used to categorize graduates into three broad groups: (a) attended 4-year colleges and universities in the state during the 6-year period; (b) attended 2-year colleges in the state during the 6-year period; and (c) worked without having attended colleges and universities in the state. There were specific criteria for inclusion into these three categories. Graduates having college enrollment data were grouped by college type, either 2 year college or 4-year college. Graduates who attended 2-year colleges and then 4-year colleges were included in 4-year college group. No minimum number of semesters of attending college was required for inclusion. Graduates in the work-only group were those (a) who reported that they planned to work and not attend post-secondary school after graduation (as indicated by responses to surveys at high school graduation), and

Griffith & Wade

(b) who had employment data and no post-secondary school data. Survey-reported plans to work was used because many of the graduates who had employment data and no post-secondary school data were likely attending colleges outside the state.

Results

CWE Graduates' Background and High School Curriculum

Table 3 displays the background and high school curriculum characteristics of the class of 1993 CWE graduates and non-CWE graduates.

An overall multivariate analysis of variance (MANOVA) test of differences in the background and high school curriculum characteristics between CWE and non-CWE graduates was statistically significant (F -value (8,3265) = 23.12, $p < .001$). Univariate F -values indicated that CWE graduates differed from non-CWE graduates on several of the characteristics. In terms of sociodemographic background, CWE graduates were more likely African American or Hispanic, and more had participated in the Free and Reduced Meals (FARMS) and English for Speakers of Other Languages (ESOL) programs in high school than non-CWE graduates. In terms of high school curriculum, CWE graduates were less likely to have completed Algebra 1, took fewer honors courses, and earned lower GPAs and SAT scores.

High School Career & Work Oriented Education

Table 3
*Background and High School Curriculum Characteristics of
 1993 CWE and non-CWE Graduates*

Background or High School Curriculum Characteristic	1993		Univariate <i>F</i> -value
	CWE (N=433)	Non-CWE (N=4043)	
<i>Background Characteristic</i>			
% African American/Hispanic	36.0	21.9	10.60***
% FARMS	37.4	16.9	47.66***
% ESOL	22.6	13.6	4.18*
<i>High School Curriculum</i>			
% completed Algebra 1	47.6	83.9	50.49***
% completed 12 th grade English or higher	85.6	95.6	1.49
Mean number of honors courses (<i>SD</i>)	1.12 (3.01)	6.75 (7.40)	94.47***
Mean GPA (<i>SD</i>)	2.65 (0.44)	2.96 (0.55)	30.11***
Mean SAT (<i>SD</i>)	918 (166)	1115 (211)	124.88***

Note. The MANOVA *F* (8,3265) equaled 23.12, $p < .001$, showing statistically significant differences between CWE and non-CWE graduates (or factor) across all the background and high school curriculum characteristics (or dependent variables).

* $p < .05$. ** $p < .01$. *** $p < .001$

Griffith & Wade

Six-Year Postsecondary Employment

Table 4 shows mean quarters worked, continuous quarters worked, and total earnings for CWE and non-CWE graduates. To determine whether CWE and non-CWE graduates differed on the three employment outcomes, an overall MANOVA was conducted. This multivariate test was done to guard against an inflated alpha due to comparisons between CWE and non-CWE graduates on several variables. In the MANOVA, CWE versus non-CWE served as the factor; the three employment outcomes served as dependent variables; and FARMS served as a covariate or control variable. Previous comparisons showed CWE graduates differed from non-CWE graduates on several background and high school curriculum characteristics. To control for possible effects of these characteristics on outcomes, FARMS was used as a covariate in analyses. Other background and curriculum characteristics were not used, as they were correlated with the FARMS variable, and their inclusion may have resulted in multicollinearity problems. The overall multivariate $F(3,3920)$ equaled 25.55 ($p < .001$) indicating that CWE graduates differed from non-CWE graduates on the three employment outcomes.

Next, for each outcome, three separate analyses of variance (ANOVAs) were conducted corresponding to each college / work group. CWE versus non-CWE served as the factor; the employment outcome served as the dependent variable; and FARMS and quarters worked (only for earnings) served as the covariates. Table 4 reports F -values for pairwise comparisons and adjusted means. Univariate F -values showed that CTE graduates worked more, had longer spells of employment, and earned more across the 6-year study period.

Figure 1 displays the mean annual earnings for CWE and non-CWE graduates in each college/work group. Values for mean annual earnings have been adjusted by graduates' FARMS status and quarters worked. Across the years, CWE graduates earned more than non-CWE graduates, even when

Table 4
 Comparison of Employment Performance between 1993 CWE and non-CWE Graduates (during the 6-year Period after High School Graduation)

Employment Outcome	1993 CWE (N = 399)		1993 Non-CWE (N = 3526)		Univariate F-value
	N	M SD	N	M SD	
<i>Total quarters worked^a</i>					
Overall	399	14.17 7.66	3526	11.35 7.26	53.03***
4-year college	73	14.82 7.11	1259	12.62 6.56	7.52**
2-year college	170	15.50 7.25	826	14.78 6.95	1.50
Working only	40	18.64 6.39	67	15.44 7.42	5.10*
<i>Continuous quarters worked^a</i>					
Overall	399	10.32 7.01	3526	7.54 6.19	69.97***
4-year college	73	9.97 6.43	1259	8.06 5.80	7.35**
2-year college	170	11.50 6.87	826	10.56 6.53	2.84+
Working only	40	14.21 6.99	67	10.95 6.98	5.40*

Table 4 (continued)
Comparison of Employment Performance between 1993 CWE and non-CWE Graduates (during the 6-year Period after High School Graduation)

Employment Outcome	1993 CWE (N = 399)		1993 Non-CWE (N = 3526)		Univariate F-value
	N	M SD	N	M SD	
<i>Total earnings^b</i>					
		SE		SE	
Overall	399	46577 1392	3526	37798 461	35.58***
4-year college	73	39517 3182	1259	37857 758	0.26
2-year college	170	59054 2237	826	52454 1012	7.21**
Working only	40	91118 6470	67	68031 4967	7.82**

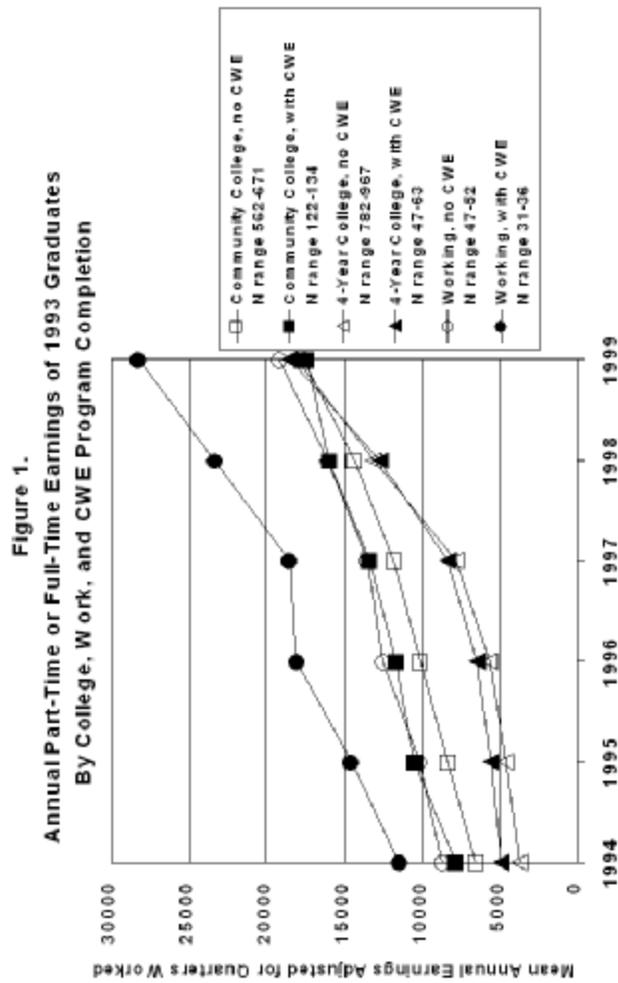
Note. The MANOVA $F(3,3920)$ equaled 25.55, $p < .001$, showing statistically significant differences between CWE and non-CWE graduates (or factor) across all the employment outcomes (or dependent variables). Univariate F values were the result of separate analysis of covariance conducted for each row or college / work group in which CWE status served as the independent variable, the employment outcome served as the dependent variable, and FARMs and/or quarters worked served as covariates.

^a Estimated means adjust for the graduate's FARMs status.

^b Estimated means adjust for the graduate's FARMs status and total quarters worked.
 $+ p < .10$. $*p < .05$. $**p < .01$. $***p < .001$

High School Career & Work Oriented Education

considering graduates' FARMS status and number of quarters worked. The MANOVA test of statistical significance in earnings per quarter between CWE and non-CWE graduates across the 6 years was significant, while holding FARMS status constant ($F(6, 1121) = 8.82, p < .001$).



Note. All wages are in 1999 dollars. Annual earnings have been adjusted for number of quarters worked and FARMS status. Not all graduates had employment data for all years, so Ns for each group vary over the years; the range of Ns is indicated for each group.

Griffith & Wade

Table 5 shows the annual earnings advantage between CWE and non-CWE within college/work groups across the 6 years of the study. Overall, CWE graduates earned more than their non-CWE counterparts in each of the college/work groups, in particular for the working-only group. The earnings advantage is most evident for those graduates who went straight to work, year after year. For CWE graduates who went to college, there was an earnings advantage right away, but the earnings advantage diminished in the later years of the study. In addition, the earnings gap between graduates who went straight to work and those who went to college after graduation narrowed in the later years of the study.

First and Most Recent Areas of Employment

Figure 2 displays the percentages of CWE and non-CWE graduates in each college/work group who entered various areas of employment as their first jobs and their most recent jobs.

Completion of a CWE program was associated with the area of industry in which the graduates were employed. A smaller percentage of CWE graduates was employed in areas traditionally considered short-term or temporary, such as restaurants, hotels, and entertainment (see Figure 2), in their first jobs ($t(3742) = -4.32, p < .001$). More CWE graduates were employed in trades (e.g., construction, transportation, automobile mechanics) than were non-CWE graduates, both at their first job ($t(3742) = 3.51, p < .001$) and their most recent job ($t(3742) = 2.40, p < .05$). Most recent employment in business areas (e.g., personnel, business, finance, insurance, accounting, real estate) was similar for CWE graduates and their non-CWE peers, but CWE graduates were somewhat more likely to enter these areas of employment in their first jobs ($t(3742) = 1.50, p < .15$).

High School Career & Work Oriented Education

Table 5
Annual Earnings Advantage of 1993 CWE Graduates Compared to non-CWE Graduates

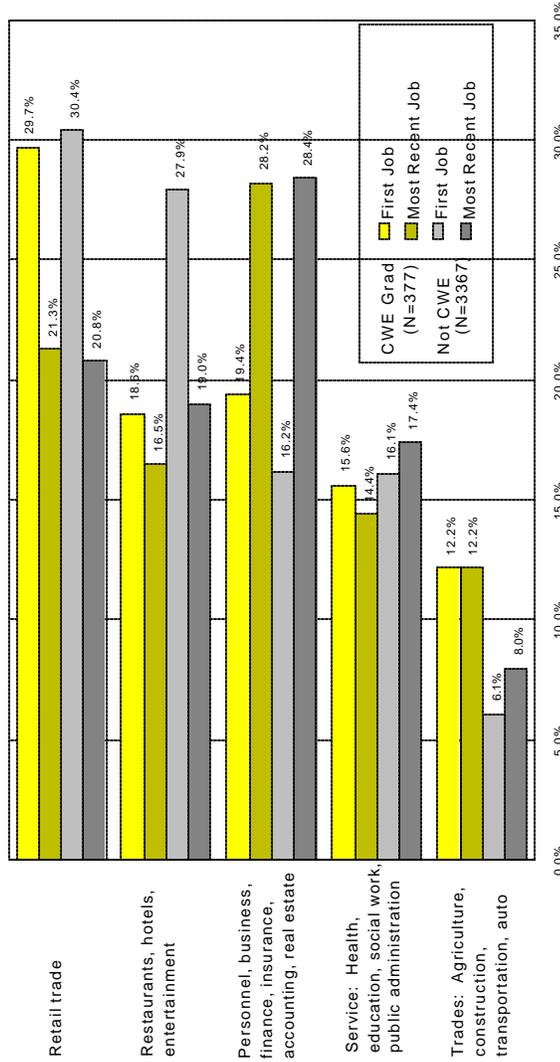
College / Work Group	1994	1995	1996	1997	1998	1999
Overall	2292***	2881***	3017***	2384***	1716*	-175
4-year college	1167**	964+	787	542	-344	464
2-year college	1250**	2108***	1547*	1536*	1604	-260
Working only	2720**	4371**	5616**	4937*	7290+	9062*

Note. Earnings have been adjusted to reflect 1999 dollars (annual earnings X 1999 CPI / year of earnings CPI). Values indicate how much CWE graduates earned in relation to non-CWE graduates. Values adjusted for graduates' FARMS status and quarters worked during the respective year.
 + $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$, two-tailed.

College Performance

Table 6 displays results for CWE and non-CWE graduates on several college performance outcomes. CWE and non-CWE graduates were very similar on college performance outcomes. Both groups took, on the average, 4 ½ years to complete college degrees. About 60% of both graduate groups enrolled in 4-year colleges had received 4-year college degrees, and about 6% of both groups enrolled in 2-year colleges had received 2-year college degrees. First-year grade point average for graduates in both groups was about C+ for 4-year colleges and about C for 2-year colleges. Percentages of CWE and non-CWE graduates in remedial education were nearly the same.

Figure 2.
Industries Employing 1993 Graduates in First and Most Recent Jobs
 Graduates Who Have Completed CWE Program and All Other Graduates



Note. Graduates having employment data for two or more quarters are included.

High School Career & Work Oriented Education

Table 6
Comparison of College Performance between 1993 CWE and non-CWE Graduates (during the 6-year period after high school graduation)

College Performance Outcome	1993 CWE (N = 266)		1993 Non-CWE (N = 2379)		Univariate F-value
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>Years to degree</i>					
4-year college	4.47	0.91	4.48	0.75	0.01
2-year college	4.40	1.17	3.91	1.20	1.38
<i>Of those who attended % received degree</i>					
4-year college	60.2		61.3		0.04
2-year college	6.0		5.4		0.10
<i>First-year grade point average</i>					
4-year college	2.56	0.81	2.58	0.88	0.03
2-year college	1.91	1.03	1.78	1.03	1.66

Griffith & Wade

Table 6 (continued)

Comparison of College Performance between 1993 CWE and non-CWE Graduates (during the 6-year period after high school graduation)

College Performance Outcome	1993 CWE (N = 266)		1993 Non-CWE (N = 2379)		Univariate F-value
	M	SD	M	SD	
<i>% in remedial</i>					
Math education					
4-year college	31.0		25.8		0.93
2-year college	61.6		57.6		0.73
English education					
4-year college	9.9		7.6		0.45
2-year college	39.1		37.3		0.14
<i>% planning to attend (reported at high school)</i>					
4-year college	29.5		71.2		17.30***
2-year college	52.2		21.1		11.98***
Working only	11.5		2.7		5.42*

Note. College performance and consistency between CWE and non-CWE graduates were compared within college / work groups. Therefore, no MANOVA F-value was calculated.

* $p < .05$. *** $p < .001$

Discussion

Summary of Results

In the present study, CWE graduates worked during more quarters overall and worked more continuously across the 6 year follow-up period than non-CWE graduates. CWE graduates also had higher earnings than non-CWE graduates, even when considering socioeconomic background, number of quarters worked, and postsecondary college and work activities. Similarly, several past studies have shown high school participants of vocationally- and work-oriented programs to perform better than non-participants on several postsecondary work outcomes, such as being employed and earning higher wages (Bishop et al., 1985; Campbell et al., 1987; Orr, 1996; National Center for Research in Vocational Education cited in Stern et al., 1995, pp. 45-52; Walsh & Breglio, 1976). The present study also showed additional benefits of career- and work-oriented secondary education. CWE graduates were less likely to be employed in areas traditionally considered short-term or temporary, such as restaurants, hotels, and entertainment, in their first jobs than were non-CWE graduates. More CWE graduates were also employed in trades than were non-CWE graduates, both at their first job and their most recent job. Most recent employment in business areas was similar for CWE graduates and their non-CWE peers, but CWE graduates were more likely to enter these areas of employment in their first jobs.

CWE graduates performed nearly the same on the college outcomes as did non-CWE graduates, including the number of years to receive college degrees, the percentage who received college degrees, the first-year grade point average, and the percentage of graduates enrolled in remedial education. Similarly, in their review, Stern et al. (1995) noted that participants of high school vocationally-oriented programs were adequately prepared for college, even though the programs were primarily vocationally-based (see also New York State Department of Education, 1990; U.S. General Accounting Office, 1991). Re-

Griffith & Wade

sults here and elsewhere have strong implications for our thinking about which high school students enter career- and work-oriented education and about the presumed effects of such an education.

Adjusting Common Perceptions about Career- and Work-Oriented Secondary Education

Stone (1993) has described common perceptions among students, school staff, parents, and the general public regarding vocationally- and work-oriented secondary education. Examples of these perceptions included: vocationally- and work-oriented education makes little difference in the labor market; and vocationally- and work-oriented secondary education hinders students continuing their postsecondary education. In this study, high school students who participated in career- and work-oriented secondary education performed as well, if not better, in the workplace and in college than did non-participants.

Another common belief described by Stone is that vocationally- and work-oriented secondary education is for students who cannot handle rigorous secondary school coursework. Indeed, in the present study, high school curriculum characteristics of CWE graduates compared to their non-CWE counterparts were consistent with this belief. CWE graduates had less high school college preparation than non-CWE graduates, and yet, CWE graduates performed as well in college as did non-CWE graduates. Still, CWE participants were disproportionately disadvantaged – students who often have lower expectations for their educational attainment. This problem has been previously documented (U.S. General Accounting Office, 1991) and, in part, explained by student perceptions that work-oriented secondary education is mainly for students who are not college-bound. One aspect of the STWOA was to provide career- and work-oriented education for all students. If STW initiatives are to achieve a broader student “reach” (see Rossi,

High School Career & Work Oriented Education

Freeman, & Wright, 1979), then new initiatives must be designed and marketed in ways to attract all student groups. Future research needs to examine barriers to participation as well as program characteristics associated with broader inclusion of high school students.

Understanding barriers to participation may lead to developing efforts to broaden the reach of career- and work-oriented educational programs. Areas of concern include: the lack of student, parent, and school staff knowledge about the positive effects of career and work preparation activities; the lack of student, parent and school staff knowledge about the positive effects of career and work preparation activities; the lack of knowledge about changes in workplace skills needed in the global economy; and the perception of less rigorous academic standards for high school course curriculum associated with career and technology education. Further study of these and other barriers to participation will help to inform strategies to address them. Strategies might include:

- Informing students and parents about changes in workplace opportunities, the skills necessary for competing in the modern economy, and the positive effects of secondary school career and work preparation activities.
- Determining ways to offer career- and work-oriented education courses and activities so that they fit into the schedules of all students.
- Having current career- and work-oriented education courses, such as accounting, finance, computer science and medical career courses qualify for honors credit or advanced placement. Such offerings would reinforce the academic rigor of career and work preparation courses.
- Devising ways to formally structure outside work experiences of students. Approximately two-thirds of the high school seniors reported working for pay. How-

Griffith & Wade

ever, only 20% of these work experiences are related to a structured school program that reviews and evaluates workplace skills (Montgomery County, 2000).

- Encouraging students, school staff, and parents to use four-year plans not only for course selection during secondary school but also for career and work exploration and planning.

Identifying Specific Program Characteristics Associated with Positive Employment and College Performance

The STWOA mandated public schools design and implement activities that better enable high school graduates to enter college and the workforce. Yet, which specific STW activities are associated with positive employment and college performance is not known. There have been few, if any, studies examining the post-secondary employment or college achievement of graduates who participated in STW initiatives. It has been argued here that activities called for and funded under the STWOA and the study's career- and work-oriented secondary educational program share broad characteristics. These similarities, in the context of study results, show the post-secondary employment and college benefits of activities called for in the STWOA. Even so, lacking still is an understanding of which specific activities or program characteristics are associated with positive effects on later employment and college performance.

In the present study, having participated or not participated in career- and work-oriented secondary education served as the only measure of program experiences. Thus, the question remains: What specifically about the career- and work-oriented education yields positive effects on postsecondary employment and college performance? At present, there can be only speculation. Positive effects of the CWE program were likely due to the program's length (spanning the high school years) and content (courses related directly to work applications). That is, students learned about career fields; selected and planned high

High School Career & Work Oriented Education

school curriculum for the chosen career field; and experienced jobs first-hand in the career field and adjusted choices accordingly; and trained in the chosen career field in the classroom and at the workplace. The program gave students information and direct experiences from a variety of career fields, allowing students to more formally acquaint themselves with the realities of career fields. Further research is needed to examine how such specific components of career- and work-oriented educational programs relate to employment and college performance. By gaining a better understanding of the characteristics of career- and work-oriented secondary educational programs that are associated with positive outcomes, educators can better develop and deliver STW activities.

Study Limitations

The present study is not without methodological limitations. First, some graduate groups were small in analyses. Therefore, caution should be exercised in interpreting and generalizing results. Second, not all graduates had employment and college data. Employment data included only records of those graduates who had worked in the state. This situation presented difficulties in deriving employment rates, since it was not possible to know whether graduates had left the state or had stayed in the state but were not working. College enrollment data included only those graduates who attended state public post-secondary schools. These limitations associated with graduates not having employment and college data appeared not to present major problems: Many of the graduates had employment (71% of the original class) or college data (42% of the original class), and these graduates generally resembled the entire graduating class on several background and high school curriculum characteristics.

A third limitation pertains to the correlational nature of the study and the lack of available data to use as statistical controls. Differences in employment and college enrollment history

Griffith & Wade

among the various graduate groups used in comparisons may be explained by systematic differences among graduates. High school programs offering career- and work-focused courses and activities may attract students who differ considerably from other students. For example, students who choose career- and work-oriented education, remain in it and benefit from it may come from home environments that encourage secondary education linked to specific jobs. It was not possible to test this explanation, as no specific information was gathered on students' home environments or other possible influences.

The effects of self-selection can sometimes be minimized by the use of standardized tests as statistical controls in analyses, but such test data were not available for all graduates. It should be noted that many of the analyses have considered student socioeconomic background and post-secondary school and work activities when comparing participants and non-participants of the career- and work-oriented secondary educational program, as methods to reduce the effects of self-selection.

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High School Career & Work Oriented Education

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**Employment During High School:
Consequences for Students' Grades in
Academic Courses**

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High school students who work intensively at paid jobs tend to have lower grades in academic courses. Prior research has not properly tested theories about the source of the relationship between student employment and grades (or other outcomes), and has not explicitly modeled the potentially reciprocal nature of this relationship. We focus on both the short- and long-term effects of adolescent employment on grades in academic courses and simultaneously consider the extent to which grades may influence employment behaviors. We find no evidence that high school employment has either short- or long-term effects on grades in academic courses or that grades in these courses influence employment activities. Pre-existing differences between more and less intensively employed students fully account for the association between employment intensity and grades in academic courses.

The movement from adolescence to early adulthood represents a meaningful passage from the relative security and certainty of childhood to the autonomy and independence of adulthood (Santrock, 1987). For Erikson (1963, 1968), adolescence is conceived as the pivotal stage in the process of identity formation—an important stage in which teenagers struggle with

Warren, LePore, & Mare

newly found freedoms and choices and formulate their own religious, political, sexual, and work role attitudes. The family, the school, and the peer group are well recognized as central contexts for the socialization of adolescents (Corsaro & Eder, 1995; Gecas, 1981; Santrock, 1987; Simmons & Blyth, 1987). However, despite the prevalence of employment among adolescents, job holding is often seen as a peripheral or secondary activity for young people—a context relevant mainly for the socialization of adults (Gecas, 1981; Marsh, 1991).

Studies of the life course typically assume that individuals' work careers begins only when their formal schooling ends. In other words, educational careers and occupational careers are usually treated as temporally non-overlapping (Ahituv, Tienda, Xu, & Hotz, 1994; Coleman, 1984; Feldstein & Ellwood, 1982; Hogan, 1978, 1980; Mare & Winship, 1984; Mare, Kubitschek, & Winship, 1984; Marini, 1984; Michael & Tuma, 1984). As a result, until quite recently we have known relatively little about the relationships between high school students' work lives, school achievements, and later life outcomes.

Despite the limited amount of empirical interest in adolescent employment, a visitor to any grocery store, movie theater, or fast food restaurant will quickly see that a significant number of American high school students are employed. Although the extent to which this employment activity represents the beginning of formal occupational careers is unclear, the pervasiveness of high school student employment is unmistakable. Results from the 1980 High School and Beyond Survey (HS&B), for example, found that about 44% of enrolled sophomores and 64% of enrolled seniors were employed during the 1980 school year (Lewin-Epstein, 1981). Similarly, using data from the 1987 National Assessment of Economic Education Survey, Lillydahl (1990) reported that 68% of twelfth-graders acknowledged holding a job at some time during the school year.

From a policy perspective, the prevailing wisdom is that the "world of school" and the "world of work" should be more fully

Employment During High School

integrated in order to properly educate and train young people for their adult roles in the work force (Byrne, Constant, & Moore, 1992; Carnegie Council on Policy Studies in Higher Education, 1979; Congressional Research Service, 1994; National Panel on High School and Adolescent Education, 1976; President's Science Advisory Committee, 1974). As Byrne, Constant, and Moore (1992) have argued, "we need to move beyond our makeshift, do-it-yourself system. Employers and educators need to work together to change the way we prepare young people for the world of work" (p. 26). The Federal School-to-Work Transition Act of 1994, for example, that provided \$100 million for support of state initiatives is one example of how these sentiments have translated into public policy.

Advocates of student employment reason that working during high school promotes responsibility, punctuality, and reliability; develops valuable work skills; and builds character and self-confidence (D'Amico, 1984; Greenberger & Steinberg, 1986; Mortimer & Finch, 1986). In contrast, critics have suggested that employment, as it occurs now (in fast-food restaurants, grocery stores, retail stores, and so forth), does not educate or properly prepare students for adult occupational roles (Behn, Carnoy, Carter, Crain, & Levin, 1974; Greenberger & Steinberg, 1981; Steinberg, 1982), fails to foster the psychological maturity or development necessary for adult employment (Behn, et al., 1974; Greenberger & Steinberg, 1981; Greenberger, Steinberg, Vaux, & McAuliffe, 1980; Steinberg, 1982), and under some circumstances hinders academic achievement (Chaplin & Hannaway, 1996; D'Amico, 1984; Greenberger & Steinberg, 1986; Marsh, 1991; Mortimer & Finch, 1986; Schill, McCartin, & Meyer, 1985; Steinberg, 1982; Steinberg, Greenberger, Garduque, & McAuliffe, 1982; Wirtz, Rohrbeck, Charner, & Fraser, 1987). In this paper, we are concerned with the latter criticism of high school students' employment. Specifically, we ask whether employment during high school has consequences for students' grades in academic courses.

Warren, LePore, & Mare

We begin by reviewing previous efforts to assess the impact of students' employment during high school on their grades and other educational outcomes. Next, we argue that these efforts are lacking in crucial respects. In particular, no prior research has modeled the relationship between employment and schooling outcomes in such a way that allows for short-term as well as long-term effects of employment, or that recognizes the potentially reciprocal nature of this relationship. Subsequently, we present analyses of data from the National Educational Longitudinal Study of 1988 (NELS88) that are designed to overcome these problems and to provide an improved assessment of how working during high school and students' grades in academic courses are related to one another.

Prior Evidence

Previous assessments of the educational consequences of high school students' employment can be divided roughly into two groups based on the manner in which employment is defined. The first group explores the effects of being employed (or *employment status*) on grades or other outcomes, whereas the second group explores the effects of the number of hours worked per week (or *employment intensity*) by high school students on these outcomes. Unfortunately, few studies have examined the impact of the character or nature of the work in which students are engaged on their educational outcomes (Mortimer, Finch, Shanahan, & Ryu, 1992; Mortimer & Ya-moor, 1987). An hour working in a movie theater or baby-sitting is generally seen as equivalent to an hour working in a meat packing plant. The works of Stone and Stern and colleagues (Stern, Stone, Hopkins, & McMillion, 1990; Stone, Stern, Hopkins, & McMillion, 1990) and more recently McNeal (1997) are exceptions to this generalization.

Early models of the association between high school students' employment status and their academic success compared

Employment During High School

workers' and nonworkers' schooling outcomes, usually as measured through grade point averages. Most researchers have noted unfavorable consequences of employment during high school. Steinberg and colleagues (Steinberg, et al., 1982), reacting to the President's Science Advisory Committee's recommendations of earlier integration of adolescents into the workplace (President's Science Advisory Committee, 1974), demonstrated that workers have slightly lower grade point averages than nonworkers. Bachman (1983) and McNeil (1984) each suggested that working detracts from school involvement, and by implication, school success. Similarly, using data from the Youth in Transition Study, Mortimer and Finch (1986) found that compared to students who work, students with no high school work experience have significantly higher academic self-concept scores in eleventh grade and higher grade point averages and educational and occupational aspirations in twelfth grade. Recent work by McNeal (1997) also makes clear that the association between employment and school success—as indicated by high school dropout—varies by the type of job that students hold and by gender.

Many researchers have examined the connection between employment status and academic outcomes after controlling for factors that might simultaneously influence those outcomes and the decision to work. Mortimer and Finch (1986), for example, reported that the negative consequences of employment for a number of academic outcomes remain robust even after controlling for ability, family socioeconomic status, student grade point average in the ninth grade, and academic self-concept at the beginning of high school. In contrast, Steinberg and colleagues (Steinberg, et al., 1982), who found only a slight association between work status and grade point average among their sample of high school students, found no association at all when demographic and socioeconomic background factors were held constant.

Researchers have also examined the effects of student em-

Warren, LePore, & Mare

ployment on grades and other outcomes by taking into consideration the number of hours per week that students have worked. After all, as we discuss below, the common-sense argument against working while attending school is that the time students devote to work detracts from the time available for studying, doing homework, or becoming involved in other school-related activities. Several observers have found strong negative correlations between number of hours worked per week and academic success (Chaplin & Hannaway, 1996; D'Amico, 1984; Greenberger & Steinberg, 1986; Kablaoui & Paulter, 1991; Lillydahl, 1990; Marsh, 1991; McNeal, 1997; Mortimer & Finch, 1986; Schoenhals, Tienda, & Schneider, 1998; Steinberg, et al., 1982; Wirtz, et al., 1987; Worley, 1995). Steinberg and colleagues (Steinberg, et al., 1982), for example, found that the number of hours that students work per week, but not their employment status, has a significant (and negative) impact on their grade point averages even after gender and social class background are held constant. Likewise, Worley (1995) concluded that grades decline as hours worked during the school year increase; Mortimer and Finch (1986) found a negative association between time spent at work and boys' grades, self-assessments of ability, and educational aspirations; and D'Amico (1984) observed that intensive work involvement (more than 20 hr/week) leads to lower levels of study time, less free time, and higher rates of dropping out.

Furthermore, the negative consequences of employment during high school, when expressed as hours worked per week, have been shown to last beyond the schooling years. For example, Carr, Wright, and Brody (1996) and Chaplin and Hannaway (1996) have each demonstrated that employment intensity during high school is negatively related to the probability of attending college and to the likelihood of completing 4 or more years of college.

Marsh (1991) has offered one of the most ambitious and comprehensive empirical analyses of the impact of high school

Employment During High School

employment on students' schooling success. Using longitudinal HS&B data, Marsh (1991) measured the effects of hours worked per week during high school on a variety of senior year and post-high school outcomes. He found that for students who did not drop out between grades 10 and 12, total hours worked during high school is negatively related to 17 of 22 senior year and post-secondary measures including academic achievement, grade point average, academic track, amount of time devoted to homework, social and academic self-concept, educational aspirations, post-high school employment, and college attendance. Moreover, these effects remain significant even after controlling for background measures and sophomore outcomes. As Marsh concluded,

...the negative effects of working during high school on a variety of senior and post secondary outcomes ... [are] predominantly a linear function of the number of hours worked and [are] reasonably consistent across ethnicity, sex, ability levels, and level of SES [socioeconomic status]. (Marsh, 1991, pp. 184-185)

Some researchers have questioned whether the negative correlates of extensive employment during high school are actually *caused* by students' labor force participation, or are simply a reflection of unmeasured, preexisting differences in family background, attitudes, ability, values, and other characteristics which foster academic success between students who work different amounts (Bachman & Schulenberg, 1993; Schoenhals, Tienda, & Schneider, 1998; Steinberg, Fegley, & Dornbusch, 1993). As Steinberg, Fegley, and Dornbusch (1993) have argued, high school students who work long hours (either by choice or necessity) may in fact be less interested in and committed to school even before they enter the labor force. Therefore, any apparent differences between students who work varying amounts of hours per week may be attributable to these pre-employment differences. Illustrating this point, Steinberg, et al. (1993), in a study of 1,800 high school sophomores and

Warren, LePore, & Mare

juniors from Wisconsin and California, found that adolescents who eventually worked more than 20 hr/week were initially less engaged in school and were granted more autonomy by their parents than other adolescents. Likewise, Schoenhals, et al. (1998) concluded that much of the adverse impact of youth employment noted in prior research could be attributed "to pre-existing differences among youth who elect to work at various intensities" (p. 723).

Even if working long hours negatively affects students' grades or other schooling outcomes, there is also some evidence that working fewer hours (as opposed to not working or to working intensively) actually has *positive* effects on school performance (D'Amico, 1984; Garasky, 1996; Schill, et al., 1985; Steel, 1991). Schill, et al. (1985), for example, showed that grades are highest among students who work, but who do not work a lot. Similarly, D'Amico (1984), Steel (1991), and Garasky (1996) each found that working (but not intensively) decreases students' chances of dropping out of high school.

Problems with Prior Research

Clearly students' employment is associated with a variety of educational outcomes. Why might these associations exist? We argue that a zero-sum model of students' time allocation quite reasonably (but usually implicitly) undergirds most research on this issue. In short, there are only so many hours in a day. Each hour spent at work, in social engagements, or in other extracurricular activities is an hour not spent studying or doing homework.

Since the 1960s, many observers have claimed that American high schools are oriented toward a "youth culture" in which social, romantic, and employment considerations interfere with students' optimal intellectual development (Coleman, 1961; Goodlad, 1984). Coleman (1961) offered a zero-sum analysis of the world of adolescents in which the costs and benefits accrued

Employment During High School

in one context of adolescent life, such as employment, are seen to have consequences for other aspects of social and intellectual development. From this perspective, working during high school impedes academic success because the amount of time spent on activities outside of narrowly defined academic pursuits (such as work, community service, and social commitments) leads to less time spent on academically focused classroom-related work (Marsh, 1991). In other words, employment during high school constrains the amount of time that can be devoted to homework, studying, and participation in school-related activities, and thus has negative implications for academic achievement and attainment (D'Amico, 1984; Kablaoui & Paulter, 1991; Marsh, 1991).

It would be wrong, however, to suggest that the *time* spent at work is the only factor affecting school success in this zero-sum framework. As Marsh (1991) notes, zero-sum models can also be applied to the social psychological consequences of high school employment. In addition to the reductions in the actual number of hours spent on schoolwork, sustaining high levels of commitment to the workplace may be antithetical to maintaining high levels of dedication to or investment in school, academic self-concept, or academic aspirations (Marsh, 1991). In addition, participation in extra-curricular and school-related activities that retard delinquency, improve psychological adjustment and commitment to high school, and promote a variety of desirable educational outcomes may be hampered by part-time work, particularly at intense levels of employment (D'Amico, 1984; Kablaoui & Paulter, 1991; Lewin-Epstein, 1981; Marsh, 1991).

We think that the zero-sum model offers a plausible theoretical explanation for why employment during high school might have a negative effect on students' educational outcomes. We also believe that-for methodological reasons-most research has only offered limited insights into this framework. One problem encountered by previous researchers involves the difficul-

Warren, LePore, & Mare

ties faced in determining the causal ordering of the variables included in empirical models, especially when those variables are measured at the same point in time and when no prior information has been obtained. If we measure hours worked per week and grades in a cross-sectional survey of students and find that those variables are associated, we cannot say which one causes the other or whether their relationship is spurious.

In an effort to get around this problem, researchers typically use longitudinal data in which schooling outcomes at time T_2 are regressed on employment and other variables at time T_1 , where T_2 and T_1 are usually separated by a year or two. Because it is implausible to suggest that future achievement affects past work habits, researchers using this approach are then better able to argue that any observed association between employment at time T_1 , and an outcome at time T_2 , after controlling for other factors as measured at time T_1 , is causal in nature.

Although we agree that there may be sustained and long-term (lagged) effects of employment at one point in time on schooling outcomes in subsequent years, the zero-sum model implies that the impact of employment should be felt in the short-term as well. Consider a hypothetical example. According to the zero-sum model, if two students take a test this Friday, the student who worked more hours in the preceding school week should get a lower grade on that test than the other student, all else being constant. The student who worked more hours may have had less time to study for the test, may have slept less, may be less committed to the educational process, or may not have been as prepared for the test in other ways. It is less clear—at least to us—how working this week might *directly* affect performance on a test 2 years later. Employment in one week should affect schooling outcomes in subsequent weeks more so than in subsequent years. Any apparent long-term effects should be seen as the product of cumulative short-term effects. Unfortunately, and again for methodological reasons, most prior analyses have only observed the effects of em-

Employment During High School

ployment on educational outcomes in subsequent years. We maintain that working probably has immediate impacts on schooling outcomes—impacts that may grow in cumulative importance over time—making it vital to measure the short-term (as well as the long-term) effects of work on school success.

It is clear that students' school performance may be affected by whether and how much they work at paid jobs. However, the opposite may be true as well. That is, students' school performance may well influence whether and how much they work. Intuitively, this makes good sense. The decision to get a job or to adjust hours worked per week is surely based on (among other things) school performance. Students who are doing poorly in school may turn to employment as an alternative avenue of achievement or fulfillment; students who are doing well might limit how much they work in the hopes of maintaining their success. Although grades are hardly a perfect or objective measure of what students have learned, they do provide a yardstick for students and parents to measure school performance. Moreover, the information provided through grades undoubtedly influences the decisions families make regarding a student's academic, extracurricular, social, and work lives. To our knowledge, no prior research has estimated a reciprocal model of the effects of employment and grades on one another, although Lillydahl (1990) and Bachman and Schulenberg (1993) speculate that causality may go both ways in the relationship between employment and schooling outcomes.

Consider another hypothetical example. If a student increases the number of hours per week that he or she works at a job, grades may suffer. If the student's grades begin to slip or if other things begin to go wrong in school, the adolescent (along with his or her parents) may decide to cut back on the hours spent at work or to quit the job altogether. Conversely, poor grades might reinforce the student's lack of commitment to school, in which case he or she may decide to increase the number of hours worked per week. Either way, if we wish to under-

Warren, LePore, & Mare

stand the relationship between employment during high school and schooling outcomes, then we need to appreciate the fact that the relationship between these variables may be more complicated than has been considered in prior research.

To summarize, methodological considerations have led researchers to estimate models of the relationship between employment and academic success that diverge from common-sense notions of how employment might actually affect schooling outcomes. These models ignore the fact that employment may have both short-term and long-term effects on schooling outcomes, and none of the work in this area explicitly examines the ways in which employment and school performance might simultaneously influence one another. We contend that in order to adequately describe the relationships between employment and grades or other outcomes, researchers need contemporaneous measures of those variables. That is not to say, however, that we advocate the use of cross-sectional data for this purpose. As we will show in our analyses, longitudinal data are necessary to model the reciprocal relationship between employment and grades.

NELS88

We analyzed data from NELS88, a longitudinal survey of the eighth-grade student cohort of 1988. In the base year, the sample included approximately 25,000 randomly selected students in 1,000 public and private schools across the United States. In addition to the data collected from student interviews, NELS88 contains information from parents, school administrators, teachers, and student transcripts. The initial student cohort has been followed-up on three occasions, in 1990, 1992, and 1994. Students who dropped out of school between survey waves were also interviewed, and for each follow-up the sample was "freshened" with new sample members in order to make the first and second follow-ups cross-sectionally repre-

Employment During High School

sentative of 1990 sophomores and 1992 seniors, respectively.

Our primary outcome variable of interest, students' senior year grades in academic courses, is derived from transcript data that were compiled after the 1992 NELS88 follow-up. We have only included students' courses that were graded in such a way that 4.0 represents an "A" and 0.0 represents an "F" (only a small percentage of courses were graded using alternate systems, such as "pass/fail"). Using this 0-4 scale, we averaged across students' courses in grade 9 and separately in grade 12 to arrive at students' grade point average (GPA) in those 2 years. On the basis of descriptions of courses in the NELS88 second follow-up transcript data codebook (U.S. Department of Education, 1995), we labeled courses as either *academic* or *nonacademic*¹. In grade 10, we included separate measures of students' ninth-grade GPA in academic courses and nonacademic courses, whereas in grade 12 we were only concerned with students' GPA in academic courses.

In the sophomore and senior year surveys, students were asked about their employment status and about how many hours they worked per week. Specifically, in grade 10, students were asked, "Are you currently employed or have you ever been employed?" In grade 12, students were asked, "Have you ever worked for pay, not counting work around the house?" Despite differences in question wording and response options, we were able to determine whether students were currently employed at the time of each survey. That is, unlike prior researchers, we considered whether students were employed at the time of their interview instead of whether they were ever employed during the school year.

In grade 10, students were subsequently asked, "How many hours do/did you usually work a week on your current or most recent job?" Likewise, in grade 12 students were asked, "How many hours do/did you usually work each week on your current or most recent job during this school year?" Again, despite differences in the phrasing of the questions and in the available

Warren, LePore, & Mare

response options, we were able to determine how many hours per week students usually worked per week if they were employed. Because the NELS88 variables which represent hours worked per week are categorical, we constructed continuous hours worked per week variables by recoding these variables through assigning of the midpoint values for each categorical range.

Achievement tests were administered to students in eighth grade and then again in their sophomore and senior years of high school. The achievement test scores administered in NELS88 were scaled using item response theory (IRT) techniques, and were constructed in such a way that scores were comparable across survey waves (National Center for Education Statistics, 1994). In addition, information regarding students' track placements, family and social backgrounds, school social contexts, and educational aspirations was available, often from multiple survey waves. The NELS88 data are better suited to this type of analysis than HS&B or other comparable surveys because of the more recent collection of the interviews and the completeness of the information gathered.

Sample Selection Criteria and Weighting

We made use of data from the 1990 and 1992 sophomore and senior year follow-ups, and initially restricted our analyses to cases in which students were in-school and in-grade in 1990, their sophomore years, and did not drop out by their senior years.² In addition, we omitted cases in which students listed their race/ethnicity as something other than Black, White, or Hispanic, or did not report how many hours they worked per week in grades 10 or 12. We refer to this group of 13,965 cases as the "full" sample.

To approximate population characteristics and to account for panel attrition over time, users of the NELS88 data must weight their sample by one of the many weights provided by

Employment During High School

the National Center for Education Statistics in the NELS88 data file (U.S. Department of Education, 1990). In our analyses, we used F2TRP1WT, which is to be used for producing weighted student panel statistics when data from the 1990 and 1992 survey waves are combined with transcript data in the analyses. To adjust our weights in such a way as to have standard errors reflect the actual sample size (as opposed to the size of the reference population), we divided the weight for each case by the sample mean of F2TRPIWT before weighting. Also, because NELS88 employed a cluster sampling design, and because commonly available statistical software packages assume that data were collected through simple random sampling, we also adjusted each weight in such a way as to correct for design effects. Specifically, after dividing each weight by its mean, we further divided each value by 2.67, the mean design effect across variables (U.S. Department of Education, 1995). After weighting, our full sample of 13,965 cases was equivalent to a simple random sample of 4,612 cases and our tests of statistical significance reflected a sample of this size.

Descriptive Statistics

In Table 1, we describe students' employment activities in grades 10 and 12, separately by several demographic characteristics. About 1 in 4 students were employed at the time of their survey in grade 10 and roughly half were employed at the time of their survey in grade 12. These estimates are low compared to those of Lewin-Epstein (1981) or Lillydahl (1990). This is because we report the percentage of students who were employed at the time of their interview, whereas others report the percentage of students who worked during a given school year. In tenth grade, about 17% of students worked more than 15 hrs/week, whereas in twelfth grade, that figure had increased to almost 30%.

The next sections of Table 1 compare the employment activities of boys and girls; Blacks, Hispanics, and non-Hispanic

	Full sample	Employment in grade 10				Employment in grade 12			
		Not employed	1 to 15 hr/week	>15 hr/week	Hr/week if employed, mean (SD)	Not Employed	1 to 15 hr/week	>15 hr/week	Hr/week if employed, mean (SD)
Nominal N	13,965	10,423	1,273	2,269		7,126	2,846	3,993	
Design effect-adjusted N	4,612	3,424	394	794		2,264	981	1,367	
Full sample	100%	74.2%	8.6%	17.2%	15.9 (10.3)	49.1%	21.3%	29.6%	17.6 (8.9)
Sex									
Boys	2,262	73.2%	7.6%	19.1%	17.5 (11.1)	52.4%	17.0%	30.7%	19.0 (9.4)
Girls	2,351	75.2%	9.4%	15.4%	14.3 (9.2)	46.0%	25.4%	28.6%	16.3 (8.3)
Race									
Whites	3,485	72.0%	9.4%	18.6%	15.8 (10.3)	45%	23.8%	31.3%	17.3 (8.7)
Blacks	517	83.5%	4.2%	12.3%	19.0 (11.6)	68.3%	10.8%	20.9%	19.5 (10.4)
Hispanics	393	81.1%	5.7%	13.1%	15.8 (9.7)	56.6%	14.1%	29.3%	19.3 (8.7)
Community size									
Urban dweller	1,159	75.6%	8.2%	16.2%	15.5 (9.9)	50.4%	20.1%	29.5%	17.7 (9.2)
Not urban	3,418	73.6%	8.7%	17.6%	16.1 (10.4)	48.6%	21.6%	29.7%	17.5 (8.8)

Employment During High School

Table 1 (continued)
Employment Status and Hours Worked Per Week in Grades 10 and 12, by Sociodemographic Characteristics

	Full sample	Employment in grade 10				Employment in grade 12			
		Not employed	1 to 15 hr/week	>15 hr/week	Hr/week if employed, mean (SD)	Not Employed	1 to 15 hr/week	>15 hr/week	Hr/week if employed, mean (SD)
Curriculum track, grade 12									
College preparatory	2,133	75.1%	9.3%	15.5%	14.7 (9.9)	50.3%	25.7%	24.0%	15.5 (8.1)
General	1,572	73.9%	9.0%	17.1%	15.9 (10.5)	47.3%	19.5%	33.2%	18.8 (9.3)
Vocational	517	69.6%	5.7%	24.7%	19.1 (10.2)	41.0%	15.0%	44.0%	20.2 (8.7)
Don't know	174	76.5%	6.4%	17.0%	15.9 (9.1)	60.9%	13.4%	25.7%	19.6 (8.4)
High school drop out									
% Who dropped out before grade 12	5,256	5.3%	1.5%	7.5%	-	-	-	-	-

Note. Sample restricted to cases in which students were in-school and in-grade in grade 10, did not drop out before grade 12 (except for the line above pertaining to dropouts), were either Black, White, or Hispanic, reported their gender, and reported how many hours they worked per week in grades 10 & 12. The data are weighted in such a way that standard errors reflect the actual (unweighted) sample size and adjust for design effects. Specifically, in the full sample we initially adjusted the weight $E2TRP1WT$ such that $NEWWEIGHT = (E2TRP1WT/178.3898)2.671$.

Warren, LePore, & Mare

Whites; city dwellers and non-city dwellers; and students in different curriculum tracks. Most prior research has shown that boys are more likely than girls to be employed and that employed boys tend to work more hours per week than employed girls (Barone, 1993; Greenberger & Steinberg, 1983; Lewin-Epstein, 1981; Light, 1994; Lillydahl, 1990; Mortimer, Finch, Owens, & Shanahan, 1990; Yamoor & Mortimer, 1990). In contrast, our data show few differences between the employment activities of boys and girls. We believe that the discrepancy between our findings and those of prior observers has to do with the recency of our data; after about 1980 girls have been about as likely to be employed as boys.

Table 1 reveals racial differences in employment activity. In both years, and consistent with prior research (Ahituv, Tienda, Xu, & Hotz, 1994; Coleman, 1984; D'Amico, 1984; Gottfredson, 1985; Kablaoui & Paulter, 1991; Lewin-Epstein, 1981; Light, 1994; Michael & Tuma, 1984), Blacks and Hispanics were less likely than non-Hispanic Whites to be employed. However, among employed students, Blacks appear to have worked more hours per week than non-Hispanic Whites in grade 10 and Blacks and Hispanics each appear to have worked more than Whites in grade 12. This is an intriguing finding and an important issue worthy of further study.

In addition to these demographic differences in employment, students who lived in cities (defined as communities of more than 50,000 people) in grade 10 differ little from other students in their employment activities. However, employment intensity does appear to vary with students' twelfth-grade curriculum track. Students in the vocational track in twelfth grade were more likely than students in the college preparatory or general tracks to work more than 15 hr/week in grade 10, and the same was true in grade 12. Likewise, among employed students, those in the vocational track worked more hours per week. In grade 12, for example, employed vocational track students worked an average of about 5 more hours per week than

Employment During High School

employed college preparatory track students.

Finally, Table 1 suggests a curvilinear relationship between employment intensity and the chances that students dropped out between grades 10 and 12 (solely for this line of this table we have temporarily reintroduced dropouts into our sample). That is, students who did not work in grade 10 were more likely to drop out of school before grade 12 than students who worked between 1 hr. and 15 hr/week, whereas students who worked more than 15 hr/week were most likely to have dropped out. Although we exclude students who dropped out before the senior-year interview from the rest of our analyses, we see this as an important finding. It is true, as some have feared, that students who work many hours per week are more likely to drop out of high school. However, the more interesting finding is that students who worked between 1 hr. and 15 hr/week were especially *unlikely* to drop out.

In our analyses of the relationship between employment and senior year grades, we control for students' family socioeconomic status, numbers of siblings, family structure, sophomore year grades, achievement test scores, educational aspirations, reading and mathematics coursework, race/ethnicity, sex, urban residence, and curriculum track, all as measured prior to grade 12. In addition, we control for zip-code-level employment rates for 16- to 19-year-old high school students and for 16- to 19-year-old high school graduates. These rates are derived from the 1990 Census and were matched to the records in the private-release version of the NELS88 data. For the remainder of our analyses, we only include cases with no missing data on any of the measures that we use in our analyses. In Table 2, we compare the full sample to our "analysis sample." There is a remarkable degree of similarity when comparing the means and standard deviations of the variables of the cases in the full sample to the cases included in the analysis sample, suggesting few obvious problems with the sample selection procedures employed.

Within the analysis sample, we compare students who did not work to those who worked 15 or fewer hours per week and those who worked more than 15 hr/week. In Table 2, asterisks indicate whether differences between groups were significant at the 0.05 and 0.01 levels. The first row of Table 2 shows that students who worked between 1 hr. and 15 hr/week (in either grade 10 or grade 12) came from more advantaged family backgrounds, as expressed by the standardized tenth-grade SES composite variable (consisting of parents' educational levels, parents' occupations, and family income) than students who either did not work or who worked more than 15 hrs/week. However, Table 2 also shows that these students were not more likely to live in 2-parent households or to have fewer siblings.

Students who worked between 1 hr. and 15 hr/week in grade 10 also had higher grade point averages in academic and non-academic courses in grade 9 and higher test scores in reading and mathematics in both grade 10 and grade 12 than students who either did not work in grade 10 or who worked more than 15 hr/week in that year. At the same time, students who worked between 1 hr. and 15 hr/week in grade 12 had the lowest grade point averages and test scores in both years. In general, students' grades and test scores are highest when they are employed, but only when they work fewer than 15 hr/week.

To assess educational aspirations, we make use of an item that indicates how confident students were in grade 10 that they would attend college. In both years, students who worked more than 15 hr/week had the lowest levels of confidence, whereas students who worked between 1 hr. and 15 hr/week had the highest levels of confidence that they would attend college. Note that Table 2 reveals little connection between coursework in English or mathematics and employment. Finally, Table 2 shows that students' employment intensity is positively related to local (zip-code-level measures) employment rates for 16- to 19-year-old high school students and graduates, suggesting that labor market conditions might influence students' decisions

Employment During High School

Table 2
Means and Standard Deviations of Variables by Employment Intensity in Grades 10 and 12

	Employment in grade 10			Employment in grade 12				
	Full sample	Analysis sample	Not employed	1 to 15 hr/week	>15 hr/week	Not Employed	1 to 15 hr/week	>15 hr/week
Nominal N	13,965	7,824	5,830	745	1,249	3,804	1,732	2,288
Design effect-adjusted N	4,612	2,930	2,154	274	502	1,362	664	904
	<i>Mean</i>							
	<i>(Standard Deviation)</i>							
Family SES in grade 10 (FISES)	0.07 (0.75)	0.07 (0.73)	0.07 (0.75)	0.23 (0.74)**	0.00 (0.65)	0.07 (0.78)	0.20 (0.71)**	-0.01 (0.66)*
Sibship size (FIS93A, FIS93B)	1.44 (1.25)	1.41 (1.26)	1.40 (1.28)	1.48 (1.19)	1.43 (1.22)	1.39 (1.28)	1.41 (1.23)	1.44 (1.25)
Father in household in grade 10? (FIS92A)	0.70 (0.46)	0.74 (0.44)	0.74 (0.44)	0.77 (0.42)	0.72 (0.45)	0.74 (0.44)	0.76 (0.43)	0.72 (0.45)
GPA in non-academic classes, grade 9 (transcript data)	2.68 (0.77)	2.76 (0.75)	2.77 (0.74)	2.86 (0.67)	2.66 (0.78)**	2.76 (0.76)	2.90 (0.68)**	2.65 (0.75)**
GPA in academic classes, grade 9 (transcript data)	2.12 (0.84)	2.18 (0.82)	2.19 (0.83)	2.35 (0.80)**	2.06 (0.77)**	2.17 (0.84)	2.37 (0.79)**	2.07 (0.78)**
Reading achievement test, IRT (F12XRIRR)	31.71 (9.77)	32.29 (9.52)	32.14 (9.67)	34.91 (8.65)**	31.51 (9.11)	32.11 (9.82)	34.50 (9.00)**	30.94 (9.16)**
Math achievement test, IRT (F12XMIRR)	45.17 (13.32)	45.95 (13.08)	45.54 (13.11)	49.57 (12.46)**	45.72 (13.02)	45.48 (13.42)	49.19 (12.26)**	44.29 (12.76)*
Proportion very likely to go to college (FIS64B)	0.55 (0.50)	0.56 (0.50)	0.56 (0.50)	0.64 (0.48)*	0.51 (0.50)*	0.55 (0.50)	0.64 (0.48)**	0.50 (0.50)*

Table 2 (continued) Means and Standard Deviations of Variables by Employment Intensity in Grades 10 and 12									
	Full sample	Analysis sample	Employment in grade 10			Employment in grade 12			
			Not employed	1 to 15 hr/week	>15 hr/week	Not Employed	1 to 15 hr/week	>15 hr/week	
Nominal <i>N</i>	13,965	7,824	5,830	745	1,249	3,804	1,732	2,288	
Design effect-adjusted <i>N</i>	4,612	2,930	2,154	274	502	1,362	664	904	
	<i>Mean</i>								
	<i>(Standard Deviation)</i>								
Coursework in math, grades 8-10 (FIS22A-J)	1.48 (1.55)	1.53 (1.56)	1.55 (1.59)	1.55 (1.43)	1.47 (1.47)	1.53 (1.55)	1.65 (1.72)	1.45 (1.44)	
Coursework in English, grades 8-10 (FIS24A)	1.14 (0.92)	1.12 (0.92)	1.12 (0.92)	1.15 (0.92)	1.11 (0.93)	1.13 (0.93)	1.14 (0.91)	1.10 (0.93)	
Proportion White (FIRACE)	0.76 (0.43)	0.77 (0.42)	0.76 (0.43)	0.83 (0.38)**	0.83 (0.38)**	0.71 (0.45)	0.84 (0.37)**	0.82 (0.39)**	
Proportion male (FISEX)	0.49 (0.50)	0.47 (0.50)	0.46 (0.50)	0.45 (0.50)	0.53 (0.50)**	0.50 (0.50)	0.40 (0.49)**	0.49 (0.50)	
Proportion in college track (FISEX)	0.49 (0.50)	0.48 (0.50)	0.49 (0.50)	0.51 (0.50)	0.42 (0.50)**	0.51 (0.50)	0.55 (0.50)	0.39 (0.49)**	
Proportion in communities with 50,000+ people (FIC5A)	0.25 (0.44)	0.26 (0.44)	0.26 (0.44)	0.26 (0.44)	0.26 (0.44)	0.27 (0.45)	0.26 (0.44)	0.25 (0.43)	
Zip-code-level employment rate, 16- to 19-year-old high school students	38.85 (12.56)	39.49 (12.28)	38.42 (12.45)	41.55 (10.99)**	42.93 (11.41)**	37.35 (12.32)**	41.42 (12.32)**	41.30 (11.66)**	
Zip-code-level employment rate, 16- to 19-year-old high school graduates	71.57 (18.99)	72.01 (18.47)	71.07 (18.90)	74.92 (15.98)**	74.43 (17.57)**	70.68 (19.27)	73.66 (17.60)**	72.79 (17.76)**	

Table 2 (continued)
Means and Standard Deviations of Variables by Employment Intensity in Grades 10 and 12

	Full sample	Analysis sample	Employment in grade 10			Employment in grade 12		
			Not employed	1 to 15 hr/week	>15 hr/week	Not Employed	1 to 15 hr/week	>15 hr/week
Nominal N	13,965	7,824	5,830	745	1,249	3,804	1,732	2,288
Design effect-adjusted N	4,612	2,930	2,154	274	502	1,362	664	904
<i>Mean</i>								
<i>(Standard Deviation)</i>								
Zip-code-level employment rate, 16- to 19-year-old high school graduates	71.57 (18.99)	72.01 (18.47)	71.07 (18.90)	74.92 (15.98)**	74.43 (17.57)**	70.68 (19.27)	73.66 (17.60)**	72.79 (17.76)**
GPA in non-academic classes, grade 12 (transcript data)	2.84 (0.77)	2.88 (0.76)	2.88 (0.77)	3.02 (0.69)**	2.79 (0.75)**	2.88 (0.78)	3.02 (0.68)**	2.77 (0.77)**
GPA in academic classes, grade 12 (transcript data)	2.20 (0.82)	2.23 (0.82)	2.24 (0.83)	2.38 (0.80)**	2.13 (0.79)**	2.23 (0.84)	2.42 (0.77)**	2.10 (0.80)**

Note. Analysis sample restricted to cases in which students were in-school and in-grade in grade 10, did not drop out of school before grade 12, were either Black, White or Hispanic, reported their gender, reported how many hours they worked per week in grades 10 and 12, and had no missing data on variables in this table. The data are weighted in such a way that standard errors reflect the actual unweighted sample size and adjust for design effects. Specifically, for the analysis sample we adjusted the weight F2TRP1WT such that NEWWEIGHT = [(F2TRP1WT/172.4786)/2.67]. Separate significance tests compare students who work 1-15 hrs/week and students who work more than 15 hrs/week to students who are not employed. Significance levels * = $p < 0.05$, ** = $p < 0.01$.

Warren, LePore, & Mare

about whether and how much to work.

The results in Table 2 largely support the hypothesis that intense work involvement is associated with lower grades. However, although the table does not present estimates of the effects of grades on work, the results are also consistent with the view that students who do well in school are more likely to work, but less likely to work many hours per week. That is, if we were to contend that doing well in school causes students to work (but not too much), these data would not disagree. Although the results in Table 2 demonstrate that there is a nonlinear relationship between employment intensity and grades, they do not tell us anything about the direction of causality in this relationship.

The Traditional Regression Model

To begin, we estimate the traditional sort of model that has been featured in nearly all prior research. In this model, senior-year grades in academic courses are a function of employment in grade 10, sophomore year grades in academic and non-academic courses, a vector of other control variables (SES, family structure, number of siblings, reading and mathematics achievement test scores, aspirations, coursework in reading and mathematics, race, sex, curriculum track, and urban residence), and a random disturbance. This analysis serves two purposes. First, we are able to compare the results of our traditional analyses with those of prior research. Second, in the end we will be able to contrast the substantive findings from the traditional models with those from our preferred models (described below).

We estimate the traditional model using data from the full analysis sample,³ and present the results in Table 3. There are no direct effects of employment status or hours worked per week in the sophomore year on grades in senior-year academic courses. The association between employment in grade 10 and

Employment During High School

Table 3
*Regression of Senior-Year Grades in Academic Courses on
 Sophomore Year Employment and Other Variables*

	Coefficient	Standard Error	<i>t</i> -statistic
Employed in grade 10	0.028	(0.073)	(0.383)
Hours worked per week in grade 10	-0.003	(0.004)	(-0.698)
White	0.105	(0.048)	(2.199)
Male	-0.198	(0.038)	(-5.150)
Family SES in grade 10	0.020	(0.029)	(0.700)
Sibship size	0.004	(0.015)	(0.292)
Father in household in grade 10?	0.078	(0.043)	(1.808)
GPA in non-academic courses, grade 9	0.048	(0.033)	(1.436)
GPA in academic courses, grade 9	0.480	(0.034)	(14.165)
Reading achievement test, IRT	0.005	(0.003)	(1.713)
Math achievement test, IRT	0.006	(0.002)	(2.752)
Believe they are very likely to go to college	0.048	(0.042)	(1.131)
Coursework in math, grades 8-10	0.009	(0.016)	(0.532)
Coursework in English, grades 8-10	-0.005	(0.028)	(-0.192)
College preparatory track in grade 12	0.039	(0.042)	(0.933)
Lives in community with more than 50,000 people	-0.035	(0.043)	(-0.808)
Constant	0.504	(0.106)	(4.748)
R^2	0.47		

Note. Design effect-adjusted $N = 2,930$; nominal $N = 7,824$. See Table 2 for description of sample selection and weighting procedures.

Warren, LePore, & Mare

grades 2 years later can be fully accounted for by controlling for family background, sophomore-year grades, and so forth.⁴ Were we to stop here, as most research does, we would conclude that parents and educators need not be concerned with the long-term effects of employment on grades in academic courses. We have said nothing about the short-term impact of adolescent employment on those grades, however.

A Simultaneous Equations Model

To examine the long-term *and* short-term effects of work on academic achievement and the potentially reciprocal relationship between employment during high school and senior-year grades in academic courses, we estimate a different series of regression models. Figure 1 displays the basic design of our model, the key feature of which is that GPA in senior-year academic courses has a reciprocal relationship with both employment status and hours worked per week in the senior year. More specifically, senior-year GPA in academic courses is a function of senior- and sophomore-year employment, sophomore-year grades and test scores, a vector of other control variables, and a random disturbance. Both employment status and hours worked per week during the senior year are functions of senior-year GPA in academic courses, sophomore-year employment, zip-code-level employment rates and earnings, a vector of other control variables, and random disturbances.

To identify the effects of senior-year GPA in academic courses on employment status and hours worked per week in that year, it is necessary to find instrumental variables that affect senior-year GPA but do not affect employment status and hours worked per week. Conversely, to identify the senior-year GPA equation, it is also necessary to find instrumental variables that affect employment status and hours worked per week but do not affect GPA.

In the first case, we do not permit reading or mathematics

Employment During High School



Figure 1. Twelfth grade employment and senior-year grades in academic courses: A simultaneous equations model

test scores or coursework as measured in the sophomore year to directly affect employment or hours worked per week in the senior year. These restrictions are reasonable, we believe, because any effects of these variables on senior year employment are likely indirect, operating through senior-year grades. Furthermore, the associations between these variables and senior-year employment are slight, whereas the associations between these variables and senior-year grades are both positive and significant.

In the second case, we do not permit zip-code-level employment rates and earnings for 16- to 19-year-olds, as measured when students were sophomores, to affect grades in the senior year. Again, the empirical associations between these variables and senior-year grades in academic courses are extremely low, whereas their associations with the employment variables are very high. These variables might reasonably affect

Warren, LePore, & Mare

students' employment activities in their senior year, but we cannot imagine how they might directly affect students' grades.

Because of the measurement properties of employment status and hours worked per week, the model illustrated in Figure 1 is not a simple linear structural equation model. Senior-year employment status is a dichotomous variable and hours worked per week in the senior year is a continuous variable censored at zero. The censoring of the hours worked per week variable, moreover, is determined by employment status because hours worked per week equals zero if and only if a student did not work. Taken together, the employment and hours worked per week equations make up a sample selection or *Type 2 Tobit* model (Amemiya, 1985; Berk, 1983; Winship & Mare, 1992). When combined with a linear equation for senior-year GPA, the model is a complex structural equation model with limited dependent variables and dummy endogenous variables (Heckman, 1978; Maddala, 1983). See the Appendix section for details about the specification and estimation of this model.

In Table 4, we present the results of our model of the relationship between employment during high school and senior-year grades in academic courses.⁵ The table consists of three sections. In Equation 1, the dependent variable is GPA in academic courses in grade 12. In Equations 2 and 3, the dependent variables are the odds of being employed in grade 12 and number of hours worked per week in grade 12 (if employed), respectively. The coefficients for the first and third equations are linear regression coefficients, and indicate the effect of a one-unit change in the independent variables. Because Equation 2, which predicts the probability of employment, is a probit model, the coefficients express the effect of a one-unit change in the dependent variable on the predicted value of a latent standard normal variable underlying the observed dichotomous dependent variable.

As reported at the top of the column for Equation 1, we find no short-term effects of senior-year employment on senior-year

	Equation 1 Dependent variable: Senior-year grades in academic courses		Equation 2 Dependent variable: Senior-year employment status (1 = employed; 0 = not)		Equation 3 Dependent variable: Senior-year hours worked per week (given employed)				
	Coefficient	SE	t-statistic	Coefficient	SE	t-statistic			
Senior-year grades in academic courses	-	-	-	-0.013	(0.151)	(-0.089)	-0.192	(3.812)	(-0.050)
Employed in grade 12	0.209	(0.145)	(1.439)	-	-	-	-	-	-
Hr/week in grade 12 (given employed)	-0.005	(0.020)	(-0.229)	-	-	-	-	-	-
Employed in grade 10	-0.029	(0.074)	(-0.396)	0.475	(0.061)	(7.843)	-2.804	(0.588)	(-4.766)
Hr/week in grade 10	-0.002	(0.004)	(-0.386)	0.006	(0.047)	(0.124)	0.235	(0.420)	(0.560)
Non-Hispanic White	0.114	(0.038)	(3.018)	0.310	(0.052)	(5.925)	0.445	(0.545)	(0.816)
Male	-0.193	(0.033)	(-5.919)	0.132	(0.054)	(-2.431)	1.865	(0.513)	(3.631)
SES composite	0.019	(0.024)	(0.785)	-0.036	(0.036)	(-1.021)	-1.227	(0.335)	(-3.666)
Number of siblings	0.016	(0.013)	(1.257)	0.021	(0.019)	(1.128)	0.072	(0.176)	(0.407)
Father in household in grade 10	0.045	(0.037)	(1.227)	-0.026	(0.054)	(-0.485)	-0.523	(0.504)	(-1.038)
Grades in non-academic courses, grade 9	0.049	(0.028)	(1.757)	-0.015	(0.041)	(-0.361)	-0.506	(0.411)	(-1.233)

Table 4 (continued)
Structural Equation Model of the Relationship between Senior-Year Grades in Academic Courses & Employment in Grade 12

	Equation 1 Dependent variable: Senior-year grades in academic courses		Equation 2 Dependent variable: Senior-year employment status (1 = employed; 0 = not)		Equation 3 Dependent variable: Senior-year hours worked per week (given employed)				
	Coefficient	SE	t-statistic	Coefficient	SE	t-statistic			
Grades in academic course, grade 9	0.476	(0.028)	(16.800)	0.036	(0.039)	(0.921)	-0.460	(1.851)	(-0.248)
Reading Achievement test score, grade 10	0.006	(0.002)	(2.374)	(Omitted: instrument variable)		Omitted: instrument variable			
Math, Achievement Test score, grade 10	0.007	(0.002)	(3.701)	(Omitted: instrument variable)		(Omitted: instrument variable)			
Very sure to attend college in grade 10	0.049	(0.036)	(1.366)	0.030	(0.052)	(0.572)	-0.662	(0.458)	(-1.446)
Coursework in math, grade 10	-0.001	(0.014)	(-0.039)	(Omitted: instrument variable)		(Omitted: instrument variable)			
Coursework in English, grade 10	0.020	(0.023)	(0.860)	(Omitted: instrument variable)		(Omitted: instrument variable)			
College preparatory track	0.078	(0.036)	(2.209)	-0.125	(0.094)	(-1.324)	-1.546	(0.720)	(-2.146)
Urban resident	-0.047	(0.036)	(-1.288)	(0.015)	(0.005)	(2.997)	-0.910	(0.039)	(-23.309)
Employment rate, 16- to 19-year-old high school students	(Omitted: instrument variable)			0.012	(0.002)	(5.785)	-0.000	(0.019)	(-0.022)

Warren, LePore, & Mare

grades in academic courses. Consistent with the results described in Table 3, employment status and hours worked per week in grade 10 also have no significant effects on senior-year grades in academic courses. That is, when holding all else constant, employment status and hours worked per week have no significant short-term or long-term effects on students' grades in academic courses in their senior year. As in the model described in Table 3, senior-year grades are primarily a function of earlier grades, gender, race/ethnicity, achievement test scores, and curriculum track.

Equations 2 and 3 reflect the impact of senior-year grades in academic courses (and other variables) on employment status and hours worked per week, respectively. From Equation 2 we see that senior-year grades in academic courses have no significant effect on students' chances of being employed, and from Equation 3 we see that senior-year grades in academic courses have no significant effect on hours worked per week among employed students. Whether students work in their senior year appears to depend on whether they worked in their sophomore year, their gender and race/ethnicity, and the local availability of jobs for high school students. How intensively students work as high school seniors (given that they are employed) depends on prior work activities,⁶ gender, SES, curriculum track, and urban residence. Senior-year grades in academic courses appear to have no effect of students' decisions about whether and how much to work.

Conclusions

In the course of our research, we have frequently listened to high school teachers who are concerned about the school performance of their students—students that are often characterized as working too much at paid jobs. It is their perception that students who work intensively are more frequently tired and are less prepared to handle the demands that their schoolwork

Employment During High School

places on them. Although teachers' perceptions may well be accurate, our evidence suggests that intense employment does not translate into lower grades in academic courses. In accord with some prior evidence, our results indicate no long-term penalty for intensive employment (Bachman & Schulenberg, 1993; Schoenhals, et al., 1998; Steinberg, et al., 1993). Perhaps more surprisingly, our results show no short-term consequences, either.

We have argued that prior research on the relationship between students' employment and their academic outcomes has often been inadequate in important ways, and we have attempted to overcome these inadequacies in our own analyses. First, we argued that the immediate, short-term effects of employment on schooling outcomes are at least as important as the long-term effects. That is, we have maintained that the repercussions of working many hours in a week will be felt in subsequent weeks at least as much as in subsequent years. Unfortunately, and primarily for methodological reasons, prior research on this topic has only examined the effects of employment at one point in time on schooling outcomes much later, often years later in our analyses, we overcame these methodological difficulties by estimating a multiple-equations model from which we observed the effects of employment in both grades 10 and 12 on grades in the senior year.

Second, we asserted that employment and grades might affect each other simultaneously. To put it another way, we argued that although employment might affect grades, grades might also affect employment. To demonstrate this, we specified a model in which we could identify reciprocal effects. As it turns out, we found no important long-term or short-term effects of employment on grades; nor did we find effects of grades on employment activities in the senior year.

Our descriptive analyses (presented in Tables 1 and 2) show quite clearly that students who work intensively are different from other students in important ways. They have lower

Warren, LePore, & Mare

grades, lower SES backgrounds, and lower achievement test scores; they are also least optimistic about their chances of going to college and are under-represented in the college track. The fact that high school seniors who work intensively tend to do less well in school has been taken as *prima facie* evidence that intense employment causes poorer school performance. The obvious policy implication is to enact more stringent teenage employment regulations and to enforce more effectively existing regulations.

Our results do not support this traditional interpretation of the association between employment intensity and school performance. There are preexisting differences between intensively employed seniors and other seniors that account for this association. Students who are from higher SES backgrounds, who have better grades and test scores as sophomores, who have higher educational aspirations, and who are placed in the college track are more likely to do well in school as seniors, and are also less likely to work intensively.

How can we interpret these results? It may be that students who do not perceive that they will be academically successful and who are not confident about their chances of going on to college turn to employment as a more fruitful way to spend their time and energy. These students may perceive that paid employment is more promising as an avenue of success, in both the short- and long-term. For them, working a lot now may seem like the best way to prepare for life after high school. Given the importance of SES, sex, and race/ethnicity in our results, this process of self-selection may not be entirely meritocratic. In any case, our results suggest that policymakers who share teachers' concerns about intensively employment students should focus more on the mechanisms through which some students come to see work-and not their education-as the most fruitful way to spend time and energy.

The present findings can only be generalized to the population of students who remain in school until grade 12. This is a

Employment During High School

weakness, of course, and the obvious next step is to estimate a model in which the impact of employment on dropping out is considered as well. Another obvious weakness in our analyses is our inattention to the ways in which our findings might differ by race/ethnicity, sex, and type of employment. We would like to pursue issues raised by McNeal (1997) in his recent article, but data and space limitations prevent us from going in that direction for now. Although we estimate separate models (the results of which are available from the authors) for boys and girls and for non-Hispanic Whites and Blacks and Hispanics, these models do a less than comprehensive job of addressing the role of race/ethnicity or sex in the relationship between student employment and schooling outcomes. Furthermore, and due primarily to data limitations, our results say nothing about how the *type* of work that students do might be related to schooling outcomes. Clearly, there is a great deal of research to be done. Although we believe that our work will serve to point others in more useful directions, we do not claim that ours is the final word.

We find no compelling evidence that employment affects grades in academic courses—at least among those students who do not drop out. However, we have said nothing about how employment during high school might affect students' achievement test scores, psychological characteristics, preparedness for their careers, attitudes toward work, levels of responsibility, longer-term occupational or educational attainment, and other outcomes. We find little evidence to support many people's concern that students are working too much and that this is hurting their grades. This does not mean that working too much has no effect on how much students learn or on other educational outcomes.

Appendix

Our simultaneous equations model can be written as fol-

Warren, LePore, & Mare

low: For the i th student, let G_i denote senior-year GPA in academic courses, H_i denote hours worked per week during the senior year, E_i denote a dichotomous variable that equals one if a student was employed in the senior year and zero otherwise; X_{γ_i} denote the γ th exogenous variable that affects employment status, hours worked per week, and GPA; W_{li} denote the l th exogenous variable that affects employment status and hours worked per week but not GPA; and V_{mi} denote the m th exogenous variable that affects GPA but not employment status or hours worked per week. In addition, let E_i^* denote a latent continuous variable for employment status that is linked to observed employment status E_i as follows:

$$E_i = 1 \text{ if } E_i^* > 0$$

$$E_i = 0 \text{ if } E_i^* \leq 0.$$

Let H_i^* be a latent continuous variable for hours worked per week that is linked to observed hours worked per week as follows:

$$H_i = H_i^* \text{ if } E_i = 1$$

$$H_i = 0 \text{ if } E_i = 0.$$

Then the equations of the model are

$$G_i = \beta_0^G + \beta_1^G E_i + \beta_2^G H_i + S_k \gamma_k^G X_{ki} + S_m \mu_m^G V_{mi} + \eta_i^G \quad (1)$$

$$E_i^* = \beta_0^E + \beta_1^E G_i + S_k \gamma_k^E X_{ki} + S_l \eta_l^E W_{li} + \eta_i^E \quad (2)$$

$$H_i^* = \beta_0^H + \beta_1^H G_i + S_k \gamma_k^H X_{ki} + S_l \eta_l^H W_{li} + \eta_i^H \quad (3)$$

Employment During High School

where the β , γ , μ , and δ values are parameters and η_i^G , η_i^E , and η_i^H are disturbances that are assumed to follow a trivariate normal distribution. Given this specification, Equation 1 is a linear model with a dummy endogenous variable E , a censored endogenous variable H , and exogenous variables X_k and V_m ; Equation 2 is a probit equation with a continuous endogenous variable G and exogenous variables X_k , and W_l and Equation 3 is a tobit equation with a continuous endogenous variable G and exogenous variables X_k and W_l . The exogenous variables V_m which are included in Equation 1, but omitted from Equations 2 and 3, are the instrumental variables that enable us to identify the effects of senior-year GPA in academic courses on employment status and hours worked per week (β_1^E and β_1^H). Similarly, the exogenous variables W_l , which are included in Equations 2 and 3, but are omitted from Equation 1, are instrumental variables that enable us to identify the effects of senior-year employment status and hours worked per week on senior-year GPA (β_1^G and β_2^G).

We estimate the model using a nonlinear instrumental variables procedure implemented in the program HotzTran (Avery, Hansen, & Hotz, 1983; Avery & Hotz, 1985). This method of estimation yields unique, consistent estimates that incorporate all of the over-identifying restrictions that are contained in the structural model. In practice, we estimate the structural parameters of Equations 1, 2, and 3 by solving these equations for their reduced forms, that is, by expressing each dependent variable as a function of the exogenous variables only; estimating the reduced form equations using HotzTran subject to the over-identifying restrictions implied by the model; and solving for the structural parameters and standard errors from the reduced form parameter estimates and standard errors, respectively.⁸

Notes

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Warren, LePore, & Mare

tance from Duncan Chaplin, Eric Grodsky, Robert Hauser, Carolyn Liebler, Adrian Raftery, Thomas Richardson, Jeffrey Owings, and several anonymous reviewers. The opinions expressed herein, however, are those of the authors.

¹The variable F2RCSSC classifies students' courses in to one of 54 major categories. We have defined the following categories of courses as academic in nature (the first two digits of the code for F2RCSSC is in parentheses): Area and Ethnic Studies (05); Education (13); Engineering (14); Foreign Languages (16); Allied Health (17); Health Sciences (18); Law (22); Letters (23); Liberal/General Studies (24); Library and Archival Sciences (25); Life Sciences (26); Mathematics (27); Multi/Interdisciplinary Studies (30); Philosophy and Religion (38); Theology (39); Physical Sciences (40); Science Technologies (41); Psychology (42); and Social Sciences (45). All other courses are labeled "nonacademic."

²We are unable to say how our findings are affected by the omission of students who dropped out before grade 12, though we readily acknowledge the important interplay between employment opportunities and the decision to end formal schooling faced by many youngsters (McNeal, 1997). As we describe below, the model we estimate is already quite complex, such that adding a sample selection equation to our model would be difficult. In the end, our findings are generalizable only to the population of students who do not drop out.

³We also estimated separate models using data for men, for women, for non-Hispanic Whites, and for Blacks and Hispanics. The results of these models are available from the authors.

⁴We also estimated these models using a less restrictive sampling scheme; the results of those models are not presented here. In those models, we did not drop cases with missing data on independent variables. Instead, we imputed variable means and included dummy variables to indicate that such imputations had taken place. The results of those models are also substantially the same as the data presented here.

Employment During High School

⁵Again, we also estimate separate models for boys, for girls, for non-Hispanic Whites, and for Blacks and Hispanics. These results are available from the authors.

⁶The large and statistically significant negative effect of tenth-grade employment status on hours worked per week in grade 12 may seem paradoxical. The coefficient seems to imply that among employed seniors, those who also worked in grade 10 typically work 2.8 fewer hours per week. However, this negative coefficient must be offset by the positive effect of hours worked per week in grade 10. Among employed seniors, Equation 3 suggests that those who worked and who worked an average number of hours per week in grade 10 will work an average number of hours per week in grade 12.

⁷We agree with McNeal (1997) that the kind of work that students do may significantly alter the impact of work intensity on schooling outcomes. However, the quality and reliability of the "kind of job" survey items in NELS88 and HS&B, for that matter, make us appropriately nervous about exploring this issue using these data.

⁸Details of the procedures used to solve for the structural parameters are available from the authors.

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**Partnerships for Career-Centered High School Reform
in an Urban School System**

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Abstract

Over the past decade, both school-to-work (STW) reforms and partnerships between schools and external change agents have become popular mechanisms for improving the educational opportunities of inner-city youth. Little research has been conducted, however, on the dynamics of such partnerships seeking career-oriented high school reform. This article uses a case-study approach to analyze the interrelationships and diverse dynamics of a partnership that brought together several career-centered high school reform initiatives in a large urban school district. We found that the initiative succeeded in regularly convening multiple partners and generating important conversations about reforming the city's failing high schools and increasing educational options for adolescent youth. However, our study also identified organizational, cultural, financial, and political conditions that severely limited the program's ability to effect change. Specific limiting factors included: tensions in the initiative's core partnership between the school system and the employment development agency, due in part to unstable leadership in the school system; the persistence of multiple and divergent high school improvement efforts; and, confusion about how school-to-work activities fit into the state-level standards and accountability system.

Over the past decade, efforts to improve high schools and education for high school-age youth have adopted “school-to-

Partnerships for Career-Centered High School Reform

work” as a key reform concept. Also known as “school-to-careers,” the “new vocationalism,” or “education through occupations,” a central premise of these efforts is that adolescents are more likely to be engaged and motivated by educational experiences that relate learning to real-world activities beyond the school walls, namely to the world of work (Grubb, 1995; Ramsey, 1995). Such activities typically involve integrating occupational content into academic curricula, and establishing work-based learning opportunities such as job-shadowing, internships, mentoring, and paid employment for teens.

Passed in 1994, the School-to-Work Opportunities Act provided substantial federal support to states and local districts for the development and implementation of school-to-work systems across the country. Administered by the National School-to-Work Office, a joint initiative of the U.S. Department of Labor and the U.S. Department of Education, numerous grants went to “intermediary organizations” charged with creating and facilitating the local partnerships among education, government, business, and community organizations necessary to establish and expand school-to-work activities. Recognizing the key role intermediaries play in bridging cultural and logistical gaps that make cross-sector partnerships difficult to create and sustain, the National School-to-Work Office established the School-to-Work Intermediary Project in fall 1998. The Project identified and disseminated activities and strategies of intermediary organizations, and established a national network to promote collective learning and sharing of best practices.

The Intermediary Project’s information about the various types of school-to-work intermediaries emphasizes strengths of different initiatives and how they fit into a larger framework for creating and managing school-community-business partnerships (Jobs for the Future & New Ways to Work, 2001). Little research, however, critically examines the partnership dynamics and overall effectiveness of intermediary organizations funded through the federal school-to-work program. In this article, we

use a case study approach to describe and analyze the context and inner-workings of one such school-to-career initiative that operated in a large, urban school district from 1996-2001.

Background

There is widespread agreement that traditionally organized comprehensive high schools have become anachronisms, no longer preparing students for the world that has changed around them (Boyer, 1983; Carnegie Forum, 1986; Goodlad, 1984; Oakes, 1985; Powell, Cohen, & Farrer 1985; Sizer, 1984). The National Association of Secondary School Principals' *Breaking Ranks* report heralded what has now become a national movement to completely rethink and restructure public education for high school age youth (NASSP, 1996). A spate of recent reports, conferences, and federal and private grants programs have carried this movement into the 21st Century with a strong show of support for high school reform (American Youth Policy Forum, 2000; Cohen, 2001; Hammack, 2000).

One of the most persistent criticisms of comprehensive high schools is that students find their classes boring and unrelated to their everyday lives or the futures they envision for themselves. This experience fosters apathy, disengagement from school, and contributes to unacceptably high dropout rates. Economic change also has promoted calls for high schools to play a larger role in preparing a greater number of students for participation in a high-skill workforce and postsecondary education (NASSP, 1996). In response, a common theme to the current high school reform movement has been the need to make high school more relevant to more students. Reform leaders have honed in on the complex web of curriculum and instruction to emphasize the integration of real-world applications and career themes into academic work, interdisciplinary and project-based activities that integrate computer and telecommunications technology, and stronger linkages between

Partnerships for Career-Centered High School Reform

course content and students' everyday lives. Strategies also include community service, work-based learning, field study, and other activities that engage students in life beyond the school walls in ways that are positive and linked with their course of study. A growing body of research shows that efforts to make high school more relevant can have positive impacts on attendance, promotion, dropout rates, and (to a lesser extent) student achievement and post-secondary enrollment (Castellano, Stringfield, & Stone, 2001; Kemple & Snipes, 2000; Legters, Balfanz, Jordan & McPartland, 2002; Plank, 2001; Stern, Dayton, & Raby, 2000). Two of the most widely discussed means for influencing these outcome variables have been the creation of small learning communities or career academies and the establishment of work-based learning experiences for students (often involving the participation of "industry advisory boards" and other types of employer involvement in the school).

Most reform approaches focused on increasing relevance in high schools call for partnerships between the school/school system and public or private organizations in the community. The importance of collaborative relationships has become a common mantra in education and social reform circles, and a general trend within our economy and society over the past two decades. In education, collaborations and networks have been promoted in relation to professional development for teachers, comprehensive school reform, parent/family involvement, integrating educational and social/health services, as well as school-to-work initiatives (Bodilly, 1998; Epstein, 2001; Little, 1993; National Commission on Teaching and America's Future, 1996; National Foundation for the Improvement of Education, 1996; Rigsby, Reynolds, & Wang, 1995; Sparks & Hirsch, 1997; Sunderman & Nardini, 1999). In 1988, Congress enacted the Educational Partnerships Act to create the Educational Partnership Program (EPP) to demonstrate the contribution of partnerships to educational reform. Thirty partnerships were funded throughout the country by the federal Office of Educational Re-

search and Improvement (OERI), and studies of a subset were conducted to identify best practices and supportive and limiting conditions.

While literature on educational partnerships tends to be highly supportive of collaborative reforms, research points to some of the challenges of creating and sustaining effective partnerships. Gray (1995), for example, cites among others challenges, institutional disincentives, historical and ideological barriers, power disparities among stakeholders, technical complexity, and political and institutional norms as potential barriers to effective alliances. In their assessment of Educational Partnership Program (EPP) grant recipients, Danzberger, Bodinger-deUriarte, & Clark (1996) found that partners were challenged to change policies and procedures in order to work together, that leadership is critical to a partnership, and that leaders who “reflect commitment to particular programs and processes may be more successful than leaders who see themselves as facilitators” (p. 2). They found that partnerships are especially challenged when attempted in highly stressed large urban school districts, but also that educational partnerships can be used to galvanize support for school reform in a community.

Research on school-to-work reforms in restructuring high schools has focused primarily on school-level efforts (see Castellano et al., 2001 for review). A common theme across at least two of these studies was the relatively subordinate and marginalized position of career and technical education with respect to the core academic program (Little, Erbstein, & Walker, 1996; Prestine, 1998). While the “image” of vocational education was found to improve somewhat through these school-based efforts, none of the schools studied had achieved successful integration of career and academic education school-wide. A third study revealed further challenges schools face in establishing work-based learning reforms (Wermuth, Maddy-Bernstein, & Greyson, 1997). Three of the four urban high schools studied had not established relationships with business or industry, even

Partnerships for Career-Centered High School Reform

though vocational education was a central component of their reform efforts. The authors cited lack of time for planning and partnership development as an important limiting factor.

While studies of school-based programs are emerging, research at the system-level on school-to-work reforms in restructuring high schools has barely begun. Ongoing federal government-funded evaluations of STW initiatives typically describe programs that ostensibly encompass an entire school system, often in the name of “systemic reform” (e.g., Hershey, Hudis, Silverberg, & Haimson, 1997), but such research has not yet probed the complex systemic issues and dynamics of multiple programs and partnerships that make up these initiatives. Examining systemic (district, state, even national) efforts to make high schooling more relevant is important for at least two reasons. First, issues such as historic cultural tensions between academic and vocational programs, as well as resources of time, staff, and funding needed to establish effective partnerships that support work-based learning, are inherently systemic and cannot be resolved at the school level. Second, the federal School-to-Work program specifically called for a systemic approach to the establishment of school-to-work initiatives in states and school districts. Intermediary organizations, described earlier, received funding for this very purpose but remain only superficially studied.

Intermediary organizations are “staffed organizations that connect schools and other youth-preparation organizations with workplaces and other community resources...” (Jobs for the Future & New Ways to Work, 2001, p. 5). According to the national framework, intermediaries serve four strategic functions: convening local leadership, brokering and/or providing services to various partners (workplaces, schools, youth, and other youth-serving organizations), ensuring the quality and impact of local efforts, and promoting policies to sustain effective practices. Descriptions of various intermediary organizations reveal that many of these organizations not only broker partner-

ships, but are collaborative entities themselves made up of two or more partnering agencies. Hence intermediary organizations offer an opportunity to examine both the role of a partnership broker, and internal partnership dynamics within the organization itself. One issue, for example, that has been identified but not yet thoroughly researched, especially in the career-focused high school reform literature, is the importance of understanding the potentially different institutional cultures of partnership members and how to bridge those differences (Ascher, 1988; Sidler, 1994).

In the following sections, we present a case study that focuses on the issues and other issues salient of high school reform, school-to-work, and educational partnerships. We analyze a systemic partnership for career-oriented high school reform that shares many characteristics of an “intermediary organization.” The strategic objectives in the particular case we consider included two fundamental outcome variables identified in the research discussed above—the dropout rate and the number of students entering post-secondary education—with reform efforts devoted to decreasing the first measure and increasing the second. The case also involved two of the most widely discussed means for influencing these outcome variables: the creation of small learning communities or career academies and the establishment of work-based learning experiences for students (involving the participation of “industry advisory boards” and other types of employer involvement in the school).

Data and Methodology

This case study sheds light on the interrelationships, diverse dynamics and effects of a partnership aimed at career-focused high school reform in a large urban school district we call “Wexford.” Qualitative data were collected from 1996-2001 through observation at schools and meetings, shadowing of stu-

Partnerships for Career-Centered High School Reform

dents, focus group discussions with teachers and students, and interviews with high school administrators, school district administrators, city government administrators involved in the school-to-work initiatives, university partners, and advisory board members from employer institutions associated with particular career academies. We also draw upon various internal documents produced or commissioned by members of the initiative management team or the Wexford Public Schools (in order to protect the confidentiality of the school system, these documents are not listed in the reference section). In a longer version of this study (Mac Iver & Legters, 2001) we analyze teacher and student surveys and high school student achievement data from Wexford over the same period (1996-2001) to ascertain outcomes of the partnership initiative related to school climate, student attitudes toward learning, student ambitions and expectations regarding postsecondary education and careers, and student achievement and attainment outcomes.

The research methodology in this dimension of the study is best characterized as “ethnographic.” Taking as our model the work of Muncey and McQuillen (1996), we sought to understand the career-centered high school reform process in Wexford through “immersion” and a “long-term time commitment” (Muncey & McQuillen, 1996, p. 299). Both authors were participant-observers within the Wexford Career Initiative (WCI) described below, serving on committees and providing various forms of technical assistance (either in program development or evaluation) over the more than five-year period of data collection. As Muncey and McQuillen (1996, pp. 299-300) emphasize, we sought “to collect data that represent[ed] various perspectives concerning an issue, various categories that [had] meaning for participants, and various occurrences that [took] place during the research period” to complement our own experiences and observations. Our holistic orientation stressed “systemic connections” among the various participants and levels of the educational system and its external relationships. We conducted interviews and collected documents to triangulate

our own experience and perspectives with those of other actors at various levels of the educational system (students, teachers, administrators, district office personnel, as well as external partners in various organizations and various positions).

Our analysis of observation and interview data (from field notes and transcripts) proceeded in an “interpretive” ethnographic tradition (Muncey & McQuillan, 1996, p. 298). We reflected on our observations, analyzed the interview data and documents, and then organized the information in a meaningful structure of categories. Some of these categories, such as institutional culture and leadership for example, were drawn from the research literature. Others, such as the tension between standards and relevance at the system level, emerged from our data. For validation of our interpretation, we gave some of those we had observed and interviewed the opportunity to react to our narrative.

This methodology admittedly has drawbacks. Single case studies, especially of complex systems, represent unique circumstances that limit the generalizability of the findings, and with our ethnographic approach we run a higher risk of the infusion of our own biases than we might using other methods. We contend, however, that this analytical interpretation of the process of career-centered high school reform in one district, based on the qualitative data collected and reflections upon it, increases the research community’s general understanding of system-level partnerships and the contexts in which those partnerships exist.

Findings

Our observations and interviews with partnership participants uncovered a common vision held by these partners that helped energize and sustain the high school reform process. At the same time, reflections on our data revealed how the partners’ differing perspectives, agendas (driven by different fund-

Partnerships for Career-Centered High School Reform

ing streams), and organizational cultures created tensions among themselves and practical obstacles to positive change. In this section, we describe the Career Initiative partners and then offer an analysis of the partnership dynamics based on our reflective interpretation of the data. After identifying both the accomplishments of Career Initiative and the impediments to reform generated by the partnership and other contextual factors, we discuss how this particular case study advances understanding of the role of external partners and intermediary organizations in the school-to-work oriented high school reform process.

Background on the Partners and Career Initiative

The Wexford Public School System

Wexford's school system, like that of other major urban centers, had suffered significantly by the mid-1980s with the departure of both the white and black middle-class for the surrounding suburban areas. Serving a population in which two-thirds of the students were eligible for free or reduced-price lunch, Wexford's per pupil expenditure was significantly lower than the statewide average, and the district's performance on state accountability measures lagged far behind other districts in the state. Numerous reform efforts, many funded by a local foundation, proliferated during the early 1990s, but did not succeed sufficiently in improving student achievement outcomes to forestall intensive scrutiny by the State Department of Education.

Though reform efforts in the city school system through the early 1990s appeared to many as scattered and diffused, movement on high school reform appeared by mid-decade to be taking on a more cohesive, focused character. The system issued a report in December 1995 outlining plans and an implementation schedule for high school reform, including (a) a clear set of standards for what graduates should know and be able to do; (b)

restructuring high schools serving the lowest achieving students into smaller learning communities; (c) a focus on professional development; (d) integrating technology into instruction; and (e) refocusing external partnerships to support students' transition to a career and/or higher education.

Although this plan was in place on paper, the Wexford school system began a period of turmoil and transition in 1996 that significantly affected the direction of high school reform in the city. First, the school system administrator who had spearheaded high school reform retired in 1996, leaving a leadership gap. Second, governance reform enacted by the state legislature in early 1997, resulting from the resolution of a city-state conflict over resources and accountability, produced an organizational and leadership transitions for the school system that continued for several years. The instability of a central district office in continual transition (with four school system leaders in as many years) was a crucial factor influencing the process by which multiple school-to-work models evolved and the Career Initiative partnership sought influence over school district policy.

Wexford Employment Development Agency

For decades the Wexford Employment Development Agency (EDA) had received government funding to provide employment training services for the city's youth. Various partnerships between the Wexford Public School System (WPS) and the EDA had existed since at least the mid 1980s. In 1994 the agency received a federal grant in partnership with the city school system to address educational and employment needs of Wexford youth in a particular empowerment zone area. Also in partnership with the school system, the agency had received a federal grant (administered by the federal School-to-Work Office) in 1995 to fund both a career academy at one of the zoned high schools and a program for out-of-school youth (dropouts) to earn their GEDs and receive career training. The partnership

Partnerships for Career-Centered High School Reform

structures of these previous initiatives provided a framework for the Career Initiative partnership.

Other Pre-existing Partnerships for High School Reform

The Career Initiative attempted to systematize a reform process that had already begun with pilot programs or “school-within-a-school” academy structures and moved towards whole-school reform (with some competing models). Wexford’s zoned high schools had previous ties to reform models such as the Coalition of Essential Schools (CES) (Muncey & McQuillan, 1996; Sizer, 1984), the National Academy Foundation (NAF) (Rosenfeld, 1991), High Schools That Work (HSTW) (Bottoms & Mikos, 1995), JROTC academies (Hanser, Elliott, & Gilroy, in press), and the Talent Development High School model (Legters, Balfanz, Jordan, McPartland, 2002). Researchers from a local university were already actively involved in high school reform within WPS, and were included within the umbrella partnership described below (though were not core partnership members).

The Career Initiative

The Wexford Career Initiative (WCI) was launched as a partnership between WPS and EDA, with EDA serving as the fiscal agent, with a federal grant that funded the first phase of the school-to-career system building in several zoned high schools within the city school system. Another grant from the state to EDA the following year allowed for expansion of the initiative to include all nine zoned high schools in Wexford. WCI’s goal of including *all city students* in its plans to promote more successful transitions to postsecondary education and/or the world of work meant nothing less than a comprehensive K-12 systemic approach. Its attention to post-secondary links led the WCI to frame itself as a K-16 systemic initiative.

The WCI consisted of three primary structural components: a series of direct grants to individual zoned high schools that

submitted proposals and budgets for school-to-career initiatives within the high schools and their feeder middle- and elementary schools; a committee system that brought individuals from EDA, WPS, and other organizations together for discussion and policy-making; and a system of technical assistance to schools for discussion, policy-making, and accomplishing their school-to-careers objectives (see Mac Iver & Legters, 2001 for a more detailed description).

Analysis of Partnership Dynamics and Their Impact on Programmatic Outcomes

The Career Initiative Partnership between WPS and EDA sought to bring representatives from various reform efforts as well as other community stakeholders (business leaders, post-secondary institution representatives, external educational service providers, etc.) together at the same table through its committee structure. The groups could all agree on the overarching goals of career-focused high school reform and supported common specific objectives (creation of small learning communities; creation of Industry Advisory Boards; preparation of students for postsecondary education; and dropout intervention, prevention, and recovery). While the different partners were drawn together by their shared goals and objectives, each partner also had its own specific agenda and patterns of operating determined by institutional cultures, particular personalities, and expectations of funding agencies. The following analysis of the particular perspective of each of the partners helps to explain some (though not all) of the obstacles encountered by the partnership in seeking to achieve high school reform.

With student outcome measures spiraling downward, increasing pressure from the State and other stakeholders, and continual flux in its high level leadership, the Wexford Public Schools entered the WCI partnership seeking to improve its public image and at the same time maintain its autonomy, mini-

Partnerships for Career-Centered High School Reform

mizing domination from outside (e.g. from the state). The funding it received from the state was woefully inadequate for the task it faced, and it was acutely aware of its need for external funding sources. Still philosophically committed to site-based management, WPS allowed each of the targeted schools to propose its own plan for how to spend WCI funds to help create a school-to-career educational structure. However, this laissez-faire attitude toward school-based proposals also was due to a leadership vacuum in WPS with respect to high school reform. Understaffed and lacking guidance, Career and Technology Education (CTE) staff within WPS were uncertain about their authority to change existing programs or start new ones and felt continually pulled away from WCI work to fulfill more immediate crises (such as helping schools write reconstitution plans for the state). In an interview, one staff member regretted that schools had not received enough guidance from WPS about how to use the grant funds more effectively to support whole school reform. Given frequent, conflicting demands and bureaucratic repercussions for failing to respond to the “tyranny of the urgent,” school-based personnel as well as central office staff often felt helpless to take the steps necessary to create fundamental change.

In comparison to WPS’s role as a beleaguered bureaucracy within the WCI partnership, the EDA could be characterized as an entrepreneurial bureaucracy—a government agency that took great pride in its aggressive pursuit of funding opportunities and its showcase programs that were widely publicized throughout the country. Though it needed to partner with the school system to receive WCI funding, it found it difficult to share leadership equitably with an organization that appeared to be more ponderous and slow-moving and almost paralyzed by bureaucratic instability and administrative logjams. When tensions occurred within the partnership over these issues, however, EDA demonstrated the ability to address the situation creatively and to adapt and change when necessary to facilitate

progress on shared goals. One EDA leader said that the WCI partnership with WPS taught her the value of “pulling back,” and working within bureaucratic constraints to action.

EDA’s funding agencies (particularly the Employment and Training Administration of the U.S. Department of Labor) shaped its priorities considerably. The requirement under some of its funding streams (e.g., Youth Opportunity Grants from ETA) for at least 30% of funds to be used for out-of-school youth may help to explain its emphasis on out-of-school youth in the WCI.

For their part, university researchers operated their whole-school reform program within a “research and development culture” influenced greatly by the requirements of their center’s funders (the U.S. Department of Education’s Office of Educational Research and Improvement—OERI) and their own long history as an educational research center. The center’s mission was both practical and research-oriented: to develop and implement whole-school reform models for at-risk students, and to conduct peer-reviewed research regarding the impact of these interventions on student achievement outcomes. Given early positive results in school climate at its first implementation sites, the research center sought to expand the implementation of its model to schools in other urban centers. Its calculation for scale-up rested, in part, on the assumption that WCI would supply technical assistance for parts of the reform model (i.e. career academies) in the pilot district that the Center was too short-handed to support. This technical assistance never materialized in the way that the research center had envisioned, however, creating tension between it and the WCI initiative. Moreover, while the university researchers encouraged co-construction, together with school system personnel, of its model in the early stages, it also needed to specify a particular reform model. While it sought to interact and cooperate with system-wide initiatives such as WCI, it needed to maintain its distinct status as well to be able to systematically evaluate the

Partnerships for Career-Centered High School Reform

results of its interventions. Hence the university model was in tension with the more laissez-faire, site-based orientation of WPS and EDA.

The other university research center, which directed a parallel project, operated out of a similar “research and development culture.” Its funding source, a Technology Challenge Grant from the Office of Educational Research and Improvement at the U.S. Department of Education, also mandated program development and evaluation reporting requirements. The direction taken by this project was also undoubtedly shaped by professional interests of project directors, which are reflected in the other projects of the Center. While it shared many goals with the other research center, the curricular program did not pursue whole-school reform and was more limited in scope.

The different strengths and perspectives of these various partners energized the high school reform process and kept it alive in the context of a school system weakened by changing leadership and unclear priorities. However, different agendas and cultures among the partners also created (or exacerbated) tensions that tended to obstruct progress toward reform. The following discussion summarizes both the accomplishments achieved under the WCI umbrella and the obstacles to reform in four areas that were expressed goals of the initiative—building small learning communities in the high schools, establishing Industry Advisory Boards and work-based learning experiences for students, increasing the number of students entering post-secondary education, and preventing students from dropping out of school.

Small Learning Communities

WCI leaders were successful in keeping small learning communities (SLCs) central to the high school reform process in Wexford during a time of considerable instability in school system leadership. As a result, all zoned schools were divided into SLCs, at least in principle. At the same time, the SLCs that

evolved did not all share similar characteristics, and it was clear that there were often significant differences between the various partners on specific organizational details. The extent to which SLCs had achieved particular goals (operating within a defined physical space and minimizing cross-traffic of students between “academies,” incorporating teachers from all core subjects within each SLC, defining a coherent sequence of courses within a particular career pathway, etc.) appeared to vary considerably, and management team members interviewed near the end of the four years appeared to still be in the process of collecting information about what was actually transpiring in the SLCs. Some SLCs appeared to form easily around an already existing career program or group of programs in the school, while others (often with the word “Humanities” or “Science” in their titles) appeared to be more of a smattering of the core academic subjects left over that did not relate to a particular career program.

Though the WCI management team recognized the need for schools to receive technical assistance in creating SLCs, it was unable to direct sufficient resources to this end. And when it did seek to direct resources towards technical assistance, the team did not appear to recognize how technical assistance offered by outside consultants and the different partners involved in WCI tended to pull schools in different directions simultaneously, a situation that worked against, rather than for, the reform process.

For example, different models for how to organize SLCs conflicted with each other, often within the same school. One issue concerned the separation of 9th graders into their own academy within the high school, a structure advocated by university researchers in the whole-school reform model. Some pre-existing SLCs (e.g., JROTC academies, NAF academies) preferred to integrate 9th graders from the beginning, and at least one school opted against forming separate 9th grade academies for other reasons. Managing such a multiplicity of mod-

Partnerships for Career-Centered High School Reform

els was a difficult task. It also was the case that pre-existing NAF academies were selective in their admission policies and had advisory boards that provided them with additional resources. This situation created tension between those who saw academies as a chance to provide the most academically motivated and gifted students with an academy experience, and those who believed that every student in a high school should benefit from the academy model. The mix of selective and non-selective academies in one school was often discouraging to those running the non-selective academies who felt they were stuck with the worst students and the least resources.

Though creation of SLCs as structures to address the anonymity problems in large urban high schools was viewed as an essential first step, significant improvement in student outcomes was unlikely to occur without substantial transformation in curriculum and instruction. Again, there were also competing models for curriculum and instruction linked to particular professional development opportunities.

The centerpiece of one program directed by university researchers was a series of project-based curricula on CD-ROMs designed to combine rigorous academic content with workplace skills, together with targeted professional development for teachers in how to implement the curriculum. This curriculum initially seemed compatible with curriculum developed by the other university research team that used similar cooperative and project-based techniques. Indeed, the two groups attempted to work together briefly. However, the two university research centers conceived related projects completely independently of each other and, when each was funded separately and simultaneously by OERI, had too much separate momentum to be able to join forces and find a way to collaborate effectively. At one point the two university-based models actually competed for scarce professional development time with the same reform-minded teachers at the same schools. Even though the WCI brought these two groups together, the lack of a strong voice

within the school system demanding coordination of efforts to meet the goals of a single effort made it easier for these groups to continue separate initiatives in the schools.

Besides these models, there were other competing professional development models. The National Academy Foundation offered its own professional development opportunities to its Wexford academies, as did High Schools That Work. At the same time, the State Department of Education was promoting professional development in “blended instruction,” that was philosophically in tune with these other curricular models but in practice much more abstract and less likely to offer teachers what they needed to immediately begin teaching in a more effective way. And while WPS sought to provide professional development opportunities acquainting teachers with the general school-to-work and career academy approach to high school education as well as more specific instructional help (e.g., how to organize a 90 minute block of instruction), the system was also mandating other uses for scarce professional development time and could not sufficiently address the depth of professional development needs. Though the WCI reported participation in all these professional development opportunities among its accomplishments, it did not appear to recognize that these activities, because of their scattered nature, were not building the systemic capacity necessary to transform learning experiences for students.

Work-based Learning and Industry Advisory Boards

EDA management team members pointed in particular to the creation of industry advisory boards (around career clusters established by the state) as another of the accomplishments achieved by the WCI. These boards were designed to help schools design appropriate career curriculum, as well as to facilitate the process of developing work-based learning opportunities for students. WPS staff noted, however, that several of those boards had been developed prior to the WCI and while

Partnerships for Career-Centered High School Reform

some expanded citywide in a positive way under the aegis of the WCI, at least one was actually weaker than it had been prior to the WCI. The WCI faced the challenge of how to balance the interests of pre-existing academies with their own advisory boards with the need for system-wide advisory boards, especially since already committed industry board members might not want or be able to expand their participation to include other schools as well. In addition, some WCI partners questioned how effective these advisory boards actually would be or whether they would be sustained by the school system once WCI funding ended.

The WCI did accomplish the selection of employers to receive the employer involvement funds (EIF) mandated as a budget item in the funding received from state and federal sources, and reported briefly on work-based learning opportunities for students and teachers provided by these employers and the industry advisory boards (e.g., job shadowing, internships, industry tours, career fairs, speakers, career resource centers). Besides reporting on the number of students engaged in work-based learning in broad categories, there did not appear to be any attempt on the part of WCI to measure the ways and extent to which the new initiatives increased the level of work-based learning already occurring within the system through various pre-existing Career and Technology programs. This was undoubtedly due to limited time on the part of management team members and the fact that the WCI funding source did not require such an analysis.

Increasing the Number of Students in Postsecondary Education

While lags in data reporting about postsecondary education make it difficult to evaluate the extent to which WCI succeeded in increasing the number of students in postsecondary education, the initiative did bring representatives from postsecondary institutions into a planning process through its Higher Education Committee designed to implement strategies for increasing

the number of students going on to postsecondary education. This committee had a number of subcommittees (postsecondary linkages, parental involvement, and K-16 communications network/partnerships). In its various summary reports, WCI identified numerous activities, including college tours, undertaken to inform students and parents about college planning. In addition, at least eight additional Tech Prep agreements were signed with local community colleges and approved by the State Department of Education. Based on our observations, however, we suspect that the primary outcome of the WCI focus on higher education was an increase in meetings among university representatives rather than increased postsecondary attendance by students.

Dropout Prevention, Intervention, and Recovery

The WCI's goals of creating small learning communities and assuring relevant, career-focused instruction in the classroom were intended as a primary means of dropout prevention. Transforming high schools into places where students wanted to be and where they could gain the skills they need for the future would theoretically keep them in school until graduation. One of EDA's particular goals throughout the duration of the WCI was institutionalizing a role for alternative programs (outside the school system itself) for high school students who had, or were at the point of, dropping out of school. The agency itself was a major provider of services to "out-of-school" youth, as well as a player in dispersing government funding to private service-providers in this area. In particular, EDA sought to recapture funding from the state (that would have gone to the school attended by the student) to follow out-of-school youth to alternative education programs outside the school system. Agency leaders identified the fact that the WCI Alternative Education committee became the school system's Alternative Education working group as one of the initiative's major accomplishments.

Partnerships for Career-Centered High School Reform

Some WPS-based staff endorsed the concept of expanding alternative programs outside WPS to address the needs of students who had been, or were on the verge of being dropped from the rolls. But others perceived the emphasis on “out-of-school” alternative programs (which usually could offer only a GED, even if they also offered career training) as a means of transferring funds away from the system or a kind of escape valve that reduced the pressure on the system for genuine instructional reform that addressed the real needs of students. If alternative programs were simply a means of recovery for students who had dropped out and had no intention of returning for a high school diploma, there was little disagreement among the partners about their usefulness. The only potential source of tension would be the higher standards of accountability imposed on high schools (which had strict reporting requirements, monitored by the State, regarding dropout rates) than on alternative programs outside the school system (which had much less rigorous requirements from their funding agencies).

It was at the point of “dropout intervention” that there was considerable diversity among the WCI partners regarding models. The central tension revolved around whether a program should be offered as a part of the school, or whether to develop and support out-of-school programs run by external providers. The “twilight academy” model developed by university researchers sought to accomplish intervention and recovery after-hours within the same school. There were also various alternative programs within WPS itself. While externally provided alternative programs could be seen as complementary, it was the extent to which EDA and some WPS advocates tended to define “Alternative Learning,” and the mission of that committee, as synonymous with externally provided opportunities, that created tension among the high school reform partners. The incentive structure actually in place for schools, whether they chose to respond to it or not, was to find a way to assign a student to an alternative program outside the system before that student

became a dropout statistic counting against the school. This was a much easier solution than genuine reform for improving a school's state report card, at least in the short run.

Contextual Obstacles to Reform

Besides the impediments to reform resulting from partnership dynamics noted above, our interviews and observations uncovered contextual obstacles that hindered the progress of the partnerships in accomplishing high school reform: conflicting expectations from the State Department of Education, structural and administrative problems within the school system bureaucracy, and unrealistic expectations for site-based management.

A Double-Minded State Department of Education

Though the State Department of Education was committed to the WCI, and indeed supported a state-wide WCI program, its accountability standards and evaluation measures often diverted school-based staff attention from the long-term objectives of a school-to-careers high school reform framework. The school performance index established by the state to judge high school performance focused on three main measures: attendance rate, dropout rate, and state functional test results. High schools were often forced to focus an inordinate amount of time on preparing students to pass tests that should have been passed in middle school. Though creation of small learning communities and career-focused education should theoretically increase attendance and reduce dropout rate, schools were forced to focus on more short-term efforts showing short-term results and could not devote as much attention to the more long-term restructuring that would produce results in the future if not in the short run. Conversations with school and district administrators revealed a pervasive sense of learned helplessness in the face of a state bureaucracy perceived as impervious to change.

Changes in school leadership were often, though not al-

Partnerships for Career-Centered High School Reform

ways, linked to failures to improve the school performance index. According to interviews with partnership members, as well as our own observations, the frequent change of principals had a decidedly detrimental effect on sustaining the structural reforms (division into small learning communities) and progressing on reforms in curriculum and instruction. In addition, the state's continued planning for high school assessment tests in the core academic subject areas tended to conflict with WCI goals.

A Dysfunctional District (and City) Bureaucracy

Structural obstacles were reinforced at the school district level, where there was little effective linkage among the various offices and players in the central bureaucracy essential to a coherent high school reform process. Even though various high school reform "committees" existed from 1994-2000, the bureaucracy's accountability and incentives structures did not operate to facilitate the implementation of a cohesive high school reform process. Though a more functionally organized bureaucracy (linking high schools together administratively under an area executive officer) may not in and of itself have been more effective overall than the geographically-organized system (linking feeder systems together), it appears essential to create an incentive structure that holds players genuinely accountable for sustaining a cohesive high school reform process. The high school reform process suffered because there was no top-level leadership within the central office heading it.

Interviews indicated that there were also administrative obstacles that hindered progress. Even though both organizations were under a common City of Wexford operational structure, transfer of funds between the two city departments required much more time (involving contractual and legal matters) than had been planned. Funds from the federal government and the state also were at times out of synch with the school year. Delays in receiving funding meant that schools could not imple-

ment programmatic plans as quickly as envisioned, and progress was slower than it might have been. These administrative glitches also diverted time and attention from the fundamental work of reform.

Counterproductive Site-Based Management

The structure for dispersal of WCI funding reflected an ideological commitment to site-based management, since schools were free to use funding according to their own discretion within some basic guidelines. Ironically enough, while both community organizations and the Wexford business community had urged this kind of school system reform during the 1980s, there was no evidence that school system outcomes improved after its implementation in the early 1990s (also see Murphy & Beck, 1995). Our own observations and interviews make us question whether schools made the best possible use of the WCI funding to achieve lasting results that would improve student outcomes over the long run. One school devoted significant funding to the development of an “electronic portfolio” that would follow students from elementary through high school. Other schools spent funding on short-term opportunities (field trips to businesses and industries, bringing speakers to schools to meet with students). While such spending furthered short-term goals of exposing students to career opportunities (unlike another school’s decision to spend funding on needed furniture), it did little to promote school-wide restructuring or build long-lasting capacity for high school reform.

Discussion and Conclusions

The analyses presented above suggest that while partnerships for career-centered high school reform may have great potential, there remain numerous obstacles to reform that need to be recognized and addressed. The following discussion examines both contextual obstacles (at the state and district level)

Partnerships for Career-Centered High School Reform

and dimensions of partnership dynamics that can impact negatively on the outcomes of high school reform initiatives. We recognize the limitations of the case-study approach in drawing generalizations, but we propose the following conclusions as grist for further research, reflection, and debate among researchers and policymakers.

This case study echoes other studies (e.g., DeBray, Parson, & Woodworth, 2000; Erlichson & Van Horn, 1999; Shafer, 1997) that have noted how state level accountability structures tend to conflict with high school reform efforts and can undermine the efforts of partnerships like the one considered here. A narrow, short-term focus on even good accountability measures mandated by the state can thwart reform efforts aimed at long-term transformation of high schools. State officials need to reflect more carefully on how accountability measures are interpreted by schools and how responses by schools to attain short-term improvement may well not be in the long-term interests of students. By pointing out the conflicting messages to schools coming from different parts of the same state education department, we emphasize the need for more comprehensive and integrated thinking about high school reform at the state level. Until the state-imposed incentive structures for districts and schools change significantly, so that efforts aimed at long-term reform are rewarded rather than punished, progress on high school reform and improved student outcomes will continue to be hindered.

Another finding of this case study is that the availability of grant monies from various funding streams tempts members of partnerships aimed at career-focused high school reform to pursue multiple initiatives simultaneously, often without understanding the implications (McLaughlin, Rhim, & Henderson, 1998). Even if initiatives mesh together without too much conflict (which is unlikely), the attempt to do too many things at once may be counterproductive, as Hess (1999) has pointed out with respect to more general system-wide reforms. One princ i

pal in our study noted this problem of fitting multiple initiatives in a single school together even before WCI was off the ground. At a policy level, funding agencies and legislators need to be aware of this problem and seek to address the underlying issues. The example of multiple university programs in Wexford high schools suggests the need for funding agencies to identify overlaps and create incentive structures for groups to work together. Partnerships need to help empower schools and school systems with the freedom and capacity to analyze how multiple initiatives will intersect and which combination of programs and resources is best to achieve their goals.

Leadership instability and turmoil are unfortunately common in large urban school systems, and partnerships for high school reform are likely to continue to confront such issues. (Hess, 1999). As others (Lewis et al., 2000; Tewel, 1995) have noted regarding the high school reform process, sustained leadership with a clear vision and continual leadership development are crucial for progress in this area. Our case study has pointed out how external partnerships and intermediary organizations may help to sustain momentum for reform, but appear incapable of effecting necessary changes on their own (Wehlage Osthoff, & Porter, 1996). What is needed are the kinds of partnerships that strengthen and build capacity within a school system so that it can effectively lead a process of cohesive reform together with partners who can come alongside to help. External partners need to seek, to the extent possible, to identify the underlying systemic needs (such as making administrative procedures more efficient, leadership development, and capacity for formulating and implementing specific action plans likely to successfully address needs identified in an evaluation process) and use their leverage to help school districts address these as well as more particular needs within the system.

A particular leadership need identified in this case study involved the issue of brokering among different reform models. The existence of multiple partners with a common overarching

Partnerships for Career-Centered High School Reform

vision but different means of achieving those goals could be energizing to a school system as long as these different models are implemented in different schools. Building on the findings of Danzberger, Bodinger-de-Uriarte and Clark (1996), this case study demonstrated how a merely facilitative leadership in an umbrella partnership may fail to identify conflicting activities within particular schools that have detrimental effects on the reform process. Bringing external partners together under an overarching umbrella is only the beginning step in forging an effective partnership for high school reform. Effective partnership leadership must identify potentially conflicting practices or combinations of existing programs and new initiatives and assure that individual schools and their leaders are not fragmented or pulled in various directions simultaneously.

Echoing the findings of others (e.g., Pedraza, Pauly, & Kopp, 1997), this case study highlighted the need for targeted, cohesive technical assistance to schools for implementing the proposed reforms. The fact that district office staff members were diverted from delivering technical assistance by other urgent tasks (often in response to demands from the state) indicates the need for rethinking how resources are distributed. It is possible that proportionally reducing funding for individual school grants or the Employer Involvement grants so that more could be devoted to technical assistance would have paid greater dividends in this initiative. At the same time, assuring that technical assistance from all partners converges (rather than pulls schools in conflicting directions) remains a challenge to be addressed in any initiative with multiple partners (Vandegrift, 1994).

In this case study we also identified the role of contrasting institutional cultures and agendas in generating particular action plans that on the surface level aimed at a common vision but resulted in conflicting or competing activity at the school level. Within the partnership between the Wexford Employment Development Agency and the school system that served as an

“intermediary” organization (Jobs for the Future and New Ways to Work, 2001) EDA’s primary focus and expertise centered, understandably, on interactions with employers and preparing youth for the work world. Its entrepreneurial culture was particularly adept at public relations, networking, and such “intermediary organization” functions as drawing stakeholder groups together and administering a systemic initiative, but when its assertive leadership style ranged into areas such as arranging for technical assistance to schools on the details of creating small learning communities, it contributed to the problem of pulling schools in several different directions simultaneously. As Legters et al. (2002) put it, the “devil is in the details,” and no one within the partnership managed to successfully negotiate these issues. In the context of turmoil and considerable leadership instability, the school system had developed an institutional culture that was unable to address the specific details of creating small learning communities and career pathways in a way that would lead to significant reform and visible improvement in student outcomes, and similarly unable to broker among various external partners advocating various reform initiatives to prevent fragmentation at the school level.

The challenge of reforming inner city high schools remains a daunting one, which requires the attention of multiple stakeholders. This case study has demonstrated both the great potential of partnerships that bring multiple stakeholders together for career-centered high school reform, and the obstacles that hinder the reform process. The lessons learned from this experience are instructive for other urban systems seeking the same goal of high school reform. We urge that further research on partnerships for career-centered high school reform in other systemic contexts pay particular attention to such contextual factors as state accountability frameworks and multiple funding streams, and also to the issue of building leadership capacity that can broker among different models and deal with the crucial details of implementing reforms that reach the classroom and student level.

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Mac Iver & Legters

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**A New, Old Vision of Learning, Working, and Living:
Vocational Education in the 21st Century**

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As we enter the 21st century, we must ask: what is the future of vocational education? Perusing an old volume on the history of American education, I was reminded of some of the debates about vocational training at the end of the nineteenth century:

Manufacturers demanded that schools teach basic industrial skills and sponsored machine training and industrial art. Technical educators sought to improve the practical training of engineers and future industrial leaders. Pedagogical reformers saw hand learning as part of a broader movement to invigorate classroom teaching. Those concerned about cultural standards hope that drawing and craft instruction would restore the ideal of the skilled artisan, while social reformers turned to manual education to teach traditional moral values and bring together a disrupted industrializing society (Lazerson & Grubb, 1974, p.3).

Barely changing a few of the ideas in this quote, it seems like entering the 21st century might not be too different from entering the last century. Business and industry are still concerned about how schools are preparing students for work. Technical educators are concerned about how to prepare engineers and other professionals for practice (Schon, 1983). Experiential educators are trying to invigorate classrooms with real world experiences. Politicians and society are looking to enforce “standards” to restore the ideal of the educated person. Moral and character education are on the rise, hoping to infuse service and values as important elements to recreate community

and a sense of belonging in a democratic society. Yes, the more we change, the more we stay the same.

Fortunately, we have learned a lot in the last one hundred years about all these issues. Most important, we know more about how learning occurs—which is essential to the development of any educational program or system.

I first digress to some recent understandings about learning, especially learning in work environments. After that brief discussion, I will explain the implications for vocational education in the future.

Learning in Work Environments

Perhaps the greatest change in learning for work, community, and family will occur in the way technology affects our lives. There is evidence that the impact of technology and computers is uncertain. Some believe that the current impact is mixed—computers have not always been instrumental in improving learning in school-based settings (Healy, 1998). What needs to be learned about computers can be learned in a relatively short period of time—we don't need to spend a lot of time in the new century teaching and training students to use computers in preparation for work (Cuban, 2000).

On the other hand, computer usage can profoundly change the very way we learn. In a powerful article about the impact of the web and Internet on learning, Brown (2000) suggests that the great transformation will take place in the way technology helps to promote “learning parks” composed of networks of learning ecologies. He suggests that computers and the web will allow us to study and learn in new ways—being able to connect experience and stories among and between learning peers, so that new understandings and applications can be generated.

Based on research done in the workplace at Xerox, Brown (2000) describes a change in the way we generate knowledge. Replacing the world of science and logical, empirical studies

Shumer

will consist of teams of practitioners who will share their knowledge through collective means. Describing the way “tech reps” learn to repair copiers and printers, Brown says: “Abstract, logical reasoning wasn’t the way they went about it; stories were (p.16).” Learning occurs “in situ”, where individuals collectively compare their prior knowledge with problems and potential solutions discovered in current problems. No one individual assumes an expert role in the new learning community; rather the “community” is the expert system. Individuals will be able to collect and connect their individual learning with an entire system, or ecology, which will, in turn, produce documents and artifacts that solidify and codify the knowledge. This new knowledge will be constantly upgraded, as other members of the community share their new stories, complete with new problems and new solutions. Learning will no longer be based on simple individual effort; it will be produced through joint means through collaborating communities.

Brown (2000) suggests that learning this way not only occurs in the workplace, it also happens through similar patterns in the classroom. Through student analysis of videotaped lectures (instead of being there), studies at Stanford and Hewlett Packard demonstrated that when learners are able to examine educational presentations in small study groups, using reflective practices, they actually out produce students who participate in live classroom lectures. He suggests the superior performance results when:

forming study groups and letting them socially construct their own understanding around a naturally occurring knowledge asset - - the lecture, turns out to be an amazingly powerful tool for learning (p.18).

Learning becomes enhanced when learning situations are placed at the center of groups who are required to engage the problem to generate knowledge and solutions. In this environment, the role of student becomes transformed from the traditional passive position, to that of an active participant generat-

ing information and knowledge.

Brown's (2000) discoveries reinforce the notions of learning described by Lave and Wenger (1991), who focus on "situated learning." Most learning occurs either alone or in social groups—the tension between the two types of learning, the "zone of proximal development", creates the modern dilemma of how we prepare students for future learning in all situations. Since most learning is social in nature (Dewey, 1938; Lave & Wenger, 1991) our challenge is to determine how to constitute social learning environments so individuals develop the skills, abilities, and attitudes to propel them to learn throughout their lifetime. Lave and Wenger argue:

The most important accounts of learning have ignored its quintessentially social character. To make the crucial step away from a solely epistemological account of the person, [they] propose that learning is a process of participation in communities of practice, participation that is at first legitimately peripheral, but that increases gradually in engagement and complexity (Lave & Wenger, 1991, p. iii).

This description of social co-participation parallels Brown's (2000) explanations of learning in the workplace. They all suggest that people do troubleshooting/problem solving as a form of narrative construction, then together produce an insight, and eventually learn through shared stories and new dialogues. Through creation of these learning and communication networks, individuals are able to share understanding and produce new knowledge systems. They move from peripheral understanding, learning from the work of others, to central understanding, where they, themselves become the generators of knowledge.

Thinking as Problem Solving

In addition to this knowledge about socially constructed learning, we have additional studies that suggest that thinking is

Shumer

essentially problem solving (Resnick, 1987a; Rogoff, 1990). Students need to be placed in environments that present dilemmas that can be addressed in a variety of ways. It is through struggling with issues and solutions to problems that cognitive, affective, and moral growth occurs (Kohlberg, 1979; Piaget, 1963; Resnick, 1987b). By engaging in challenging environments, students participate in “cognitive apprenticeships” where they have opportunities to learn by doing in a particular context. Thus cognitive and affective change occurs as a result of situational challenge, coupled with support from adults or peers in the community. Challenge is one of the key components of optimal learning (Csikszentmihalyi, 1990).

Learning in the 19th century was more in line with this approach because young people often learned skills and learned about life from working on family enterprises. Through work, such as farming, their effort had value to the family and to the community. They were not extraneous to society, as they are often described in today’s culture. They produced work of real value and they learned by connecting work with life. It was through these living “internships” that learning took place—that thinking became connected to action.

In some ways we need to return to thinking embedded within doing—of eliminating the artificial separation between thought and action. Thinking and doing are inseparable. To construct learning situations that don’t have meaning becomes impossible simply because learning by doing, through real experience, has the potential to constantly engage students in thinking as a product of practice.

A Vision of Vocational Education for the Next Century

What are the implications for vocational education based on these understandings of how learning occurs? Since good learning happens in places where young people have opportunities to interact with their environments, experience challenge,

obtain feedback on their actions, receive guidance from more knowledgeable individuals, and participate in the creation of new knowledge, it is important to describe some of the essential settings where learning of vocation and life occur.

Family

The first place that children usually encounter rich learning opportunities is in the family. It is here that they learn language, social skills, value systems, and general modes of social behavior. All of these skills and knowledge have later application in work and other social settings.

While early learning has traditionally taken place in home/family environments, the 21st century portends more of the experiences of the 1990s, where children spend time out of the home very early in life at day care centers and other child care facilities. These extensions into non-parental environments necessitate earlier learning in situations away from parents and other family members—so learning in social environments out of the home will continue in the next century. In some ways this portends well for vocational education, because it means that children and youth will have more experience socializing and learning in situations outside of the home. So children should be more experienced and more comfortable interacting with non-parental adults.

The danger is that children may also not have sufficient bonding with parents and family, as well as “time” for simply being children. Since some research (Csikszentmihalyi, 1990; Elkind, 1984) suggests that a happy childhood is one of the best predictors of success in the adult world, rushing and separating children from parents early in life may create some long-term potential problems for adults in the 21st century. There needs to be balance between exposure to non-parental environments and experience within family or family-like structures. We must acknowledge that family and family interactions play an important part of vocational preparation and success by providing a

Shumer

stable and positive home environment.

One of the greatest needs in the 21st century is affordable child-care. Vocational programs can assist families and communities by providing programs that meet these needs. One of the best ways to accomplish this is to actually have schools operate child development programs where students learn about infants and young children by actually interacting with them in supervised settings. Operating day care programs at either junior or senior high schools, as part of a comprehensive program to prepare all students to be parents, aunts, uncles, and grandparents, would serve all segments of our society well. It would ensure that all students, no matter what their home situation, have opportunities to study the development and behavior of young children. It would also ensure that our communities could expand the capabilities for meeting the affordable child-care crisis.

All educators need to remember that families influence success throughout the entire school experience. Research suggests that students who have families involved in their education do better in school academically than those who do not. Vocational education programs need to work to keep families connected to school programs. They can do this by not only providing excellent child care programs, but also by having family members serve as community sponsors for learning, having parents work with students as mentors, coaches, and community-site sponsors of learning. In this way young people remain connected to adults in their family, and other youth learn to connect and respect parents and adult friends of their peers.

Twenty-first century educational programs need to serve and honor families. Families (in all their configurations) appear to be part of the foundation of learning and successful human development—educators need to capitalize on developing and expanding the learning that can and does occur through family settings.

School

The next common learning environment is that of school. Besides family, schooling takes up a significant portion of a child's time as he/she grows from childhood to adulthood. Children learn many things in schools—perhaps the most important is attitude toward learning and education (Dewey, 1938).

With attitude comes a whole set of learning environments and outcomes—all of which are tied to some context and some set of problems or issues. The role/goal of education is to engage youth in everyday dilemmas in order to learn how to get along in life and to perform major adult functions: employment, family/parent, citizen, scholar, friend, intimate partner, financial manager and planner, and member of society. All of the subjects taught in school are designed to help young people prepare for adult life. They contain content knowledge that must be mastered, along with learning how to process knowledge and how to conduct interpersonal skills.

Integration of academic learning with practical skills and knowledge has been one of the major emphases in vocational education for decades. In fact, John Dewey describes vocational education as a life-long process that helps individuals find direction and meaning in their lives:

A vocation means nothing but such a direction in life activities as renders them perceptibly significant to a person, because of the consequences they accomplish, and also useful to his associates.... Occupation is a concrete term for continuity. It includes the development of artistic capacity of any kind, of special scientific ability, of effective citizenship, as well as professional and business occupations, to say nothing of mechanical labor or engagement in gainful pursuits (Dewey, 1916, p.307).

Vocational education is about helping young people find direction, purpose, and abilities in their lives. In some ways it is simply about educating the whole person: mind and spirit, head and hand. The old mental-manual controversy that has plagued

Shumer

vocational education throughout history will be replaced by this renewed understanding that learning theory (mental processes) can never be separated from doing and practice. Similarly, learning in school can never be separated from learning in life situations. And workplaces are important settings that help individuals learn about career, job skills, personal development, and application of life skills.

Besides a continuation of the commonly utilized programs that attempt to connect school-based academic learning with work-related skills, abilities, and settings (such as cooperative education, tech-prep, career academies, and work experience), we find a new ally in the 21st century in the school/work preparation field: service-learning. Several states, including South Carolina and Minnesota, include service-learning as one of their accepted programs in the state school-to-work plan. Unpaid work, tied to service and learning of academic and related subjects, can produce some of the very outcomes found in more traditional work-based programs. Clearly, service experiences in the community, tied to educational programs, provide valuable career knowledge found in some of the more effective work-based programs (Billig, 2000; Shumer, 1994; Shumer & Rentel, 1998). They also include some of the important SCANS skills, including ability to work in groups, improved attitudes toward learning, and ability to solve problems (SCANS, 1991).

Through service-learning, youth also gain important citizen skills, such as applying problem solving abilities to real problems. Since vocation is about learning to work in a society, learning to contribute skills and talents, paying taxes, and supporting important societal infrastructures, school programs that integrate these skills to help students function as engaged citizens will grow in popularity and importance. The next century will realize what many in the 20th century understood: vocational education is one of the important ways to democratize learning and society. Including all students in the study of career, critical thinking, application of theory through practice,

A New, Old Vision of Learning, Working, and Living

and personal development—all done in a community context—will make the school and workplace vital settings for significant learning to occur.

A potential challenge to the experiential nature of service and vocational education programs in the 21st century is the potentially narrow usage of computers in schools. From Oregon to Florida, school districts are experimenting with entire high school curricula available to students through online formats. Every conceivable course is potentially available through electronic means. It will not take long before school districts realize that much potential revenue is available through on-line courses, with little increase in cost. So for some students in a few years going to school may mean staying at home!

The challenge to vocational/experiential educators is to ensure that using computers and the Internet have experiential components or that the computer/internet features of the courses are designed to enhance community-connected activities. Several examples illustrate what these courses can/should look like. In Small Town, Oregon, high school students rebuild and repair computers and then donate them to elementary schools and to senior citizens. In Hawaii, an elementary school program has 5th and 6th graders providing computer and Internet education to senior citizens and to schools (National Service-Learning Clearinghouse, 2000). In both these programs computers serve many purposes. They are the source of technical learning—students learn how to actually put computers together. They are also the source of service to others—they provide the opportunity to teach others how to acquire and use knowledge in the age of the internet. Rather than stifling experiential learning, these two programs demonstrate how computers can enhance experiential programs that have vocational emphases.

Community

In addition to school, young people spend a significant

Shumer

amount of time in the community. Through community organizations, such as scouts and 4-H, they learn to engage in applications of knowledge through organized games, tasks, and other activities. Community settings, like workplaces and family environments, provide individuals with opportunities and challenges to master over the course of a lifetime.

Community settings, like work settings, provide young people with unique opportunities to connect with and learn from adults, especially adults outside the home. One of the major problems at the end of the 20th century is the isolation of youth from adult cultures and the inability of young people to engage in constructive discussion with older individuals.

By connecting young people with older members of society, they both can learn to appreciate the lives of others, and learn how to participate in programs that join young and old around common problems.

By working in the community, young people can also learn to appreciate societal problems and learn to develop their ability to address social issues (Kahne & Westheimer, 1996; Melchior, 1998; Putnam, 1995). As with service-learning and other community-connected programs, youth learn to identify with adults and community programs as resources to help understand life and work in a local context. It also allows them to ingratiate themselves with others, both adults and peers, and to demonstrate their capacity to produce genuine goods and services. Just as youth contributed to society in powerful ways in the 19th century through agriculture, so too can they contribute through community problem solving by interacting with communities as part of their educational experience.

Community experiences produce many of the same outcomes as paid work (Alt & Medrich, 1994; Billig, 2000). Working in 4H clubs, Boys and Girls clubs, and Boy's/Girl Scouts, youth learn to develop social skills, learn to work in groups, and learn the connection between learning and having fun. They also learn to problem solve, to care, and to plan

(Noddings, 1988; McLoughlin, Irby, and Langman, 1994; Melchior, 1998). All of these skills are required for successful work as adults.

Conclusion

What is the role of vocational education in the 21st century? If you believe that vocational education is about lifelong planning, learning to work and interact with others, and learning to make a productive life, then vocational education will be a central force for all American children and youth.

Vocational education will focus on the whole child/youth, acknowledging that what begins at home in the family affects what happens at school, which ultimately influences what happens in the world beyond the family and school, namely the community (including the work community). An education that makes personal and cognitive development central to the nature of the situations provided is what vocational programs are intended to provide. Learning in the home, in the school, and in the community will be intimately connected so that each builds upon the other. Acknowledging that the work can be both remunerated and voluntary, vocational programs in the 21st century will strive to continue the connections between practical and academic learning. Vocational educators know that such learning can never be separated because each builds upon the other. One cannot learn theory without practice, nor can one effectively learn practice without broad, theoretical understandings.

Vocational programs in the 21st century will recognize that the world is changing in the United States; that computers and the Internet will greatly influence how and where we educate our youth and our society. Again, recognizing that situations dictate the kind and quality of learning, settings will be provided that maximize the potential of the Internet without sacrificing our understanding that electronic learning should never

Shumer

replace real-world environments. The 21st century will wrestle with instructional design issues that attempt to take advantage of the power of computers, without sacrificing the power of experiential learning. This will mean that vocational educators will need to weigh in with their colleagues as curriculum is developed, to ensure that young people have ample opportunity to do real things in the world. They also need to engage adults and subject matter through purposeful relationships focused on personal development, caring, cognitive growth in order to create environments that engage the entire community (family, school, workplace, community organizations) as partners in lifelong learning.

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A New, Old Vision of Learning, Working, and Living

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Shumer

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