Educational Evaluation and Policy Analysis
Winter 1989, Vol. 11, No. 4, pp. 405–416

Benefits and Costs of Dropout Prevention in a High School Program Combining Academic and Vocational Education: Third-Year Results from Replications of the California Peninsula Academies

David Stern, Charles Dayton, Il-Woo Paik, and **Alan Weisberg**
University of California, Berkeley

This paper reports 1987–88 results from an evaluation of 11 academy programs in California high schools. Academies are schools within schools, combining academic and vocational courses in a program designed to reduce dropout rates. The evaluation used a matched comparison group for each cohort of academy students at each site. Results for in-school outcomes were generally positive. Focusing on one grade-level cohort for which graduation rates are available, the number of dropouts saved was estimated, along with the costs and economic benefits to society. The estimated net benefit from dropout prevention among this cohort of 327 students is between $1.0 and $1.3 million.

The plight of high school dropouts attracts continuing public concern. For recent reviews of evidence and reasons for concern, see Rumberger (1987); McDill, Natriello, and Pallas (1985); and William T. Grant Foundation (1988). Many states and localities, in addition to the federal government, are pursuing initiatives intended to help more students finish high school successfully. Examples of recent programs are described by Orr (1987), and the U.S. General Accounting Office (1987).

However, it has not always been evident that the economic benefits of past dropout prevention efforts have exceeded the cost (Weisbrod, 1965). Now the cost of dropout prevention may well be increasing as dropouts have become a smaller minority of the population, making it likely that a larger proportion of current dropouts are individuals for whom high school graduation is possible only if more expensive efforts at remediation and school reform are undertaken. At the same time, the difference in earnings between high school graduates and dropouts—conventionally used as the principal measure of economic benefit from dropout prevention—has grown substantially in the past 20 to 30 years (Stern, Dayton, Paik, Weisberg, & Evans, 1988). Data on benefits and costs of current dropout prevention programs are therefore of considerable interest.

The data presented here are from an evaluation of 11 *academies* that have been created in California public high schools to retain likely dropouts. The state of California is subsidizing these academies, which are designed to replicate two programs that began in 1981 in a school district on the San Francisco peninsula—hence the name *Peninsula Academies*. More information on the

Support for this work was provided by grants from the William and Flora Hewlett Foundation, and from the Edna McConnell Clark Foundation, to Policy Analysis for California Education (PACE).

original Peninsula Academies is given in Stern et al. (1988). Although the state subsidized the replication effort, the evaluation was supported by private foundations.

Each academy is a school within a school. All of the academies at present are designed to enroll students from grades 10 through 12. Academy students at each grade level take some or most of their classes together, including English, math, science, and a lab or shop class. Academy teachers work together to coordinate curriculum. Each academy focuses on a particular occupational sector such as the health industry or computer-related occupations—a vertical segment, not a horizontal stratum, of the occupational hierarchy. Representatives of local employers in the relevant occupational field participate in several ways, including one-to-one relationships as students' mentors. Extended descriptions of individual academies appear in articles by Dayton and various coauthors (Dayton, Reller, & Evans, 1987; Dayton, Weisberg, Stern, & Evans, 1988; Dayton, Weisberg, & Stern, 1989).

The evaluation makes use of matched, nonrandom comparison groups. At each academy site, students were selected from the same school to compare with each cohort of academy students. Students who were chosen for the comparison groups had approximately the same average characteristics as academy students. In addition to race and sex, comparison students as a group matched the academy students on the criteria used to select students for the academy: a record of poor attendance, low grades, insufficient course credits, but standardized test scores not more than 2 years below grade level. Profiles of academy and comparison students in each cohort at each site are given in Dayton et al. (1987, 1988, 1989).

It is important to recognize that this is a quasi-experimental evaluation; that is, students were not randomly assigned to academy and comparison groups. The results therefore may contain unknown biases. For instance, students who volunteered for the academy may have more ambition and initiative than students in the comparison group, in which case they might have done better than the comparison students even if the academy did not exist. Differences in performance between academy and comparison students—the basis for our evaluation—would then overstate differences that occurred as a result of the academy program. On the other hand, the academy may attract and reward students who possess particular interests and aptitudes (*e.g.*, computers, health care). If these students had remained in the regular program, where these special interests were stymied, they might have done worse than students in the comparison group. In this case, our evaluation would understate differences resulting from the academy program. A priori, we cannot know which of these or other possible biases are more important. Empirical procedures (Heckman, 1979; Maddala, 1983) to correct for selection bias cannot be applied here, due to absence of prior information that might be used to predict participation in the academy.

The in-school part of this evaluation has now ceased, though data on 1988 graduates from the academy and comparison groups are continuing to be collected. This paper summarizes results from 1987–88. It then analyzes the benefit-cost implications of differences in dropout rates through senior year, using data on academy and comparison students who were sophomores in 1985–86.

In-School Outcomes

A statistical regression model was used to test whether academy students in each grade at each site performed better in school than students in the comparison group. The regression controlled for prior year's performance, sex, race, and date of birth. *F*-tests were performed to determine whether academy and comparison students could be pooled in the analysis; if not, the test for significant differences was done with separate regressions for the two groups. A detailed description of the statistical model is given in Stern et al. (1988).

Table 1 shows whether the performance of academy students was significantly better or worse than comparison students. Each

academy is denoted by a capital letter. Performance is measured by attendance, credits earned, grade point average (GPA), number of courses failed, and the probability that the student left high school during the given year. In Table 1, a plus sign means that academy students performed significantly better than comparison students; a minus sign means academy students performed significantly worse. *Better* means a higher attendance rate, more credits earned, higher GPA, fewer courses failed, or lower probability of leaving high school during the year. All effects were measured in regression models controlling for the variables listed above. Ordinary least-squares estimation was used for all outcomes except the probability of leaving high school, for which we did a logit analysis.

Of the 270 tests reported in Table 1, 61 show significantly better performance by academy students, while 11 show the comparison students did significantly better. If the 270 tests were statistically independent, fewer than 14 would be expected to give significantly positive or negative results, using the 0.05 criterion for significance. On the whole, then, the results of these tests are preponderantly positive.

The absolute size of a difference deemed statistically significant varied from one site to another, depending on sample size and how well the model fit. However, as reported in Stern et al. (1988), the smallest absolute difference that was statistically significant also appeared large enough to be educationally important: for instance, two percentage points in the attendance rate, or 0.3 points of GPA.

The number of statistically significant positive results varied markedly from one program to another. Academies G, H, and D produced particularly positive results. Academy A had a large share of negative results. (Note that Academy B was discontinued in 1987–88, while Academies J, K, and L were added. Academies D and I enrolled freshmen instead of sophomores in 1985–86, and did not enroll a new cohort of students in 1986–87.)

In addition to variation among the different academies, results also differ systematically between years for each cohort. Results are substantially more positive for each of the first 2 academy cohorts in its 1st year than in subsequent years. The academy cohort that entered in 1987–88 also showed a lot of positive results in its 1st year. Evidently, 1st-year participation in the academy is associated with widespread improvement among academy students, compared to similar students at the same high school. These 1st-year gains are generally maintained in subsequent years: they are not usually augmented, but even less often are they significantly eroded. Better attendance and academic performance in the 1st year may be attributable to a Hawthorne effect, but the results are real. Academy students continue to perform at a higher level in subsequent years although the difference between their performance and that of comparison students does not widen as much in subsequent years as in the 1st year.

In addition to the outcomes analyzed in Table 1, the evaluation also gave standardized Comprehensive Tests of Basic Skills (CTBS) in reading and mathematics to all academy students in spring 1987 and again in spring 1988. Detailed results are given in Dayton et al. (1989). In most sites and cohorts, academy students in 1987 scored lower than the norm, even when the norm was adjusted for the socioeconomic composition of the high school. From 1987 to 1988, academy students generally did not improve relative to the norm. These tests, therefore, do not generally give positive evidence of the academies' effectiveness. However, it was not possible to give the tests to students in the matched comparison groups, so it is difficult to draw firm conclusions from these test scores.

Estimated Effects on Dropout Prevention

The proof of the pudding for these programs is whether, in fact, they reduce the dropout rate. The Peninsula Academies and replications have been conceived primarily for the purpose of keeping likely dropouts in high school. Recent California legislation authorizing continuation and expansion of

TABLE 1
Statistically significant difference between academy and comparison groups, by cohort, year, and site

	Attendance	Credits	GPA	Courses Failed	Dropout Probability
Cohort entering fall 1985					
1985–86 Outcomes					
A	+				
B		+	+		
C		+		+	
D		+		+	
E			+		
F		+	+		
G	+	+	+	+	
H	+	+	+	+	
I				−	
1986–87 Outcomes					
A					−
B					
C					
D	+	+	+	+	
E					
F					
G		+			+
H			+	+	
I					
1987–88 Outcomes					
A					
C					
D					
E	−				
F				−	
G			−		
H	−	−	+		
I	+	+			
J					
K					
Cohort entering fall 1986					
1986–87 Outcomes					
A					
B		+	+		
C	+		+		
E					
F			+		
G	+	+	+	+	
H	+	+	+	+	
1987–88 Outcomes					
A	−	−	−	−	
C					
E					
F					
G	+				
H			+	+	
J					
K		+			

TABLE 1 *continues*
Statistically significant difference between academy and comparison groups, by cohort, year, and site

	Attendance	Credits	GPA	Courses Failed	Dropout Probability
Cohort entering fall 1987					
1987–88 Outcomes					
A					
C					
D		+	+		
E					
F					
G	+	+	+	+	
H		+		+	
I	+	+	+	+	
J		+			
K					
L	+	+			

Note. $p < .05$

the replication effort has explicitly included student retention as an outcome on which the flow of state money to participating school districts will depend. One reason for emphasizing this particular outcome is that graduation from high school—unlike grades, attendance, courses failed, or credits earned while in school—has evident economic value, since it is well known that high school graduates generally do better than dropouts in the labor market. If the additional earnings of high school graduates can be attributed to their additional schooling rather than to preexisting differences between students who graduate and those who drop out, then these additional earnings can be used as a measure of the additional economic output resulting from dropout prevention.

Here we present estimates of how many would-be dropouts in fact graduated from high school as a consequence of participating in one of these academy programs. We also estimate the cost per dropout saved, and compare it with the economic benefit, as measured by the average difference in earnings between high school graduates and nongraduates in the population at large.

Table 2 shows cumulative dropout and transfer rates for each cohort of academy and comparison students at each site. Known dropouts are students who are known to have left high school. Transfers are students who have left the high school they were attending when they became part of the study sample, but for whom a transcript has been requested by another school. Probable dropouts are those for whom no spring semester records exist, but no transcript has been requested by another school. Dropout and transfer rates for the cohort that entered in fall 1985 cover a 3-year period. Two-year rates are shown for the cohort that entered in fall 1986, and one-year rates for the group that entered in fall 1987. The initial numbers of academy and comparison students, respectively, in each cohort at each site are shown in parentheses. Both dropout and transfer rates are generally lower among academy students than in the comparison groups.

To estimate the number of dropouts saved in each academy program, we focus on students who were sophomores in 1985–86, and for whom the 1987–88 data therefore indicate actual graduation rates. We compared the actual number of academy students counted as known or probable dropouts with the number that would have occurred if academy students dropped out at the same rate as students in the comparison group at the same school. Table 3 shows the results for the 8 academy programs that had students graduating in 1987–88. In 6 of the

TABLE 2
Cumulative percentages of known dropouts, probable dropouts, and transfers, by cohort and site, 1987–88

	Academy			Comparison Group		
	Known Drops	Prob. Drops	Trans-fers	Known Drops	Prob. Drops	Trans-fers
Cohort entering fall 1985						
A (59, 42)	9%	7%	27%	7%	2%	19%
C (68, 84)	9	0	24	35	8	31
D (108, 111)	3	0	16	5	0	21
E (24, 53)	0	0	63	6	2	42
F (24, 24)	0	0	29	0	8	54
G (39, 40)	3	0	10	3	15	55
H (32, 43)	16	0	44	7	2	44
I (108, 57)	6	6	37	7	2	30
J (37, 44)	11	0	19	11	0	52
K (44, 28)	14	0	7	21	0	4
Statewide Average (543, 526)	6.6%	0.7%	25.6%	11.0%	3.6%	33.1%
Cohort entering fall 1986						
A (36, 59)	3	6	14	2	2	17
C (47, 109)	5	15	13	24	9	17
E (31, 59)	0	0	45	3	2	54
F (21, 38)	0	0	57	8	0	68
G (31, 38)	0	0	23	3	8	24
H (28, 45)	7	0	21	7	7	51
J (27, 45)	0	0	7	7	0	9
K (37, 55)	8	0	5	16	0	15
Statewide Average (258, 448)	3.1%	3.5%	20.9%	10.3%	4.0%	29.2%
Cohort entering fall 1987						
A (33, 38)	7	6	21	5	0	5
C (21, 70)	5	0	5	6	0	9
D (25, 41)	0	0	4	2	0	2
E (15, 36)	0	7	7	0	0	0
F (12, 27)	0	0	0	0	0	0
G (43, 36)	0	2	12	0	0	0
H (15, 35)	0	0	0	0	0	0
I (36, 37)	0	0	3	0	0	5
J (33, 45)	0	0	0	0	0	0
K (38, 48)	3	0	5	4	2	8
L (16, 28)	0	0	0	0	0	0
Statewide Average (287, 441)	1.4%	1.4%	6.3%	2.0%	0.2%	3.4%

Note. Numbers in parentheses are initial sizes of academy and comparison groups, respectively.

8 academies, the dropout rate among the comparison group was higher than among academy students. The estimated net number of dropouts saved in all 8 academies was approximately 29, of whom 21 or 22 were at Academy C.

This procedure for estimating the number of dropouts saved does not employ multivariate methods to control for prior differences between academy and comparison students, as the procedure reported in Table 1 did. The reason for using a simpler procedure here is that attendance, credits, courses failed, and GPA can take on many

TABLE 3
Estimated numbers of dropouts saved from cohort entering Academies as sophomores in 1985–86, and cost per dropout saved

Academy	Number of dropouts		Number saved: Predicted minus actual	Cost per dropout saved	
	Actual	Predicted		To society	To taxpayers
A	9	5.6	−3.4	—	—
C	6	27.5	21.5	8,120	6,558
E	0	1.8	1.8	59,443	45,447
F	0	2.0	2.0	17,640	17,640
G	1	6.8	5.8	66,005	18,683
H	5	3.0	−2.0	—	—
J	4	4.2	0.2	682,860	524,400
K	6	9.4	3.4	64,184	40,482
Total	31	60.3	29.3	41,006	25,506

more values than the high school dropout variable, which is either yes or no. Ordinary least-squares regression is appropriate to analyzing these many-valued outcomes, and has better small-sample statistical properties than procedures such as logit and probit, which are appropriate for analyzing binary outcomes but are valid only in large samples. (Accordingly, the fifth column of Table 1 should be regarded with more skepticism than the other four.) Therefore, in estimating the numbers of dropouts saved, we use a simpler procedure. The validity of this procedure depends on the assumption that students in each comparison group were not systematically different from students in the corresponding academy group, prior to their sophomore year. For the most part, the profiles reported in Dayton et al. (1987, 1988, 1989) do not show much dissimilarity between academy and comparison students on the characteristics measured.

Costs and Economic Benefit of Dropout Prevention

Costs

Table 3 also shows the cost per dropout saved. The components of cost are detailed in Table 4. The first component is additional teacher time. Academies use extra time of teachers because classes are smaller than in the rest of the school, and in some of the academies teachers have an extra preparation period each day. The amount of additional teacher time was calculated by computing the number of Full-Time Equivalent (FTE) teachers who would have been assigned to the academy if academy teachers carried the same student load (student contact hours per day) as the average teacher in that high school.

For our cost calculation, we valued additional teacher time at $40,000 per FTE. (The actual average teacher's salary in California was $27,410 in 1985 and $33,159 in 1988, according to the National Education Association [Hertling, 1986; Miller, 1989]. Adding 30% for fringe benefits gives a figure slightly under $40,000.) Aides and administrators are valued at $20,000 and $50,000 per FTE, respectively. The value of extra facilities or equipment given to the academy program is converted to an annual expense, using an annualization factor of 0.2. Time donated by local employers' representatives is given a value of $200 per day. These numbers are necessarily somewhat arbitrary: Valuing a teacher at less than $40,000, or an employer's representative at more than $200 per day obviously would give somewhat different results. However, these numbers are within the range of plausibility. Also, using the same prices to value resources used in different sites is better than using the prices actually paid in these sites, because it puts the comparison in terms of the actual amounts of resources used (Levin, 1983).

The resources reportedly used in 1987–88

TABLE 4
Reported costs of academy programs in 1987–88, and 3-year cost attributed to cohort entering as sophomores in 1985–86

	Components of cost in 1987–88					Fraction attributed to cohort entering 1985–86	3-year cost for cohort entering 1985–86	
Academy	Additional teacher time	Aides	Admin.	Facilities and equip.	Local employers' reps.		To society	To taxpayers
A	36,000	8,000	10,000	7,000	3,800	0.46	89,424	84,180
C	80,000	0	10,000	4,000	22,400	0.50	174,600	141,000
E	62,000	6,000	10,000	2,200	24,700	0.34	106,998	81,804
F	28,000	0	0	0	0	0.42	35,280	35,280
G	70,000	6,700	16,500	10,000	261,400	0.35	382,830	108,360
H	16,000	20,000	0	6,000	2,600	0.43	57,534	54,180
J	56,000	20,000	10,000	6,000	27,800	0.38	136,572	104,880
K	88,000	20,000	10,000	6,000	72,600	0.37	218,226	137,640
Total	436,000	80,700	66,500	41,200	415,300	0.40	1,201,464	747,324

by these 8 academies were spent on sophomores and juniors as well as seniors, but we want to relate costs to benefits of dropout prevention, and the only cohort for which final graduation rates can be computed at this time are the 1987–88 seniors. Therefore, we had to allocate some fraction of the total 1987–88 cost to the 1987–88 seniors, that is, the 1985–86 sophomores. The fraction of cost we allocated to the 1985–86 sophomore cohort is the original number of academy students in that cohort, divided by the original number of students in all three cohorts attending the academy in 1987–88. After computing the cost in 1987–88 allocated to the 1985–86 sophomore cohort, we multiplied it by 3 to estimate the total cost of resources spent on that cohort of students during their 3 years in the academy. This produced the estimates in the two right-hand columns of Table 4.

The results in Table 4 are estimates of the incremental cost of academy programs for this cohort, over and above what the schools would have spent on them ordinarily. It can be argued that, if being in the academy does cause some students to remain in school longer, then the ordinary cost of schooling is also an incremental cost—assuming the school would have reduced its expenditure if those students left. This argument implies that approximately $3,000 to $4,000 per year should be added to the cost of dropout prevention for each dropout saved, since this is what California public high schools were spending per student, on average, during these years. As an upper bound, approximately $10,000 could be added to the cost per dropout saved, to reflect the extreme case of a student who would have dropped out at the beginning of sophomore year if he or she had not enrolled at the academy.

The value of all resources spent in connection with the academy program is an estimate of the cost to society. This includes the imputed value of time donated by local employers' representatives. Table 5 shows how this time was reportedly used: mostly in direct contact with students, either as mentors or job supervisors. Because this time could have been spent on other productive activity, it must be counted as a cost to society. But since no public money was paid to these representatives of local employers, the time they gave the academy students is not a cost to taxpayers. The last two columns of Table 4 accordingly distinguish between the 3-year cost incurred to taxpayers and the cost to society as a whole on behalf of the 1985–86 sophomore cohort in each academy program.

The last two columns of Table 3 show these costs divided by the number of dropouts saved from this cohort in each acad-

TABLE 5
Reported numbers of days spent by local employers' representatives in academy-related activities, 1987–88

Academy	Activity						
	Advisory committee meetings	Speaking to groups of students	Field trips	Mentors	Job placements	Job supervision	Total
A	0	3	3	2	3	8	19
C	35	40	10	22	4	1	112
E	2	9	7	88	6	12	124
F	0	0	0	0	0	0	0
G	25	40	50	112	20	960	1,307*
H	1	2	2	—	2	6	13
I	40	15	10	338	75	75	553
J	24	5	5	80	10	15	139
K	20	8	25	200	10	100	363
L	45	12	6	11	3	11	88
Total	192	134	118	853	133	1,188	2,718*

* Includes 100 days reported helping to plan and evaluate programs.

emy. In the two academies where the dropout rate was higher among academy students than among their comparison group, the cost per dropout saved is undefined. In the other 6 programs, the cost to society per dropout saved ranges from approximately $8,000 to almost $700,000. For these 8 academies as a group—including the 2 with negative numbers saved—the 3-year cost to society is approximately $41,000 per dropout saved, and the 3-year cost to taxpayers is approximately $25,500. If the ordinary cost of schooling were added to these estimates of incremental cost, the numbers would increase by no more than $10,000.

Benefits

How do these costs compare with the economic benefit of dropout prevention? The main economic benefit to society from dropout prevention is the value of extra output produced by graduates, compared to dropouts. An approximate measure of this extra output is the average difference in pretax earnings between graduates and dropouts.

Using this difference to measure the economic benefit of dropout prevention is valid if the difference is attributable to the effects of the extra schooling, rather than to preexisting dissimilarities between dropouts and

TABLE 6
Summary of benefits and costs for cohort entering as sophomores in 1985–86, by academy

Academy	Cost		Dropouts saved	Net benefit	
	To society	To taxpayers		To society	To taxpayers
A	$89,424	$84,180	−3.4	$−381,824	$−376,580
C	174,600	141,000	21.5	1,674,400	1,708,000
E	106,998	81,804	1.8	47,802	72,996
F	35,280	35,280	2.0	136,720	136,720
G	382,830	108,360	5.8	115,970	390,440
H	57,534	54,180	−2.0	−229,534	−226,180
J	136,572	104,880	0.2	−119,372	−87,680
K	218,226	137,640	3.4	74,174	154,760
Total	$1,201,464	$747,324	29.3	$1,318,336	$1,772,476

graduates. There is some evidence that the difference in labor market outcomes experienced by high school dropouts and graduates is not, in fact, attributable to observed, preexisting dissimilarities (Stern, Paik, Catterall, & Nakata, 1989). Furthermore, the effects of unmeasured characteristics, such as ability or ambition, do not necessarily favor those who obtain more schooling—contrary to the conventional supposition that people who go to school longer on average have higher ability to begin with, in which case the difference in earnings associated with education should not all be considered a result of education. Recent work by Willis and Rosen (1979) and Garen (1984) indicates that the benefit of additional schooling for those who do not get it would be less than the actual benefit to those who do get it. In their research, ability is multidimensional, and schooling enhances the economic payoff from some abilities more than others. Individuals, who have some knowledge of their own abilities, sort themselves into educational categories where their particular abilities will have the greatest comparative advantage. The upshot is that differences in earnings do not have to be deflated to adjust for unobserved differences in ability; the unadjusted differences can be interpreted as the result of additional schooling.

We therefore use the difference in average lifetime earnings between graduates and dropouts as a measure of the economic benefit from dropout prevention. One good source of data on employment and earnings of graduates and dropouts by age is the 1984 Survey of Income and Program Participation (SIPP) (U.S. Department of Commerce, Bureau of the Census, 1987). The difference in average annual earnings between individuals who have not finished high school and those who have finished high school but no more was computed for each age from 18 to 65. Differences for ages over 18 are discounted back to age 18, to give the capitalized present value of the projected lifetime stream of extra earnings associated with a high school diploma. Using a 5% discount rate, the present value of this discounted stream at age 18 is $77,500. Using a 10% discount rate gives a present value of $42,000. However, 5% (or less) is closer to the prevailing real (inflation-free) rate of interest, and a real interest rate is the appropriate discount rate to use with cross-sectional earnings data, which are all in same-year dollars. Since the $77,500 figure is based on 1984 earnings data, it should be increased approximately 10 to 12% to represent inflation between 1984 and 1987–88, when the cost data were collected. In 1987–88 dollars, then, the estimated economic benefit of saving one dropout is approximately $86,000.

This estimate is based on differences in earnings observed in a single year, 1984. Most likely, the actual future differences in earnings between recent dropouts and graduates as they grow older will differ somewhat from the amounts used here. However, as mentioned above, the earnings gap between high school graduates and dropouts has been growing wider in the past 20 to 30 years. If this trend continues, the actual earnings difference in the future will be larger than the difference observed in 1984. Therefore, our $86,000 figure can be regarded as conservative.

In addition, this figure also leaves out other benefits, such as the lower risk of incarceration and lower health costs for people who finish high school—some of which may be attributable to the effects of schooling, or at least to the effect of not being pejoratively labeled a dropout (Catterall, 1987). For these reasons, a number in the neighborhood of $86,000 seems a conservative estimate of how much society benefits from keeping one student in high school through graduation.

Table 3 shows that the eight academies for which high school graduation rates are now available saved an estimated 29 students from dropping out, at a 3-year cost to society of $41,000 per dropout saved (or up to $51,000 if the ordinary cost of schooling is included). If the social benefit of saving one dropout is $86,000, then the "profit" or net benefit to society was approximately $45,000 (or at least $35,000) per dropout

saved. This implies a total net benefit between $1.0 and $1.3 million for this cohort of 327 students in the 8 academies that had students graduating in 1988.

Table 6 summarizes the calculation of net benefit for each academy. Five of the eight academies produced a positive net benefit. (This would remain true if the cost were augmented by $10,000 per dropout saved, to reflect the ordinary cost of schooling.) However, if Academy C were excluded from the calculation, the costs incurred for the 1985–86 sophomore cohort in the other 7 academies would exceed the benefit of dropout prevention by $356,064. On the other hand, even leaving out Academy C, the other 7 produced a net benefit to taxpayers of $64,476. (Since academy graduates are themselves taxpayers, taxes they pay on future earnings are not counted here as a benefit to taxpayers.)

Conclusion

The first conclusion from the 3rd-year results is that patterns discovered in the 2nd year appear again here (cf. Stern et al., 1988). In-school outcomes are generally positive for academy students relative to matched comparison groups. Academy students' relative gains are biggest in their first year in the academy. Standardized tests in reading and mathematics do not show academy students improving relative to the norm, but lack of data for the matched comparison groups make it difficult to interpret these test results.

The same academies that appeared most successful after the 2nd year also appear most effective in the 3rd year. Although not discussed in this paper, the evaluation gave a substantial amount of attention to why this is true, and concluded that the most effective programs were those that had implemented the various features of the academy model most faithfully (Dayton et al., 1989).

In this paper we focused on calculating a bottom-line estimate of the net economic benefit from preventing dropouts among the cohort of academy students who entered the program as sophomores in 1985–86 and reached the normal age for graduation in 1988. On average, the cost per dropout saved is estimated to be substantially less than the economic benefit. In this cohort of 327 academy students, the net economic benefit of dropout prevention was estimated to be between $1.0 and $1.3 million, in 1987–88 dollars.

In addition to a positive judgment of the economic value of the academy replication effort as a whole, the main lesson that can be derived from this evaluation is that individual academies vary greatly in their measured effectiveness. Replication is risky. Success cannot be taken for granted. Continual monitoring, technical assistance, and discontinuation of ineffective programs are necessary if scarce resources are to be used efficiently. This lesson applies not only to the academies and other dropout-prevention programs, but to educational endeavors generally. Evaluations, including comparisons of cost, should be done much more routinely in education.

References

Catterall, J. S. (1987). On the social costs of dropping out of school. *The High School Journal 71*(1), 19–30.

Dayton, C., Reller, D., & Evans, J. (1987). *Peninsula Academies replications: 1985–86 evaluation report*. Berkeley, CA: University of California, School of Education.

Dayton, C., Weisberg, A., Stern, D., & Evans, J. (1988). *Peninsula Academies replications: 1986–87 evaluation report*. Berkeley, CA: University of California, School of Education.

Dayton, C., Weisberg, A., & Stern, D. (1989). *California Partnership Academies: 1987–88 evaluation report*. Berkeley, CA: University of California, School of Education.

Garen, J. (1984). The returns to schooling: A selectivity bias approach with a continuous choice variable. *Econometrica, 52*(5), 1199–1218.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica, 47*(1), 153–161.

Hertling, James. (1986, February 26). Bennett says 'wall chart' shows gains. *Education Week*, p. 1, 10, 12–13.

Levin, H. M. (1983). *Cost-effectiveness, a primer*. Beverly Hills, CA: Sage.

Maddala, G. S. (1983). *Limited-dependent and qualitative variables in econometrics.* Cambridge, England: Cambridge University Press.

McDill, E. L., Natriello, G., & Pallas, A. M. (1985). Raising standards and retaining students: The impact of the reform recommendations on potential dropouts. *Review of Educational Research, 55*(4), 415–433.

Miller, Julie A. (1989, May 10). 'Wall chart' data indicate plateau in reform drive. *Education Week*, pp. 115–17.

Orr, M. T. (1987). *Keeping students in school.* San Francisco, CA: Jossey-Bass.

Rumberger, R. W. (1987). High School dropouts: A review of issues and evidence. *Review of Educational Research, 57*, 101–121.

Stern, D., Dayton, C., Paik, I., Weisberg, A., & Evans, J. (1988). Combining academic and vocational courses in an integrated program to reduce high school dropout rates: Second-year results from replications of the California Peninsula Academies. *Educational Evaluation and Policy Analysis, 10*(2), 161–170.

Stern, D., Paik, I., Catterall, J., & Nakata, Y. (1989). Labor market experience of teenagers with and without high school diplomas. *Economics of Education Review, 8*(3), 223–246.

U.S. Department of Commerce, Bureau of the Census. (1987). *What's it worth? Educational background and economic status: spring 1984.* Washington, DC: Author.

U.S. General Accounting Office. (1987). *School dropouts: Survey of local programs.* GAO/HRD-87-108. Washington, DC: Author.

Weisbrod, B. A. (1965). Preventing high school dropouts. In R. Dorfman, (Ed.): *Measuring benefits of government investments.* Washington, DC: Brookings Institute.

William T. Grant Foundation Commission on Work, Family, and Citizenship. (1988). *The forgotten half: Non-college youth in America.* Washington, DC: Author.

Willis, R. J., & Rosen, S. (1979). Education and self-selection. *Journal of Political Economy, 87*(5, part 2):S7–S36.

Authors

DAVID STERN, Associate Professor, School of Education, University of California, Berkeley, CA 94720. *Specialization*: economics of education.

CHARLES DAYTON, Research Consultant and Policy Analyst, Foothill Associates, 230 Main St., Nevada City, CA 95959 and Policy Analysis for California Education (PACE), 3659 Tolman Hall, University of California, Berkeley, CA 94720. *Specializations*: at-risk high school youth, school-business partnerships, program evaluation.

IL-WOO PAIK, Assistant Professor, Yonsei University, Seoul Korea 205-22 Noryangjin-Dong Dangjak-Gu Seoul Korea. *Specialization:* economics of education.

ALAN WEISBERG, Policy Analyst, Foothill Associates, 230 Main St., Nevada City, CA 95959 and PACE, 3659 Tolman Hall, University of California, Berkeley CA 94720. *Specialization:* employment program development for at-risk youth.