

**INCENTIVES TO STUDY
AND
THE ORGANIZATION OF SECONDARY INSTRUCTION**

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The Problem: The scientific and mathematical competence of American high school students is generally recognized to be low. The National Assessment of Educational Progress (NAEP) reports that 92 percent of high school seniors cannot "integrate specialized scientific information" and do not have "the capacity to apply mathematical operations in a variety of problem settings." (NAEP 1988a p. 51, 1988b p. 42)

There is a large gap between the science and math competence of young Americans and their counterparts overseas, particularly at the end of high school. The Americans who participated in the Second International Math Study were high school seniors in college preparatory math courses. This group which represented only 13 percent of American 17 year olds, was roughly comparable to the 15 percent of youth in Finland and the 50 percent of Hungarians who were taking college preparatory mathematics. In Algebra, the score of 40 percent correct for this very select group of American students was about equal to the score of the much larger group of Hungarians and substantially below the Finnish score of 79 percent correct (McKnight et al 1987).

The findings of the Second International Science Study are similar. Take Finland, for example. The 41 percent of the Finnish students who were taking some biology in their senior year of secondary school got 50 percent correct. The 12 percent of Americans taking a second biology course in senior year got 38 percent correct. The 16 percent of Finns taking chemistry knew almost as much as the 2 % of American high school seniors who were taking their second year of chemistry (many of whom were in "Advanced Placement") (Postlethwaite and Wiley, 1992). Only in reading are American students in the middle rather than the bottom of the international league tables (Postlethwaite and Ross, 1993).

The poor performance of American students is sometimes blamed on the nation's "diversity". However, the U.S. is not the only country challenged by ethnic diversity. The share of the students who are taught in a language different from their own mother tongue is 6 percent in both France and the United States, 5 percent in Scotland, 12 percent in Canada, 15 percent in Northern Italy and 20 percent in Switzerland (IAEP 1991a). It is true that secondary schools do a particularly poor job educating African-Americans, Hispanics and children from low income backgrounds. But the affluent non-minority parents who believe that their children are doing acceptably by international standards are misinformed. In Stevenson, Lee and Stigler's (1986) study of 5th grade math achievement, the best of the 20 classrooms sampled in Minneapolis was outstripped by every single classroom studied in Sendai, Japan and by 19 of the 20 classrooms studied in Taipeh, Taiwan. The nation's top high school students rank far behind much less elite samples of students in other countries. Substantially larger shares of 17-18 year old Belgians, Finns, Hungarians, Scots, Swedes and Canadians are studying advanced algebra, pre-calculus and calculus and their achievement levels are significantly higher than American high school seniors in such classes. The gap between American high school seniors in middle class suburbs and their counterparts in many northern European nations and Japan is larger than the two to three grade level equivalent gap between whites and

blacks in the US (NAEP 1988b; IAEEA 1987). The learning deficit is pervasive.

It is sometimes said that low achievement is the price one must pay for greater access. The U.S. does have larger stocks of secondary school graduates than other nations, but on a flow basis, the American advantage has vanished. Table 1 presents data on the ratio of secondary school diplomas awarded to population for a variety of industrialized countries. The ratio is over 100 percent in Denmark, Finland and Germany, 90 percent in Japan, 85 percent in France, 82 percent in Ireland, 81 percent in Sweden, and 65 percent in England. Despite the minimal standards for getting a diploma in the United States, the ratio of secondary school diplomas awarded to population 18 years of age was only 73.7 percent in 1988, slightly below its level in 1968.¹ Standards were lowered in the 1970s, but access did not improve.

Table 1
Graduation Rates for Secondary and University Education

	Sec. Dipl /Pop18	Bachelors /Pop22	Sci,Eng,Math Deg/Pop2534		Sec. Dipl /Pop18	Bachelors /Pop22	Sci,Eng,Math Deg/Pop2534
Australia	---	19.5%	7.4%	Italy	43%	7.7%	2.4%
Canada	68%	25.4%	6.4%	Japan	90%	26.3%	8.4%
Denmark	105%	10.1%	5.1%	Netherlands	57%	11.4%	3.7%
Finland	116%	18.6%	6.9%	Norway	58%	23.6%	---
France	85%	12.1%	7.2%	Sweden	81%	12.7%	4.0%
Germany	112%	13.3%	6.1%	United Kingdom	65%	16.3%	---
Ireland	82%	17.2%	8.7%	United States	74%	25.6%	7.2%

Source: OECD, *Education at a Glance*, 1992, Table R1, R2, and R5. Column 1 is the ratio of secondary school diplomas and credentials awarded in 1988 to population 18 years of age. It exceeds 100 percent in Denmark, Finland and Germany because older individuals from larger birth cohorts are completing their secondary schooling and because some individuals obtain two secondary level credentials (eg. In Germany some recipients of the Abitur pursue 3 year apprenticeships which yield vocational qualifications). The third column is 10 multiplied times the ratio of science, mathematics, computer science and engineering degrees awarded in 1989 at all levels (BS, MS and PhD) to population 25 to 34.

Participation in postsecondary education is higher in the United States, but most college freshmen and sophomores are studying material that European university students have studied in secondary school. Drop out rates are high, due in part to the poor preparation received in high school. In 1988 the ratio of bachelors (or equivalent) degrees awarded to the population 22 years old was 25.6 percent for the United States, 26.3 percent for Japan, 25.4 percent for Canada, 18.6 percent for Finland, 16.3 percent for England, 13.3 percent for Germany and 12.1 percent for France (OECD 1992). In the economically critical fields of science, mathematics, computer science and engineering, degree production relative to population exceeds U.S. levels in Japan, Australia and Ireland. France produces proportionately just as many people trained in these fields as the United States. Finland, Canada and Germany are close behind. The abundance and quality of scientists and engineers has historically been an important source of competitive advantage for American companies. This advantage is diminishing.

The Consequences: The poor quality of American secondary schools has economic consequences. The high school graduates of 1980 knew about 1.25 grade level equivalents less mathematics, science and English than the graduates of 1967. This decline in the academic achievement lowered the nation's output

by \$86 billion in 1987 and will lower it by more than \$200 billion annually in the year 2010 (Bishop 1989).

A high school diploma no longer signifies functional literacy. Most schools do not help their graduates obtain employment and many do not even send transcripts to employers when their graduates sign the necessary waivers while applying for a job. This is one of the reasons why, for the last six years, an average of 28 percent of noncollege-bound white high school graduates and 55 percent of the black graduates had no job four months after graduating from high school (Bureau of Labor Statistics 1989, 1991). It also contributed to the 14 percent decline in real wages of recent high school graduates since 1971 (Katz and Murphy 1990).

The deteriorating achievement levels of those completing high school in the late 1970s did not cause college entrance rates to decline, but it did cause a decrease in college completion rates. The share of high school graduates 25-29 years old who complete 4 years of college, which rose dramatically in the 1950s and 1960s, peaked at 28 percent in 1976/7 and then fell to 25 percent in 1981/2. It has since crept back to 27.2 percent in 1991/92 (NCES, 1992a, Table 22.3).

Demand for highly educated workers has grown rapidly during the last 40 years and wage premiums for college graduates are now at post war highs. The very high payoff to completing a college degree has stimulated a modest increase in rates of college completion by recent high school graduates but completion rates are still low. By February 1986, for example, only 18.8 percent of 1980 high school graduates had obtained a bachelors degree. Even for students with A averages in high school, the BA completion rate was just 49 percent. For C students, 2.5 percent had completed college (National Center for Education Statistics 1992b, Table 299). If the academic preparation of those completing high school does not improve, college drop out rates will probably remain high and, as a result, the supply of college educated workers will fall short of the forecasted demand and wage gaps between educational haves and educational have nots will remain very high (Bishop and Carter 1991).

Why does the mathematics and science achievement of American high school students compare so unfavorably to achievement levels in other advanced countries? The first three sections of the paper offer a diagnosis. Section 1 examines the proximate causes of low achievement levels: the low priority that students, parents and the public place on learning. Section 2 demonstrates that the rewards for learning are particularly weak in American secondary schools and suggests that this is the primary reason why students, parents and the public commit so few resources to teaching and learning mathematics and science. Section 3 examines how school organization and external assessment influence student learning. The fourth and fifth sections offer practical policy recommendations for strengthening student incentives to learn and parental incentives to demand higher quality instruction.

I. LOW EFFORT: THE PROXIMATE CAUSE OF THE LEARNING DEFICIT

This poor record of achievement is caused by the limited amount of time, money and psychic energy devoted to academic learning in American high schools. Students, parents and the public are all responsible.

1.1 STUDENT EFFORT

Time on Task: Learning is not a passive act; it requires the time and active involvement of the learner. In a classroom with 1 teacher and 20 students, there are 20 learning hours spent for every hour of teaching time. Student time is, therefore, the critical resource, and how intensely it is used affects learning significantly. Numerous studies have found learning to be strongly related to time on task (Wiley 1986; Walberg 1992).

Studies of time allocation using the reliable time diary method have found that the average number of hours per week in school is 25.2 hours for primary school pupils, 28.7 hours for junior high students and 26.2 hours for senior high students. The comparable numbers for Japan are 38.2 hours for primary school, 46.6 hours for junior high school and 41.5 hours for senior high school (Juster and Stafford 1990).

Classroom observation studies reveal that American students actively engage in a learning activity for only about half the time they are scheduled to be in school. A study of schools in Chicago found that public schools with high-achieving students averaged about 75 percent of class time for actual instruction; for schools with low achieving students, the average was 51 percent of class time (Frederick, 1977). Overall, Frederick, Walberg and Rasher (1979) estimated 46.5 percent of the potential learning time is lost due to absence, lateness, and inattention.

Homework: Harris Cooper's (1989) meta-analysis of randomized experimental studies found that students assigned homework scored about one-half a standard deviation higher on post tests than students not receiving homework assignments. The impact of homework on the rate at which middle school students learn was also significant, though somewhat smaller. There was no evidence of diminishing returns as the amount of homework increased. Non-experimental studies indicate that the relationship between homework and learning is linear.

In the High School and Beyond Survey, students reported spending an average of only 3.5 hours per week on homework (National Opinion Research Corporation 1982). Time diaries yield similar estimates for the early 1980s: 3.2 hours for junior high school and 3.8 hours for senior high school. Time diaries for Japanese students reveal that they spend 16.2 hours per week studying in junior high school and 19 hours a week studying in senior high school. Homework assignments appear to have increased since the early 1980s. In a 1991 survey, 29 percent of American 13 year olds said they were doing two or more hours of homework daily. The proportion doing more than two hours of homework was equally low in Canada and Portugal and even lower in Scotland and Switzerland. In most countries the proportion was higher: 79 percent in Italy, 63-64 percent in Ireland and Spain, 50-58 percent in Israel, Hungary, France, Jordan and the former Soviet Union and 41-44 percent in Brazil, Korea, Taiwan and China (NCES 1992b Table 387).

In many American high school classes homework is not even assigned. Arthur Powell describes one school he visited:

Students were given class time to read The Scarlet Letter, The Red Badge of Courage, Huckleberry Finn, and The Great Gatsby because many would not read the books if they were assigned as homework. Parents had complained that such homework was excessive. Pressure from them might even bring the teaching of the books to a halt....[As one teacher put it] "If you can't get them to read at home, you do the next best thing. It has to be done....I'm trying

to be optimistic and say we're building up their expectations in school."(Powell, Farrar and Cohen 1985, p.81)

It's not just reading that teachers feel they cannot require. A high school history teacher who had previewed PBS's 11 hour series on the Civil War and who had participated in developing teaching materials associated with the series was asked by a reporter whether he was assigning it to his class. The teacher replied that unfortunately he could not because 11 hours was way beyond what most high school students were willing to commit to an assignment.

Other Uses of Time: When homework is added to engaged time at school, the total time devoted to study, instruction, and practice in the US is only 18-20 hours per week -- between 15 and 20 percent of the student's waking hours during the school year. By way of comparison, the typical senior spent nearly 10 hours per week in a part-time job (NORC 1982) and 19.6 hours per week watching television. Thus, TV occupies as much time as learning. Numerous studies conducted in a variety of countries have found that time spent watching TV is negatively correlated with student performance in school (IAEP 1992). In Table 2 we can see that secondary school students in other industrialized nations watch much less television:

Table 2
Time Use By Students

	T.V.		Reading Time
	Students	Adults	Students
U.S.	19.6	15.9	1.4
Austria	6.3	10.6	4.9
Canada	10.9	13.3	1.5
Finland	9.0	9.0	6.0
Netherlands	10.6	13.4	4.3
Norway	5.9	7.2	4.3
Switzerland	7.7	9.0	4.8

Source: Hours spent per week on each activity derived from time diary studies. Organization of Economic Cooperation and Development, Living Conditions in OECD Countries, 1986, Tables 18.1 & 18.3.

55 percent less in Finland, 70 percent less in Norway and 44 percent less in Canada. In other countries high school students watch less TV than adults; in the United States they watch more. Reading takes up 6 hours of a Finnish student's non school time per week, 4.8 hours of Swiss and Austrian students time but only 1.4 hours of an American students time.

Avoidance of Demanding Courses: Science and mathematics deficits are particularly severe because most students do not take rigorous college preparatory courses in these subjects. Of those graduating from high school in 1987, only 45 percent had taken chemistry, only 20 percent had taken physics, only 12 percent had taken pre-calculus and only 6 percent had taken calculus (National Center for Education Statistics, 1991, p. 54). Advanced Placement courses in Biology, Chemistry and Physics are each taken by only about 1 percent of high school graduates.

States have attempted to deal with this problem by increasing the number of mathematics and science courses required for graduation. What impact does the number of courses taken in a subject have on

Table 3
 Change in Academic Achievement
 Resulting from Modifying Curriculum
 (In Percent of a Grade Level Equivalent)

Achievement on	Taking Rigorous College Prep Courses	Taking 3 Additional Courses In		
		Math & Science	Business & Office	Technical
Verbal Test	34%***	-17%***	20%***	4%
Math Test	76%***	19%***	-9%	15%**
Science Test	74%***	-9%***	-6%	-1%
Civics Test	44%*	-18%***	+15%**	1%
GRADE POINT AVERAGE	-.12**	0.0	.06**	.05*

Source: Entries are averages of coefficients from separate regressions for males and females. For the four test scores, entries are coefficients scaled as a percent of a grade level equivalent under the conservative assumption that the test's standard deviation is equal to 3 grade level equivalents. The results for GPA are in percents of one point on a 4 point GPA scale. The dependent variable was the change between the end of sophomore and senior years. The models used to derive these estimates contained a total of 75 control variables. Included among the control variables were the sophomore values on the 10 other outcome measures, a great variety of specific courses, years of courses in specific subjects taken during freshman and sophomore year and during junior and senior year, family background, self-assessed ability to succeed in college, and parental pressure to attend college.

*Statistically significant at the 95 percent level.

**Statistically significant at the 99 percent level.

***Statistically significant at the 99.9 percent level.

learning? To answer this question, an analysis was conducted of longitudinal data on the sophomore cohort of High School and Beyond. The dependent variables were the change between sophomore and senior years in overall grade point average and test scores in four subjects: English, mathematics, science and social studies. The specific model estimated was:

$$Y_{it} - Y_{i,t-1} = \beta X_{i,t-1} + \phi C + \theta Y_{j-1,t-1} \quad i = 1 \dots 5$$

where

Y_{it} = the "i"th outcome variable measured at the end of senior year. (e.g. math test score)

$Y_{i,t-1}$ = the sophomore year measure of the "i"th outcome variable

$Y_{j-1,t-1}$ = a vector of sophomore year measures of outcome variables other than the "i"th

$X_{i,t-1}$ = a vector of variables characterizing background and curriculum course-work variables measured in the sophomore year

C = a vector of variables describing the courses taken in junior and senior year

ϕ = a vector of coefficients measuring the impact of course work on learning and career aspirations

The control variables included an array of socioeconomic background variables, base year grades, test scores, attitudinal variables, base-year educational and occupational expectations, and parents' career expectations for their children. Numerous measures of curriculum were used to assess curriculum effects, including base-year, self-reported curriculum track (vocational and academic), self-reported number of courses taken between the sophomore and senior year in a variety of subjects, and self-reported data on whether the respondent had taken a number of specific courses. Chemistry, physics, algebra II, trigonometry and calculus were selected from a more complete list of courses to represent rigorous math and science course work generally taken during or after the sophomore year in high school (Bishop 1985).

Results are presented in Table 3. Holding background characteristics and the rigor of the math and science courses constant, an additional three courses in math and science during high school increased the gain in math competency between 10th and 12th grade by only .19 of a grade level equivalent and reduced science gains by .09 of a grade level equivalent and reduced English and social studies gains by .17-.18 of a grade level equivalent. Holding background characteristics and the total number of courses taken in specific fields constant, taking five college preparatory math and science courses--chemistry, physics, algebra II, trigonometry and calculus--increased the gain during the two year period on math and science tests by .74-.76 of a grade level equivalent and increased the gain in English and social studies by .34-.44 of a grade level equivalent. The crucial difference is apparently that these college preparatory classes are more demanding than other classes. This is clearly the case in our data, for the students who took all 5 of the college preparatory classes experienced a significant decline in their grades between sophomore and senior year. These results clearly imply that learning rates are determined by the rigor not the number of courses taken in a subject. Consequently, state requirements that students take more math and science courses to graduate

will have little effect on learning if students meet the requirement by taking undemanding courses. Most students avoid the more rigorous science and math courses because such courses increase their workload and lower their grade point average.

Psychic Energy: Even more important than the time devoted to learning is the intensity of the student's involvement in the process. At the completion of his study of American high schools, TheodoreSizer (1984) characterized students as, "*All too often docile, compliant, and without initiative.*" (p. 54)" John Goodlad (1983) described: "*a general picture of considerable passivity among students...*" (p. 113)". The high school teachers surveyed by Goodlad ranked "lack of student interest" as the most important problem in education.

Implicit Contracts between Teachers and Students: The student's lack of interest makes it difficult for teachers to be demanding. Sizer's description of Ms. Shiffe's biology class, illustrates what sometimes happens:

She wanted the students to know these names. They did not want to know them and were not going to learn them. Apparently no outside threat--flunking, for example--affected the students. Shiffe did her thing, the students chattered on, even in the presence of a visitor....Their common front of uninterest probably made examinations moot. Shiffe could not flunk them all, and, if their performance was uniformly shoddy, she would have to pass them all. Her desperation was as obvious as the students cruelty toward her. (1984 p. 157-158)

How do teachers avoid this treatment? Sizer's description of Mr. Brody's class provides an example.

He signaled to the students what the minima, the few questions for a test, were; all tenth and eleventh-graders could master these with absurdly little difficulty. The youngsters picked up the signal and kept their part of the bargain by being friendly and orderly. They did not push Brody, and he did not push them....Brody's room was quiet, and his students liked him. No wonder he had the esteem of the principal who valued orderliness and good rapport between students and staff. Brody and his class had agreement, all right, agreement that reduced the efforts of both students and teacher to an irreducible and pathetic minimum. (p. 156)

Some teachers are able to overcome the obstacles and induce their students to undertake tough learning tasks. But for most, the student's lassitude is demoralizing. Teachers are assigned responsibility for setting high standards but they are not given any tools that might be effective for inducing student observance of the academic goals of the classroom. They must rely on the force of their own personalities. All too often teachers compromise academic demands because the bulk of the class sees no need to accept them as reasonable and legitimate.

Nevertheless, American students do not appear to realize how poor their performance is. Even though American 13 year olds were one-fourth as likely as Korean students to "understand measurement and geometry concepts and [to be able to] solve more complex problems," Americans were three times more likely to agree with the statement, "I am good at mathematics" (Lapointe, Mead and Phillips 1989).

Past efforts to improve secondary education have focused on stricter graduation requirements, more rigorous courses, greater emphasis on the basics (English, math, science, social science, computer science), and improvements in the quality of teaching through higher salaries, career ladders, and competency tests for teachers. Upgrading the content and quality of school offerings is a necessary but not a sufficient

percent of Taiwanese and Japanese parents but by only 28 percent of American parents. Science workbooks had been purchased by 51 percent of Taiwanese parents, 29 percent of Japanese parents, and by only 1 percent of American parents (Stevenson, Lee and Stigler 1986). This is not because they love their children any less, they have different priorities such as teaching responsibility and work habits by requiring that they do chores around the house. Taiwanese parents place such a high priority on school performance, their children are expected to devote themselves to studying and are, therefore, relieved of household duties. Clearly, American parents hold their children and their schools to lower academic standards than Japanese and Taiwanese parents.

If American parents were truly dissatisfied with the academic standards of their local public schools, tutoring after school would be common (as in Japan) and enrollment in private schools offering an enriched and rigorous curriculum would be higher (as in Australia). It is the better discipline, religious education and absence of disruptive students which appears to attract students to private day schools, not more rigorous academics and better qualified teachers. Private school students do not learn at an appreciably faster rate than public school students (Cain and Goldberger 1983).

1.3 PUBLIC EFFORT: EDUCATIONAL EXPENDITURE--A DECEPTIVE INDICATOR

Graduation Requirements: Graduation requirements have been raised but they are still not very high. While most states require four years of English, no states require four years of mathematics and only 8 require three years of mathematics. In most states the mathematics requirement can be fulfilled without learning any geometry or algebra. For science the norm is a two year requirement. Only 3 states require three years of science and 3 require only one year (NCES 1992 Table 145). In some states the science requirement can be met by taking horticulture courses.

Spending per Pupil: The ratio of per pupil expenditure in kindergarten through 12th grade to per capita GNP is lower in the United States than in 10 of 11 other advanced Western nations (Mishel and Rasell 1990).² These statistics appear to imply that, compared to ability to pay, the U.S. spent less on elementary and secondary education than other OECD countries. People who disagree with this implication point to another statistic, per pupil expenditure deflated by a cost of living index on which the United States ranks 2nd among roughly the same group of 12 nations (US Department of Education 1990). This second form of comparison is not very useful, however, because the cost of providing instruction of given quality varies a good deal across countries. The cost of recruiting quality teachers is higher in the U.S. because college graduates (the pool of workers from which teachers must be drawn) are much better paid in the U.S. Since labor compensation accounts for the bulk of education costs, the proper deflator for schooling expenditure is not a general cost of living index, but a wage index that reflects the cost of recruiting competent teachers. In the absence of such an index, deflation by GDP per worker is the next best thing. OECD's estimates of the ratio of public expenditure on secondary education per student to GDP per capita and GDP per worker are given in Table 5. This way of comparing expenditure per student places the U.S.

Table 5
Public Expenditure per Secondary School Student
Relative to GDP per Worker and GDP per Capita

	<u>Relative to GDP per</u>			<u>Relative to GDP per</u>	
	Worker	Capita		Worker	Capita
Australia	9.5%	20.5% (voc ed excl)	Italy	8.1%	22.2%
Belgium	11.4%	32.0%	Japan	7.9%	16.0%
Denmark	15.8%	30.6%	Netherlands	7.2%	17.7%
Finland	13.5%	27.4%	Norway	15.5%	30.6%
France	9.0%	22.5% (apprenticeship exp excl)	Sweden	18.3%	34.9%
Germany	8.4%	19.0%	United Kingdom	9.0%	20.4%
	16.3%	37% if employer expenditure on apprenticeship incl)	United States	10.5%	22.4%

Source: OECD, *Education at a Glance*, 1992, Table P7. Column 1 deflates expenditure per student by GDP per worker. Column 2 deflates by GDP per capita.

roughly in the middle of the league table, below Belgium and the Scandinavian countries but above Japan, the United Kingdom, Australia, Netherlands, Germany and Italy.

Even with the correct deflator, expenditure per pupil remains a deceptive indicator of a nation's investment in education because countries budget school costs differently and assign public schools different functions some of which have little to do with academic instruction. Since, vocational education is more expensive than traditional academic courses, providing vocational education through schools as is done in Sweden, Holland, France and the United States raises costs. Dual systems of education like the German, Austrian and Swiss systems arrange for employers to provide most of the vocational instruction and thus place lower demands on the taxpayer. In 1980, German employers invested an average of \$6000 per year in the training of each apprentice they took on as part of the dual system of vocational training (Noll et al. 1984). The German government estimates that private expenditure on education of youth (almost all of which is employer spending on apprenticeship training of secondary school students) is equal to 1.9 percent of GDP (OECD 1992, Table P1). This implies that German employers account for nearly half of the nation's spending on secondary education and that Germany spends about 60 percent more on students participating in secondary education than the U.S. does.

American schools often perform functions such as after school sports, bus transportation, psychological counseling, medical check ups, after school day care, hot meals, and driver education that many other countries assign to other institutions. Costs of transportation are generally not included in school budgets in Japan and Europe where students use the public transportation system to go to school. In many European countries after-school sports are sponsored and organized by local government, not the school. This removes the capital costs of extensive school-based sports facilities and the salaries of coaches and maintenance personnel from the school budget. The additional functions performed by American schools are one of the reasons why non teaching staff account for a much larger share of employment in U.S. public education than in most other countries (OECD 1992 Table P9.e). If adjustments were made for service mix

Table 6
Teacher Compensation and Student-Teacher Ratios

	Teacher Compensation inc Soc Sec 1982-84	GDP Per Hour Worked 1977-81	Ratio Teacher Index/ GDP/hr	Secondary Students/ Teachers 1988	Share of Non Teaching Staff
Australia	---	--	----	12.1	27%
Belgium	120	94	1.28	8.3	19%
Canada	124	88	1.41	15.3	---
Denmark	---	--	----	11.1	42%
France	128	95	1.35	13.4	26%
Germany	107	95	1.13	----	18%
Ireland	---	--	----	17.5	---
Italy	60	68	.88	9.2	---
Japan	74	59	1.25	18.2	23%
Netherlands	106	97	1.09	20.0	16%
Sweden	124	79	1.57	11.5	---
United Kingdom	63	78	.81	16.5	---
United States	100	100	1.00	15.8	51%

Column 1 is total compensation including compulsory health & pension contributions deflated by cost of living indexed to make the U.S. = 100. Source is Barro and Suter, "International Comparisons of Teachers' Salaries: An Exploratory Study," NCES 1988 and the UNESCO Statistical Yearbook, (1985, 1986). Column 2 is Gross Domestic Product divided by total hours worked deflated by cost of living from Angus Maddison (1982, 1989) (Index with US = 100). Column 3 is column 1 divided by column 2. Column 4 is the ratio of the number of full-time-equivalent pupils enrolled in secondary schools to the number of full-time-equivalent secondary school teachers taken from OECD (1992, Table P16). Column 5 is share of all staff employed in publicly funded schools and ministries of education that are instructional staff from Table P9.e of OECD (1992). The non-teaching staff includes administrators at all levels, custodial staff, bus drivers, clerical workers, nurses and counselors. Staff providing continuing vocational training, apprenticeship training, art and music schools not under departments of education were excluded from both the numerator and denominator of the ratio.

and a cost of education index reflecting compensation levels in alternative college level occupations were used to deflate expenditure, the ranking of the US in Table 5 would probably drop somewhat.

American education budgets are spent differently than European and Japanese education budgets. Computers are more plentiful and physical facilities are generally better. Libraries are larger and textbooks more colorful and up to date. In part, this reflects the fact that books, computers and buildings are cheaper (relative to teachers of constant quality) in the United States. Student-teacher ratios in U.S. secondary schools are close to the OECD average. They are below those in Japan and Holland but above those in Belgium, Denmark, Italy and Sweden (see column 4 of Table 6).

What is most unique about the way Americans organize and budget their schools is the heavy investment in non-teaching staff and the relatively low levels of teacher compensation. Non-teachers account for one half of the employees in public education in the U.S. Non-teachers account for less than one-fifth of employees in Belgium, Germany and Netherlands and only 23-26 percent of employees in France and Japan (see column 6 of Table 5). Howard Nelson's (1990) examination of this issue concluded that teacher compensation was between 45.5 and 53.5 percent of current expenditures in the U.S.³ These ratios are higher in most other OECD countries. The mean for OECD countries reporting this statistic was 62 percent (OECD 1992 Table P5).

Teacher Compensation: Since many countries fund pensions and medical insurance through mandated social security taxes, it is essential to include both voluntary and compulsory contributions for these purposes in the measurement of teacher compensation. Estimates of total compensation per teacher deflated for cost of living differences between countries are presented in the first column of Table 6. In 1982-84, total compensation was 24 percent higher in Canada and Sweden, 6-7 percent higher in Germany and Holland, 20 percent higher in Belgium and 28 percent higher in France than in the United States.⁴ Despite lower overall standards of living, teachers in these countries were better paid than teachers in the U.S. Compensation was 37 percent lower in the United Kingdom, 40 percent lower in Italy and 26 percent lower in Japan. Relative to output per hour worked, however, Japan paid its teachers 25 percent more than the U.S. Thus, only Britain and Italy pay their teachers less well relative to GDP per hour worked than the U.S.

The key salary comparison, however, is not with teachers of other nations, but with salaries available in other occupations requiring similar levels of education. When college graduate salaries are compared, education majors come out at the very bottom. Despite recent increases in teacher salaries the gap between teachers and other college graduates has remained large. SIPP data on relative salaries in 1984 and 1987 is presented in the first column of Table 7. Physical science majors earned 77 percent more, economics majors 129 percent more and business majors 106 percent more than education majors. Social science majors earned 39 percent more and humanities majors earned 8 percent more than education majors. Relative to individuals with graduate degrees in education, those with MBAs earned 64 percent more, those with law degrees earned 104 percent more, and those with advanced degree in physical science earned 75 percent more.⁵

Not all nations pay their teachers so poorly. Australian university graduates with education degrees

Table 7
Relative Salaries by Field of Study in University

<u>Field of Study</u>	<u>United States</u>		<u>Australia</u>		<u>Canada</u>		<u>United Kingdom</u>	
	BA/BS	1990	Prev. Yr.		1986	1982	1980	1980
	18+	Grad	Grads.		Grad	Grad	Grad	Grad
Date of Earnings..	1984,87	1991	1979	1989	1988	1987	1981	1985
<u>Bachelors Degree</u>								
Education	100	100	100	100	100	100	100	100
Humanities	108	99	86	92	89	87	86	118
Phys Sci & Math	177	137	97	102	107	113	101	146
Biological Science	146	110	---	---	85	90	91	121
Health	117	167	---	---	115	113	86	128
Engineering	226	163	102	110	111	116	104	141
Soc Sci except Econ	139		---	---	93	110	87	119
Economics	229	108	91	100	93	97	90	156
Business (BA)	206	126	---	---	93	113	89	145
<u>Advanced Degrees</u>								
Humanities	85	---	---	---	64	67	---	---
Phy. Science	175	---	---	---	80	82	---	---
Engineering	171	---	---	---	84	103	---	---
Soc Sci except Econ	112	---	---	---	77	80	---	---
Business (MBA)	164	---	---	---	95	115	---	---
Law	204	---	---	---	114	128	---	---

The index numbers hold the level of the degree constant and compare the salary of degree recipients in specified major to the salary of those who majored in education. For advanced degrees the United States data were for all advanced degrees (incl. PhDs), while the Canadian data were for Masters and First Professional Degrees (not PhDs).

Source: Column 1 is derived from Robert Kominski What's It Worth, (1990) Current Population Report, P70, No. 21, Table B. Column 2 is derived from the Digest of Education Statistics (1993) Table 327. Column 3 and 4 is derived from Graduate Careers Council of Australia, Graduate Starting Salaries 1989. Column 5 is calculated from Warren Clark, The Class of 1986, (1992) Table C-4 & C-5. Column 6 is from Warren Clark, The Class of 1982 Revisited, (1991) Table E-3 & E-4. Column 7 and 8 are derived from Dalton and Makepeace (1990) Table 1 and 2.

start at the same salary as graduates in economics/business, 8 percent ahead of those who majored in humanities and only 2 percent behind those who majored in physical science (Guthrie 1990). In Canada starting salaries of education graduates are 11 percent higher than the salaries of humanities graduates, 7 percent higher than economics and business graduates. Five years after graduation, education graduates in Canada were still 13 percent better paid than humanities graduates, 3 percent better paid than economics graduates and only 13 percent less well paid than business graduates. In the United Kingdom in 1981 starting salaries of education graduates were 14 percent higher than humanities graduates, 10-11 percent higher than business graduates and only 1 percent below math and physical science graduates. By comparison, in the United States starting salaries of mathematics and physical science majors are 37 percent above education majors and the starting salaries of business majors 26 percent above.

No wonder it is so difficult in the United States to attract the best and brightest into teaching. No wonder it is particularly difficult to recruit competent science and mathematics teachers. SAT test scores are lower for education majors than for any other major. The gap is particularly large in mathematics. In 1990-91 the Math SAT of intended education majors was 33 points below the overall average, 107 points below engineering majors and 131 points below majors in the physical sciences. The Verbal SAT of intended education majors was 16 points below the overall average, 34 points below arts and humanities majors and 31 points below social science majors (NCES 1992, Table 124).

In Europe and Japan, by contrast, there is often fierce competition to enter university programs specializing in the preparation of secondary school teachers. Only medicine, law and veterinary science are consistently more selective than teacher education programs.

The quality of the people recruited into teaching is very important. The teacher characteristic that most consistently predicts student learning are tests assessing the teacher's general academic ability and subject knowledge (Hanushek 1971; Strauss and Sawyer 1986, Ferguson 1991). Since Americans with university training in mathematics and science can earn much more in non-teaching jobs, those with talent in these areas are difficult to recruit into high school teaching. This results in most teachers being poorly prepared in science and mathematics. This, in turn, helps explain why American students lag behind European and Japanese students in mathematics and science but not in reading (Postlethwaite and Ross, 1993).

The question that tends to be raised by statistics such as these is "Why do American voters choose to pay teachers so little?" One reason, of course, is that American teachers work fewer days of the year than teachers in Europe and Japan. That only shifts the question slightly. Why, when all other American workers have shorter vacations than their European counterparts, do American teachers have substantially longer vacations than European teachers? Why is our school year shorter than in most other advanced countries? Why do voters not demand higher standards of academic achievement at local high schools? Why do school boards allocate scarce education dollars to interscholastic athletics and the band rather than better mathematics teachers and science laboratories? It is to questions such as these that we now turn.

1.4 VOTER APATHY REGARDING ACADEMIC ACHIEVEMENT

One of the unique characteristics of the American education system is that all the really important decisions--budget allocations, hiring selections, salary levels, teaching strategies, grading standards, course offerings, pupil assignments to courses and programs, disciplinary policies, etc.--are made by classroom teachers and school administrators who are responding to local political pressures. Federal and state officials are far removed from the classroom, and the instruments available to them for inducing improvements in quality and standards are limited. They do not have effective control of the standards and expectations that prevail in the classroom. They do not control the allocation of school funds between academics and athletics.

State aid can be increased; but econometric studies suggest that increases in state aid reduce local property tax collections by a significant amount (Carroll 1982; Ehrenberg and Chaykowski 1988). For every extra dollar of non-categorical state aid to local school districts only about 50 cents is spent on education by the locality: the rest either lowers tax rates or enables the community to spend more on other public functions. For categorical programs like Title I, the increase in local education spending is larger, but some leakage appears to be inevitable (Tsang and Levin 1983; Monk 1990).

School boards are the primary mechanism by which the voters exercise authority over local schools. In most parts of the country only bond issues need go to the voters for approval. The board determines the budget and sets the property tax rates necessary to fund that budget. Parents are typically a minority of voting age adults in the community, but only about 10 percent of the non-parents in a community typically vote in school board elections. Parents are more likely to vote in school board elections, so they have effective control of the school board in many communities. In other communities, they could easily gain control if they turn up at the polls and vote in concert. Parents pay less than a third of school taxes in most communities, so voting for school board members who promise to support increased educational spending and higher standards is, for them, a low cost way of improving the school attended by their child. Why hasn't this potential power been exercised to raise academic standards and teacher salaries? Why are less than a third of parents voting in most school board elections? Why do so many parents vote against increases in school taxes? When additional money is available, why is so much of it spent on upgrading the sports program and the band, not on hiring a physics teacher?

If, as indicated above, the parents of a community are satisfied with academic outcomes which leave their children years behind students of other nations in mathematics and science, federal and state efforts to raise standards will have no lasting effect.

II. THE ABSENCE OF REWARDS FOR EXCELLENCE: THE ROOT CAUSE OF THE LEARNING DEFICIT

The fundamental cause of the low effort level of American students, parents, and voters in school elections is the absence of good signals of effort and learning in high school and a consequent lack of rewards for effort and learning. In the United States the only signals of learning that generate substantial

rewards are diplomas and years of schooling. In most other advanced countries mastery of the curriculum taught in high school is assessed by essay examinations which are set and graded at the national or regional level. Grades on these exams signal the student's achievement to universities, colleges and employers and influence the jobs that graduates get and the universities and programs to which they are admitted. How well the graduating seniors do on these exams influences the reputation of the school and in some countries the number of students applying for admission to the school. In the United States, by contrast, students take aptitude tests that are not intended to assess the learning that has occurred in most of the classes taken in high school. The primary signals of academic achievement are grades and rank in class--criteria which assess achievement relative to other students in the school or classroom, not relative to an external standard.

Consequently, the students who do not aspire to attend highly selective colleges benefit very little from working hard while in high school, and parents have little incentive to vote the tax increases necessary to upgrade the academic quality of local schools. This is a consequence of eight phenomena.

2.1 GRESHAM'S LAW OF COURSE SELECTION

Easy and entertaining courses drive out rigorous courses. Because their student bodies are so diverse, American high schools offer a variety of courses at vastly different levels of rigor. The rigor of the courses taken is not well signaled to employers and most colleges, so taking rigorous courses is seldom rewarded. Most students choose courses that have the reputation of being fun and not requiring much work to get a good grade. Most parents are uninformed about course options and their consequences and fail to influence the choices made. In Ithaca, New York, for example, less than one-fifth of parents attend the meeting in 8th grade at which the student and guidance counselor plan the student's 9th through 12th grade course sequence. Teachers know this and adjust their style of teaching and their homework assignments with an eye to maintaining enrollment levels. Attempts to induce students to take tough courses seldom succeed:

An angry math teacher [who remembering] the elimination of a carefully planned program in technical mathematics for vocational students simply because not enough signed up for it,...[said] 'Its easy to see who really makes decisions about what schools teach: the kids do.'
(Powell, Farrar and Cohen 1985, p. 9)

Making graduation contingent on passing a minimum competency exam does not solve the problem because the minimum is set low and most students pass it early in their high school career.

2.2 ACHIEVEMENT IN HIGH SCHOOL IS NOT NECESSARY FOR COLLEGE ADMISSION

Most American colleges and universities do not set rigorous standards for admission. While college attendance is correlated with high school achievement, achievement not even functional literacy is required for admission to most community colleges and a number of four year colleges. High school students know that taking undemanding high school courses and goofing off in these courses will not prevent them from being admitted to a college.

In the United States access to higher education is rationed primarily by student ability and parental willingness to pay. Most financial aid to undergraduates is awarded solely on the basis of need not the

student's past academic achievements. The most selective universities and colleges are also the most expensive. Doing well in high school typically results in parents having to pay more for the college education of their child, not less. In Japan, the most prestigious universities are also the cheapest, so doing well in high school lowers the amount of money parents have to pay for college.

In Europe, universities are free and most governments provide college students with a stipend to cover living costs. Places in higher education are rationed not by price or aptitude, but by achievement in the core subjects studied in secondary school.

2.3 ADMISSION TO SELECTIVE COLLEGES IS BASED ON APTITUDE AND CLASS RANK NOT ACHIEVEMENT

Where admission to college does depend on high school performance, it is not based on an absolute or external standard of achievement in high school subjects. Rather, it is based, in part, on aptitude tests which do not assess the high school curriculum, as well as on measures of student performance such as class rank and grade point averages, which are defined relative to classmates' performances. Selective colleges do look at the rigor of the high school program a student has pursued in high school and evaluate grades in that light. Many students are unaware of this practice and choose courses that they know they will have no difficulty in getting an A. Selective colleges give preference to students who take Advanced Placement courses. Seniors applying to selective colleges are aware of this and often sign up for AP classes. The AP exams come after colleges announce their admission decisions, however, so many students do not put the required energy into the course and decline to take the AP exam when the time comes.

2.4 DIFFICULTIES IN SIGNALLING UPGRADED STANDARDS TO COLLEGES AND EMPLOYERS

Setting higher academic standards or hiring better teachers does not on average improve the signals of academic performance--rank in class, GPA and SAT scores--that selective colleges use for making admission decisions and a few employers use to make hiring decisions. Higher standards for graduating are not likely to be supported by the parents of children not planning to go to college, because they would put at risk what is most important, the diploma. Higher standards do not benefit students as a group, so parents as a group have little incentive to lobby strongly for higher teacher salaries, higher standards and higher school taxes.

2.5 LOCAL MONOPOLIES IN THE PROVISION OF SECONDARY SCHOOLING

In most American communities, students and parents cannot choose which public high school to attend. In Europe and Japan, by contrast, the family can often select which secondary school a student attends. Barriers to attending a school other than the closest one are lower in these countries because schools are smaller and more numerous, public transportation is available, opportunities to participate in sports and music are often organized by the community not the school, and centralized funding of schools means that spending per pupil varies little and money follows the student even when a school is in a nearby

community is selected. The centralization of funding and the free choice of schools results in stronger competitive pressure on schools to excel and smaller quality differentials between schools of the same type than in the U.S. This is one of the reasons why, despite the comprehensive character of American schools, variations in achievement across individuals and schools are larger in the U.S. than in most other advanced countries. In science at 14-15 years of age, the U.S. ranks 2nd among 15 advanced countries in the inequality of student achievement and 5th in the inequality of school mean achievement levels (IAEA, 1988 Table 5 and 7).

If American parents and students were allowed to choose their high school, however, the Gresham's law of course selection might become a Gresham's law of school selection. If college admissions decisions continued to be based on grades and rank in class, it might be preferable to be a big fish in a low standards pond than an average fish in a high standards pond. Even though American high schools differ greatly in standards and quality, employers do not appear to be using high school reputation as a signal when making hiring selections (Hollenbeck and Smith 1984). Some colleges take high school quality into account when evaluating a student's GPA, but most colleges do not. In such an environment it is not clear what will impel parents to send their children to a school that promises a rigorous academic program involving a great deal of homework rather than to a school with an Afro-centrist curriculum or a reputation for excellence in hockey.

School choice will induce schools to upgrade the rigor and quality of their program only if substantial rewards--better jobs and admission to selective college programs--go to those who graduate from schools with higher standards, better teachers and longer homework assignments. Including high school "reputation" in the factors considered when making hiring and college admission decisions is not a satisfactory solution, however, because the reputations of U.S. high schools are based more on the socio-economic background of the students, where they go to college and (for private schools) the percent of applicants rejected than on the actual academic achievement of the students (about which little is known). Schools would respond by hiring PR firms to produce flashy videos about the school and by becoming more selective in admissions. Even if reputations were based on information on average achievement levels (in England, for example, comparative data on numbers of students passing various exams are published each year), reputations change only slowly, so efforts to improve one's school would be rewarded only with a long lag.

In order for school choice to generate an environment that induces schools to focus on upgrading instruction and improving learning, (1) the skills and competencies of individual graduates must be assessed relative to an external standard that is comparable across schools and (2) individual rewards--eg. access to preferred university programs and better jobs--must be attached to these results. Only then are students and parents encouraged to select schools on the basis of their expected value added, rather than on the basis of reputations that school staff are unable to change by doing a better teaching job. Most advanced nations have such an assessment system. The United States does not. Without such assessments, school choice might well cause academic expectations and standards to decline.

2.6 DIFFICULTIES IN ASSESSING TEACHER PERFORMANCE

There is no effective way of holding most high school and middle school teachers individually accountable for the learning of their students. Unionization is not the critical barrier, for unionized European and Japanese secondary school teachers and most American primary school teachers feel accountable for the learning of their students. The lack of accountability in American secondary schools stems from: (1) the rarity of high stakes examinations assessing student achievement in particular subjects relative to an external standard, and (2) the fact that most secondary school students receive instruction in English, mathematics, history, and science from many different teachers. The exceptions to this norm are the coaches of the athletic teams, the band conductor, teachers of advanced placement classes, and vocational teachers (who are often evaluated for their success in placing students in good jobs). In Europe, students who are preparing to take a particular exam at the end of their secondary education typically remain together in one class and are taught by the same teacher in successive years. In most Japanese junior high schools, a team of teachers, each responsible for a different subject, teach all the 7th graders one year, the 8th graders the next year, and the 9th graders the third year. Examinations taken during 9th grade determine admission to competitive high schools so teachers feel responsible for how well their students do on these examinations.

2.7 PEER GROUP NORMS

In the United States, the peer group actively discourages academic effort. No adolescent wants to be considered a "nerd, brain geek, grade grubber or brown noser" or to be "acting White," yet that is what happens to students who study hard and are seen to study hard. Because the school's signals of achievement assess performance relative to fellow students through grades and class rank, not relative to an external standard, peers have a personal stake in persuading each other not to study.

The primary reason for peer pressure against studying is that pursuing academic success forces students into a zero-sum competition with their classmates. Their situation has many elements of the classic prisoner's dilemma game. Their achievement is not being measured against an absolute, external standard. In contrast to scout merit badges, for example, where recognition is given for achieving a fixed standard of competence, the school's measures of achievement assess performance relative to fellow students through grades and class rank. Students who study hard for exams make it more difficult for close friends (other members of the class) to get an A or be ranked at the top of the graduating class. Since devoting time to studying for an exam is costly, the welfare of the entire class is maximized if no one studies for exams which are graded on a strict curve. The cooperative solution is "no one studies more than the minimum." Participants are generally able to tell who has broken the "minimize studying" code and reward those who conform and punish those who do not. Side payments and punishments are made in a currency of friendship, respect and ridicule which is not subject to a budget constraint. For most participants the benefits that might result from studying for the exam are less important than the very certain costs of being considered a "brain geek", "grade grubber," "brown noser" or "acting White," so most students abide by the "minimize studying" norm.

The peer norms that result are: *It is OK to be smart. You cannot help that. But, it is definitely not OK to study hard to get a good grade.* This is illustrated by the following story related by one of my students:

Erroneously I was lumped into the brains genus by others at [high] school just because of the classes I was in. This really irked me; not only was I not an athlete but I was also thought of as one of those "brain geeks". Being a brain really did have a stigma attached to it. Sometimes during a free period I would sit and listen to all the brains talk about how much they hated school work and how they never studied and I had to bite my lip to keep from laughing out loud. I knew they were lying, and they knew they were lying too. I think that a lot of brains hung around together only because their fear of social isolation was greater than their petty rivalries. I think that my two friends who were brains liked me because I was almost on their level but I was not competitive (Tim 1986).

Note how those who broke the 'minimize studying' norm tried to hide the fact from classmates. They did not espouse an alternative "learning is fun and important" norm.

The costs and benefits of studying vary across students because interest in the subject varies, ability varies and parental pressure and rewards vary. This heterogeneity means that some students choose to break the "minimize studying" norm. When they are a small minority, they cannot avoid feeling denigrated by classmates. In the top track and at schools where many students aspire to attend competitive colleges, the numbers of such students may be sufficient to create a sub culture of its own with its own norms denigrating those who do poorly on tests or who disrupt classroom instruction. This is the structural basis of the "brains" and "preppie" cliques found in many high schools. Most high school students, however, are in cliques which denigrate studying.

Peer pressure not to study does not derive from a general desire to take it easy. In jobs after school and at football practice, young people work very hard. In these environments they are part of a team where individual efforts are visible and appreciated by teammates. Competition and rivalry are not absent, but they are offset by shared goals, shared successes and external measures of achievement (i.e. satisfied customers or winning the game). On the sports field, there is no greater sin than giving up, even when the score is hopelessly one sided. On the job, tasks not done by one worker will generally have to be completed by another. For too many students in too many high schools, when it comes to academics, there is no greater sin than trying hard.

A second reason for peer norms against studying is that most students perceive the chance of receiving recognition for an academic achievement to be so slim they have given up trying. At most high school awards ceremonies the recognition and awards go to only a few--those at the very top of the class. By 9th grade most students are already so far behind the leaders, that they know they have no realistic chance of being perceived as academically successful. Their reaction is often to denigrate the students who take learning seriously and to honor other forms of achievement--athletics, dating, holding your liquor and being "cool"--which offer them better chances of success.

2.8 THE LABOR MARKET DOES NOT REWARD ACHIEVEMENT IN HIGH SCHOOL

The labor market fails to reward effort and achievement in high school. Analysis of the Youth

Cohort of the National Longitudinal Survey indicates that during the first 10 years after leaving high school, greater competence in science, language arts and mathematical reasoning lowers wages and increases the unemployment of young men. Table 8 present estimates of the percentage increase in wage rates that results from a five grade level equivalent improvement on tests assessing competence in mathematical reasoning, English, science, technology and computational speed (Bishop 1988b). For young women, verbal and scientific competencies have no effect on wage rates and a one grade level increase in mathematical reasoning competence raises wage rates by only one-half of one percent. As a result, students who plan to look for a job immediately after high school see very little connection between how much English, mathematics and science they learn and their future success in the labor market. Less than a quarter of 10th graders believe that geometry, trigonometry, biology, chemistry, and physics are needed to qualify for their first choice occupation (LSAY, 1988, BA24B-BA25D).

Although the economic benefits of higher achievement to the employee are quite modest and do not appear until long after graduation, the benefits to the employer (and, therefore, to national production) are immediately realized in higher productivity. Over the last 80 years, industrial psychologists have conducted hundreds of studies, involving hundreds of thousands of workers, on the relationship between productivity in particular jobs and various predictors of that productivity. They have found that competence in reading, mathematics, science and problem solving are strongly related to productivity in almost all of the civilian and military jobs studied (Ghiselli 1973; Hunter, Crossen and Friedman 1985). Table 9 presents the results of one study predicting a hands-on measure of job performance in the military. Technical competence had no effect on job performance in clerical jobs but very substantial effects on performance in skilled technical, general maintenance and skilled electronics jobs. A five grade level equivalent improvement in mathematical reasoning ability raised performance by .447 standard deviations (SD) in clerical jobs, .34 SD in general maintenance jobs (eg. truck driving and construction), and .18-.24 SD in skilled technical and skilled electronics jobs. The proportionate change in productivity that results is somewhere between 25 and 40 percent of these numbers.⁶ Science and word knowledge also have substantial effects on job performance in skilled technical, general maintenance and clerical jobs (Bishop 1989b).

Despite their significantly higher productivity, young workers who have achieved in high school have not been receiving appreciably higher wage rates after high school. Apparently, when a non-college-bound student works hard in school and improves his or her competence in language arts, science and mathematical reasoning, the youth's employer reaps much of the benefit.

Employers appear to believe that school performance is a good predictor of job performance. Studies of how employers rate job applicant resumes which contain information on grades in high school have found that employers give substantially higher ratings to job applicants with high grade point averages (Hollenbeck and Smith 1984). However, they have great difficulty getting information on school performance. If a student or graduate has given written permission for a transcript to be sent to an employer, the Federal Education Rights and Privacy Act obligates the school to respond. Many high schools

Table 8
Effect of Competencies on
Log Wage Rates and Earnings

	Technical	Clerical Speed	Computation Speed	Math Reasoning	Verbal	Science	R ²	Number of Obs.	FTest on Academic Coef.
MALES									
Wages--1986	.080*** (6.10)	.005 (.51)	.064*** (5.75)	-.007 (.51)	-.021 (1.49)	-.008 (.60)	.264	4272	4.35** neg
Earnings-1985	.133*** (6.26)	.004 (.21)	.119*** (6.55)	-.037* (1.78)	.014 (.61)	-.021 (.93)	.358	4564	2.4
FEMALES									
Wages--1986	.006 (.31)	.028*** (2.60)	.024** (2.04)	.027* (1.94)	.027* (1.75)	.012 (.81)	.275	4080	12.6*** pos
Earnings--1985	-.020 (.64)	.022 (1.14)	.053*** (2.60)	.065*** (2.66)	.039 (1.40)	.009 (.34)	.328	3888	11.8*** pos

* p<.05 on a one tail test
 ** p<.025 on a one tail test
 *** P<.005 on a one tail test

T Statistics are in parentheses under the coefficient.

Source: Analysis of the 1986 National Longitudinal Survey of Youth. Sample excluded individuals who were in the military in 1979 but included students both full and part time if they had a job in 1985 or 1986. School attendance was controlled by four separate variables: a dummy for respondent is in school at the time of the interview; a dummy for respondent has been in school since the last interview; a dummy for part time attendance and the share of the calendar year that the youth reported attending school derived from the NLS's monthly time log. Years of schooling was controlled by four variables: years of schooling, a dummy for high school graduation, years of college education completed, and years of schooling completed since the ASVAB tests were taken. Reports of weeks spent in civilian employment were available all the way back through 1975. For each individual, these weeks worked reports were aggregated across time and an estimate of cumulated civilian work experience was derived for January 1 of each year in the longitudinal file. This variable and its square was included in every model as was age, age squared and current and past military experience. The individual's family situation was controlled by dummy variables for being married and for having at least one child. Minority status was controlled by a dummy variable for Hispanic and two dummy variables for race. Characteristics of the local labor market were held constant by entering the following variables: dummy variables for the four Census regions, a dummy variable for rural residence and for residence outside an SMSA and measures of the unemployment rate in the local labor market during that year.

Table 9 Effect of competencies on job performance (SQT).

	Mechanical Comprehension	Auto. Info.	Shop Info.	Electr. Info.	Attention to Detail	Comp. Speed	Word Knowl.	Arith. Reasoning	Math Knowl.	Science	R ²
Skilled technical (1324)	0.092*** (3.07)	0.017 (0.58)	0.132*** (4.28)	0.174*** (5.09)	0.024 (1.12)	0.031 (1.17)	0.215*** (6.77)	0.062** (1.96)	0.121*** (3.76)	0.057* (1.83)	0.548
Skilled electronic (349)	0.086 (1.30)	0.098 (1.49)	0.246*** (3.64)	0.045 (0.60)	0.084 (1.81)	-0.013 (0.22)	-0.004 (0.06)	-0.021 (0.30)	0.261*** (3.67)	0.072 (1.05)	0.426
General (const.) maintenance (879)	-0.004 (0.11)	0.082** (2.34)	0.117*** (3.25)	0.121*** (3.05)	0.043* (1.76)	0.068*** (2.19)	0.066* (1.80)	-0.101*** (2.73)	0.441*** (11.70)	0.134*** (3.67)	0.592
Mechanical maintenance (131)	0.042 (0.38)	0.314*** (2.88)	0.206* (1.84)	-0.089 (0.71)	0.055 (0.72)	0.235** (2.43)	-0.004 (0.03)	-0.068 (0.59)	0.061 (0.52)	0.096 (0.85)	0.412
Clerical (830)	-0.068 (-1.59)	0.087*** (2.05)	-0.030 (-0.69)	0.065 (1.33)	0.015 (0.50)	0.085** (2.24)	0.118*** (2.61)	0.241*** (5.33)	0.206*** (4.46)	0.064 (1.44)	0.425
Operators and food (814)	0.109* (2.50)	0.179*** (4.11)	0.062 (1.39)	0.100** (2.02)	0.050 (1.62)	-0.037 (0.96)	0.061 (1.33)	0.114* (2.47)	0.106** (2.25)	0.076* (1.66)	0.414
Unskilled electronic (2545)	0.004 (0.14)	0.027 (0.87)	0.062* (1.93)	0.077** (2.15)	0.036 (1.65)	0.053* (1.92)	-0.010 (0.31)	0.058* (1.75)	0.018 (0.55)	-0.025 (0.76)	0.052
Combat (5403)	0.147*** (8.28)	0.060*** (3.38)	0.080*** (4.42)	0.058*** (2.86)	0.048*** (3.82)	0.035** (2.23)	0.069*** (3.71)	0.070*** (3.74)	0.139*** (7.29)	0.070*** (3.82)	0.358
Field artillery (534)	0.059 (1.10)	0.047 (0.89)	0.030 (0.56)	0.134** (2.21)	0.088** (2.33)	-0.009 (0.19)	0.000 (0.01)	0.186*** (3.28)	0.230*** (3.99)	0.061 (1.10)	0.422

Source: Reanalysis of Maier and Grafton's (1981) data on the ability of ASVAN 6/7 to predict Skill Qualification Test (SQT) scores. The correlation matrix was corrected for restriction of range by Maier and Grafton.

are not, however, responding to such requests. In Columbus Ohio, for example, Nationwide Insurance sent over 1,200 requests for transcripts signed by job applicants to high schools in 1982 and received only 93 responses.

An additional barrier to the use of high school transcripts in selecting new employees is that when high schools do respond, it takes a great deal of time. In most high schools, the system for responding to transcript requests has been designed to meet the needs of college-bound students rather than the students who seek jobs immediately after graduating. The result is that a 1987 survey of a stratified random sample of small and medium-sized employers who were members of the National Federation of Independent Business (NFIB) found that transcripts had been obtained prior to the selection decision for only 14.2% of the high school graduates hired.⁷ Only 15% of the employers had asked high school graduates to report their grade point average. The absence of questions about grades on most job application forms reflects the low reliability of self reported data, the difficulties of verifying them, and the fear of EEO challenges to such questions.

Hiring on the basis of recommendations by high school teachers is also uncommon. In the NFIB survey, when a high school graduate was hired, the new hire had been referred or recommended by vocational teachers in only 5.2% of the cases and referred by someone else in the high school in only 2.7%. Tests are available for measuring competency in reading, writing, mathematics, science, and problem solving; but, after the 1971 Griggs decision, almost all firms were forced to stop employment testing by EEOC guidelines which made it prohibitively costly to demonstrate test validity (Friedman and Williams 1982). The 1987 NFIB survey found that basic skills tests had been given in only 2.9 % of the hiring decisions studied. Other countries handle the signaling of high school accomplishments to colleges and to prospective employers very differently.

After a worker has been at a firm a while, the employer presumably learns more about the individual's capabilities and is able to observe performance on the job. Workers assigned to the same job often produce very different levels of output (Hunter, Schmidt and Judiesch 1988). Why, one might ask, are the most productive workers (those with just the right mix of specific competencies) not given large wage increases reflecting their higher productivity? The reason appears to be that workers and employers prefer employment contracts which offer only modest adjustments of relative wages in response to perceived differences in relative productivity. There are a number of good reasons for this preference: the unreliability of the feasible measures of individual productivity (Hashimoto and Yu, 1980), risk aversion on the part of workers (Stiglitz, 1974), productivity differentials that are specific to the firm (Bishop, 1987a), the desire to encourage cooperation among coworkers (Lazear 1986) and union preferences for pay structures which limit the power of supervisors. In addition, compensation for differences in job performance may be nonpecuniary -- praise from one's supervisor, more relaxed supervision, or a high rank in the firm's social hierarchy (R. Frank, 1984). A study of how individual wage rates varied with initial job performance found that when people hired for the same or very similar jobs are compared, someone who is 20 % more productive than average is typically paid only 1.6 % more. After a year at a firm, better producers received only a 4% higher

wage at nonunion firms with about 20 employees, and they had no wage advantage at unionized establishments with more than 100 employees or at nonunion establishments with more than 400 employees (Bishop, 1987a).

If relative wage rates only partially compensate the most capable workers in a job for their greater productivity, why don't they obtain promotions or switch to better paying firms? To some degree they do, particularly in managerial and professional occupations. This explains why workers who score high on tests and/or get good grades are less likely to be unemployed and more likely to be promoted, and why, many years after graduation, they eventually obtain higher wage rates (Wise 1975; Bishop 1988b). Since, however, worker productivity cannot be measured accurately and cannot be signaled reliably to other employers, this sorting process is slow and only partially effective (Bishop 1987b).

2.9 INCENTIVES TO LEARN IN OTHER NATIONS

The tendency not to reward effort and learning in high school appears to be a peculiarly American phenomenon. Marks in school are the major determinant of who gets the most preferred apprenticeships in Germany. Japanese and European educational systems administer achievement exams which are closely tied to the curriculum. While the Japanese use a multiple choice exam, all other nations use examinations in which students write essays and show their work for mathematics problems. Generally, regional or national boards set the exams and oversee the blind grading of the exams by committees of teachers. These are not minimum competency exams. In many subjects the student may choose to take the exams at two different levels of difficulty. Excellence is recognized as well as competence (Noah and Eckstein 1988).

Performance on these exams is the primary determinant of admission to a university and to particular fields of study such as medicine and law. In many countries, good grades on the toughest exams--physics, chemistry, advanced mathematics--carry particularly heavy weight. Exam grades are included in resumes and are asked for on job applications (see Exhibit 1 and 2).

In Japan, clerical, service, and blue collar jobs at the best firms are available only to those who are recommended by their high school. The most prestigious firms have long term arrangements with particular high schools to which they delegate the responsibility of selecting new hires for the firm. The criteria by which the high school is to make its selection are, by mutual agreement grades and exam results. In addition, most employers administer their own battery of selection tests prior to hiring. The number of graduates that a high school is able to place in this way depends on its reputation and the company's past experience with graduates from the school. Schools know that they must be forthright in their recommendations because if they fail just once to make an honest recommendation, the relationship will be lost and their students will no longer be able to get jobs at that firm (Rosenbaum and Kariya 1989).

This system has the consequences one might expect. Rosenbaum's (1990) study of the high school to work transition in Japan finds that good grades, no discipline problems, and participation in extracurricular activities all have significant positive effects on obtaining jobs at large firms and entering a white collar

activities. For female high school graduates, obtaining a white collar job is associated with high grades, but it is also positively associated with being a discipline problem in school.

Parents in Japan, Australia, and Europe know that a child's future depends critically on how much is learned in secondary school. In many countries the options for upper secondary schooling depend primarily on the child's performance in lower secondary school, not on where the parents can afford to live, as in the US. Since the quality and reputation of the high school is so important, the competitive pressure often reaches down into lower secondary school. National exams are the yardstick, so achievement tends to be measured relative to everyone else's in the nation and not just relative to the child's classmates. As a result, parents in most other Western nations demand more and get more from their local schools than we do and, nevertheless, they are more dissatisfied with their schools than American parents.

Japanese teenagers work extremely hard in high school, but once they enter college, many stop working. For students in non-technical fields a country club atmosphere prevails. The reason for the change in behavior is that when employers hire graduates with non-technical majors, they base their selections on the reputation of the university and a long series of interviews and not on teacher recommendations or other measures of academic achievement at the university. Students in engineering and other technical programs work much harder than their liberal arts counterparts largely because job opportunities depend entirely on the recommendation of their major professor. **Studying hard is not a national character trait; it is a response to the way Japanese society rewards academic achievement.**

American students, in contrast, work much harder in college than in high school. This change is due, in part, to the fact that academic achievement in college has important effects on access to high paid occupations such as medicine and law and on the quality of the job obtained at graduation. When higher level jobs requiring a bachelors or associates degree are being filled, employers pay more attention to grades and teacher recommendations than when they hire high school graduates. The NFIB survey found that when college graduates were hired, 26 percent of the employers had reviewed the college transcript before the selection, 7.8 percent had obtained a recommendation from a major professor and 6.3 percent had obtained a recommendation from a professor outside of the graduate's major or from the college's placement office.

III. THE LACK OF CONTINUITY IN RELATIONSHIPS

Schools must be challenging places, but they must be supportive places as well. School is a stressful experience and students need emotional support from fellow students and from teachers. Most European countries appear to believe that the way to create a supportive environment is to form students into classes which remain together for most of the school day and from one year to the next. In Scandinavia and Germany, for example, elementary school classes typically remain intact and have the same teacher for 3 years. Lower and upper secondary schools are typically smaller than in the U.S. At the beginning of lower secondary school, a class is formed which stays together for most of the day and remains intact (except for normal turnover) from one year to the next. Secondary teachers of French, chemistry or history would typically teach a particular class three years in a row. It is reasonable to hypothesize that the continuity of

teacher and peer relationships and the fact that assessment is primarily relative to an external standard not relative to others in the class might affect student perceptions of how friendly the school's atmosphere is. Thus, the anomie and competitiveness (student against student) of American secondary schools might be the real reason why, despite minimal graduation standards, American dropout rates are so high.

This hypothesis is supported by an experiment conducted in a high school attended by disadvantaged minority students. Sixty-five of the entering 9th graders were randomly assigned to a unit which took homeroom and most core classes together in classrooms which were located in close physical proximity to one another. The homeroom teacher (who also taught one of the core subjects) was assigned the guidance and counseling duties normally handled by guidance counselors and other specialized school staff. The experiment focused on ninth graders because student vulnerability to developing academic and emotional difficulties appears to be greatest during transitions from one school to another. The organization of 10th through 12th grade was not changed. This very modest step towards a European style student assignment system had remarkably large effects on absenteeism, grades and retention. Nineteen percent of the controls dropped out in 9th or 10th grade, only 4 percent of the experimental group. During the 9th and 10th grades, the experimental group was absent significantly less and got significantly higher grades. By the end of high school 43 percent of controls had dropped out; only 21 percent of experimentals (Felner, Ginter and Primavera 1982, Felner and Adan 1991). The research is being replicated in other schools. The experimental evaluation of New York City's Career Magnet schools tends to support Felner's findings: the magnets that most completely isolated themselves from the rest of the high school in which they were located had more positive effects (Crain, Heebner and Si 1992). These results suggest that inexpensive restructuring of how entering students are assigned to classes (to reduce the anomie that students experience in our large secondary schools) can produce salutary effects. The results also call into question the nation's heavy investment in specialized school staff.

3.1 TEACHERS AS COACHES RATHER THAN JUDGES

Most students do not develop strong personal ties with any teacher and those relationships that develop typically expire at the end of the academic year. When a mentoring relationship develops it is usually with a coach, a band conductor, a dramatics teacher, debate team sponsor, yearbook advisor, vocational teacher or an advanced placement teacher. There are reasons why these important but infrequent relationships usually develop with these specific staff. The intensive multi-year interaction with a small stable group of students helps create a supportive atmosphere. More important still is the effects of a coaching relationship in which the teacher is helping the student prepare for a "performance" (a play, concert or AP exam) or a competition with students from another school (basketball game, debate or VICA contest). These teachers are not the high stakes judge of the student's performance and achievement. They give guidance and feedback while the student prepares for the game or exhibition, but summative evaluations are made by others. As a result, the mentor/coach is able to set high performance standards without losing the crucial role of advocate, confidant and friend.

External assessment of accomplishment is thus crucial to the development of mentoring relationships between teachers and students. Without it, the effort to become friends with one's students and their parents tends to deteriorate into extravagant praise for mediocre accomplishment. In courts of law, judges must disqualify themselves when a friend comes before the bar. Yet, American teachers are placed in this double bind every day. Often the role conflict is resolved by lowering expectations or hiding failure with charitable phrases such as "does good work when he chooses to participate." Other times the choice of high standards means that close supportive relationships are sacrificed.

It is these considerations which account for the strong support that teachers in European secondary schools give to externally graded exams and external reviews of a student's completed projects. When changes in this system were proposed in Ireland, the Association of Secondary Teachers of Ireland wrote:

Major strengths of the Irish educational system have been:

- (i) The pastoral contribution of teachers in relation to their pupils
- (ii) the perception of the teacher by the pupil as an advocate in terms of nationally certified examinations rather than as a judge.

The introduction of school-based assessment by the pupil's own teacher for certification purposes would undermine those two roles, to the detriment of all concerned...

The role of the teacher as judge rather than advocate may lead to legal accountability in terms of marks awarded for certification purposes. This would automatically result in a distancing between the teacher, the pupil and the parent. It also opens the door to possible distortion of the results in response to either parental pressure or to pressure emanating from competition among local schools for pupils.

IV. A STRATEGY FOR TRANSFORMING SECONDARY EDUCATION

It is easy to list ways of increasing educational achievement: greater attention in class, more reading, less TV, more homework, more challenging courses, better teaching, more competent teachers and longer school years (see Appendix A). There are, however, no magic bullets. Young people in other nations learn more than ours because they work harder at it. What is difficult is identifying practical ways of inducing 47,000,000 students to study harder and 80,000,000 million parents to demand higher quality, high standards education for their children. There are 22,731 public secondary schools in the United States which are run by 15,358 largely autonomous local education agencies. Mandates from above have been tried and have failed. This section of the paper outlines a strategy of change built around increasing the rewards at both the individual and community levels for improvements in academic achievement.

The key to motivating students to learn and parents to demand a quality education is recognizing and rewarding learning effort and achievement. Some students are attracted to serious study of a subject by an intrinsic fascination with the subject. They must pay, however, a heavy price in the scorn of their peers and lost free time. Society offers them little reward for their effort. Most students are not motivated to study by a love of the subject. The sentiment expressed by one student, "You're going to work your whole

life...[High school should be a place to] enjoy life and have fun" (Powell et al, 1985, p 43) is quite common. Sixty-two percent of 10th graders agree with the statement, "I don't like to do any more school work than I have to" (Longitudinal Survey of American Youth or LSAY, Q. AA37N). As a result, far too few high school students put serious time and energy into learning and society suffers.

If this situation is to be turned around, the peer pressure against studying needs to be reduced and rewards for learning need to be increased. The full diversity of types and levels of accomplishment need to be signaled so that everyone--no matter how advanced or far behind--faces a reward for greater time and energy devoted to learning. Learning accomplishments need to be described on an absolute scale so that improvements in the quality and rigor of the teaching and greater effort by all students in a school makes everybody better off. Colleges need to be induced to select students on the basis of externally validated achievements, not by "aptitude" test scores or rank in class.

If employers know who is well educated in these fields, they will provide the rewards needed to motivate study. Ninety-two percent of 10th graders say they "often think about what type of job I will be doing after I finish school"(LSAY, Q. AA13C). If the labor market were to begin rewarding learning in school, high school students would respond by studying harder and local voters would be willing to pay higher taxes so as to have better local schools. The Secretary of Labor's Commission on Workforce Quality and Labor Market Efficiency advocates such a change:

The business community should...show through their hiring and promotion decisions that academic achievements will be rewarded (1989, p. 9).

High-school students who excel in science and mathematics should be rewarded with business internships or grants for further study (1989, p. 11).

Some might respond to this strategy for achieving excellence by stating a preference for intrinsic over extrinsic motivation of learning. This, however, is a false dichotomy. Nowhere else are people expected to devote thousands of hours to a difficult task while receiving only intrinsic rewards. Public recognition of achievement and the symbolic and material rewards received by achievers are important generators of intrinsic motivation. They are, in fact, one of the central ways a culture symbolically transmits and promotes its values.⁸

Recommendations for policy initiatives have been grouped into four categories:

- * Better signals of learning accomplishment,
- * Inducing students to pursue a more rigorous curriculum,
- * Generating additional recognition and rewards for learning.

4.1 BETTER SIGNALS OF LEARNING ACCOMPLISHMENT

Instituting Statewide Achievement Examinations

Statewide assessments of competency and knowledge that are keyed to the state's core curriculum (e.g. New York State's Regents Examinations and California's Golden State Examinations) should be made a graduation requirement. All students would be assessed in core subjects such as English, mathematics,

history and science but students would also be able to select additional subjects--eg. foreign languages, art, economics, psychology, auto repair, electronics, computer programming--for assessment. Results of these assessments would replace SAT and ACT test scores in the admission and selection process and determine the award of state merit based scholarships.⁹ Students would be given a credential certifying performance on these exams and employers should be encouraged to factor examination results into their hiring decisions.

This approach to signaling academic achievement to employers is preferable to extensive use of employment testing of job applicants. By retaining control of exam content, educators and the public influence the kinds of academic achievement that are rewarded by the labor market. Societal decisions regarding the curriculum (e.g. all students should read Shakespeare's plays and understand the Constitution) tend to be reinforced by employer hiring decisions. Tests developed solely for employee selection purposes do not ask questions about Shakespeare and the Constitution. Because it is centralized and students undertake the assessments over the course of their final years in high school the quality and comprehensiveness of the assessment can be much greater.

Externally Assessed Achievement Should Determine College Admissions

Al Shankar, President of the AFT, and Robert Samuelson, editorial writer for Newsweek, have argued that college admission and financial aid should go only to those who have demonstrated some minimum level of achievement on an external assessment. Such a policy would indeed dramatically strengthen incentives to study in high school, but undoing the open admissions policies of most community colleges in America would engender intense political opposition. If some form of it were implemented, the minimum standard would probably be set at a low level and it would not improve the incentives faced by most youth.

There is, however, a more modest proposal which is consistent with open admissions at community colleges and voc/tech institutions and which would have stronger and more wide spread incentive effects. **The proposal is to use externally assessed achievement as the basis for deciding who is admitted to particular colleges, to particular fields of study (eg. an electronics technician program might admit only those with a minimum level of competence in algebra and physics) and into degree credit programs generally.** Entering students who did not meet these requirements would be able to fulfill them at community colleges but the credits received in remedial courses would not count towards an associates or bachelors degree.

This is not really a radical proposal because most colleges already offer remedial courses which students with deficiencies in their background must take without getting degree credit. The proposal is to raise what we expect of students before they are admitted into bachelors or associates degree programs, and to require poorly prepared students to spend additional time getting a degree.

Colleges and universities are already stratified in their rigor and prestige and the economic rewards for graduating from the finest colleges are very substantial (Solomon 1975; Symonette 1981; Karabel and McClelland 1987; Mueller 1988; James, Alsalam, Conaty and To, 1989). Graduates with scientific and

technical training are much better remunerated than graduates with humanities and social science degrees. This means that strong incentives to compete for admission to the best colleges and the high wage majors already exist. The problem is not a lack of competition, but the basis of that competition--teacher assessments of achievement relative to others in your high school and aptitude tests which do not assess what has been learned in most high school courses. If college admissions decisions were made on the basis of external assessments of achievement in the subjects studied in high school, student incentives to study in high school and parental incentives to press for higher standards would dramatically improve.

If, however, external assessments of achievement are to be used in the college admissions decision, the results of these assessments must become available in time to effect these decisions. **This means that assessments of achievement will have to be completed and graded by the end of April and announcements of admission to college will have to wait until late May.** Advanced Placement exams, for example, will have to be taken a month earlier than they are now and must be graded in the space of a couple of weeks. Colleges will have to be forced to stop competing for students by offering early guarantees of admission. These changes would have a number of salutary effects. Ask any teacher about second semester seniors and you will hear complaints about their unwillingness to work hard. This would end. They would, in fact, become the hardest workers in the high school thereby providing a positive role model for the younger students. More significantly, the whole structure of incentives to study would be strengthened.

Develop Better Assessment Mechanisms

If student recognition and rewards depend on the results of assessments of competency made by the education system, it is essential that all the competencies that we believe students should be developing be assessed. Since curriculum objectives differ somewhat from state to state, there will be a need for a diversity of assessment mechanisms. Means of assessing higher order thinking skills, hands on performance and portfolios of the student work need to be developed. Written exams might include some multiple choice items but other types of questions--essays, short explanations, showing your work in multi-step math problems--should become more common.

Certifying Competencies and Releasing Student Records

Schools should develop easily understood transcripts which at the request of students, are readily available to employers. These transcripts should contain documentable measures of achievement in a variety of fields as well as attendance records. State governments should provide assistance to facilitate the standardization of transcripts so that they will be more easily understood. (Secretary of Labor's Commission on Workforce Quality, p. 12)

Schools should provide graduates with certificates or diplomas that certify the students' knowledge and competencies, rather than just their attendance. Competency should be defined by an absolute standard in the way Scout merit badges are. Different types and levels of competency need to be certified. Minimum competency tests for receiving a high school diploma do not satisfy the need for better signals of achievement in high school. Some students arrive in high school so far behind, and the consequences of not getting a

diploma are so severe, we have not been willing to set the minimum competency standard very high. Once they satisfy the minimum, many students stop putting effort into their academic courses. What is needed is a more informative credential which signals the full range of student achievements (e.g. statewide achievement exam scores, competency check lists).

One of the saddest consequences of the lack of signals of achievement in high school is that employers with good jobs offering training and job security are unwilling to take the risk of hiring a recent high school graduate. They prefer to hire workers with many years of work experience. One important reason for this policy is that the applicant's work record serves as a signal of competence and reliability that helps the employer identify who is most qualified. In the United States recent high school graduates have no such record and information on high school performance is not available, so the entire graduating class appears to employers as one undifferentiated mass of unskilled and undisciplined workers. A common employer view of 18 year olds was expressed by a supervisor at New York Life Insurance (a company which has recently moved some claims processing work to Ireland) who commented on television "When kids come out of high school, they think the world owes them a living" (PBS, March 27, 1989). Surely this generalization does not apply to every graduate, but the students who are disciplined and academically well prepared currently have no way of signaling this fact to employers.

The school can help students get good jobs by developing an equitable and efficient policy for releasing student records. School officials have the dual responsibility of protecting the student's right to privacy and helping them find good, suitable jobs. The student and his or her parents should receive copies (encased in plastic) of transcripts and other records that might be released so that they may make them available to anyone they choose. Schools might also develop a sheet explaining to parents and students their rights, as well as the pros and cons of disclosing information.

According to the Federal Education Rights and Privacy Act, all that a student/graduate must do to have school records sent to a prospective employer is sign a form specifying the purpose of disclosure, which records are to be released, and who is to receive the records. The waiver and record request forms used by employers contain this information, so when such a request is received, the school is obliged to respond. Requiring that graduates fill out a school devised form, as some high schools do, results in the employer not getting the transcript requested and the graduate not getting the job. Many high school graduates do not realize that they failed to get a job they were hoping for because their high school did not send the transcript that was requested.

Credential Data Bank and Employee Locator Service

It may, however, be unrealistic to expect more than 20,000 high schools to develop efficient systems of maintaining student records and responding quickly to requests for transcripts. An alternative approach would be to centralize the record keeping and dissemination function in a trusted third party organization. The student would determine which competencies are to be assessed and what types of information are to be included in his/her competency portfolio. Competency assessments would be offered for a variety of scientific, mathematical and technological subjects, languages, writing, business and economics, and

occupational skills. Tests with many alternate forms (or administered by computer using a large test item bank) would be used so that students could retake the test a month later if desired. Only the highest score would remain in the system. Students would be encouraged to include descriptions of their extracurricular activities, their jobs and any other accomplishments they feel are relevant, and to submit samples of their work such as a research paper, art work, or pictures of a project made in metal shop. Files could be updated after leaving high school.

Students would receive copies of their portfolio which they could carry to job interviews or mail to employers. They would also be able to call a 900 number and request their portfolio be sent to specific employers. Finally, they could put themselves in an employee locator data bank similar to the student locator services operated by the Educational Testing Service and American College Testing. A student seeking a summer or post graduation job would specify the type of work sought and dates of availability. Employers seeking workers could ask for a print out of the portfolios of all the individuals living near a particular establishment who have expressed interest in that type of job and who pass the employer's competency screens. Student locator services have been heavily used by colleges seeking to recruit minority students and an employee locator service would almost certainly be used in the same way. Pilot programs are underway in Hillsborough County, Florida, Orange County, California, Fort Worth, Texas, and New Jersey and a number of other locations. State governments should consider becoming sponsors of such systems.

Acting as a Source of Informal Contacts

School personnel can be a reference and a source of job contacts for their students. Some students may feel that they do not have and cannot develop good employment contacts. School personnel can help out by building and maintaining trusting relationships with local employers and then helping to match employer and student needs. Students from disadvantaged backgrounds have special need for this kind of help, because their relatives and neighbors typically lack the employment contacts of middle-class families.

Many schools provide job placement and referral services for their students and graduates. Three and a half million people found their current job through a referral by a teacher, school or college (Rosenfeld 1975). This function of schools is a lot more important than is generally thought.

Whenever possible, there should be a one-on-one relationship between a specific teacher or administrator and an employer. A study by McKinney et al. (1982) found that when schools formalize this relationship by creating a placement office, fewer vocational students found jobs. The best example of an informal contact system is the one that exists for many vocational students. Vocational teachers often know local employers in related fields; they also know their students well enough to recommend them. This kind of informal system could be expanded to include all students not planning to attend college.

4.2 INDUCING STUDENTS TO PURSUE A MORE RIGOROUS CURRICULUM

The analysis of the causes of the American apathy regarding teaching and learning has important implications for the curriculum. Many of the weaknesses of math and science curricula--the constant review

and repetition of old material, the slow pace and minimal expectations--are adaptations to the low level of effort most students are willing to devote to these subjects. When considering proposed revisions of the curriculum, one must remember that motivating students to take tough courses and to study hard must be a central concern.

A second constraint that must be recognized is the great diversity of the learning goals and capabilities of high school students. On the NAEP mathematics scale 15 percent of 13 year olds have better mathematics skills than the average 17 year old student, and 7 percent of 13 year olds score below the average 9 year old (NAEP 1988b). On the NAEP reading scale 16.5 percent of 13 year olds have better reading skills than the average 17 year old student, and 9 percent of 13 year olds score below the average 9 year old (NAEP 1986). Consequently, it is neither feasible nor desirable for all senior high school students to pursue the same curriculum. While many nations have a common curriculum with no tracking in elementary school and lower secondary schools, no country requires all senior secondary students to take the same courses. Some students will want to pursue subjects like mathematics and science in greater depth and rigor than others. Some students will want to concentrate on technology not pure science. Some courses will be easier than others and students will inevitably be able to choose between more demanding and less demanding courses.

How then does one convince students to take tough courses and study hard? I would propose 4 steps: (1) develop rigorous courses that teach students concepts and material that they will use after leaving high school, (2) convince students that the material being taught is useful by presenting it as solutions to practical real world problems, (3) define accomplishment in a way that students who work hard will perceive themselves as successful, and then (4) recognize and reward accomplishment.

Usefulness is a important criterion for selecting topics in a curriculum for three reasons. First, the social benefits of learning derive from the use of the knowledge and skills, not from the fact they are in someone's repertoire. Secondly, skills and knowledge that are not used deteriorate very rapidly. In one set of studies, students tested 2 years after taking a course had forgotten 1/2 of the college psychology and zoology, 1/3 of the high school chemistry, and 3/4 of the college botany that had been learned (Pressey and Robinson, 1944). Skills and knowledge that are used are remembered. Consequently, if learning is to produce long term benefits, the competencies developed must continue to be used after the final exam (either in college, the labor market or somewhere else). Finally, usefulness is essential because students are not going to put energy into learning things they perceive to be useless. Furthermore, the labor market is not in the long run going to reward skills and competencies that have no use. Indeed, selecting workers on the basis of competencies that are not useful in the company's jobs is in most circumstances a violation of Title VII of the Civil Rights Act.

Making a Differentiated Senior High Curriculum Work

By 10th grade most students have a pretty good idea of what kinds of jobs they want after finishing their education. Ninety-seven percent can select a particular occupation they expect to be doing at age 40

and 77 percent agree with the statement: "I am quite certain about what kinds of jobs I would enjoy doing when I am older" (LSAY, Q. AA13C & AA22A). Students who are planning careers in science and engineering need to be able to take college preparatory biology, chemistry and physics courses that prepare them for the core courses they will face in college. The students not planning on scientific careers, however, quite often fail to see how these courses will be useful to them. Less than a quarter of 10th graders believe that geometry, trigonometry, biology, chemistry, and physics are needed to qualify for their first choice occupation (LSAY, Q. BA24B-BA25D).

In senior high school an effective way to motivate students to take demanding courses and to study hard is to tailor courses to the student's career interest and insure that prospective employers are aware that the student took challenging rigorous courses. An experimental evaluation of New York City's Career Magnet schools suggests that they have increased both reading scores and retention (Crain, Heebner and Si 1992).

Teaching Science and Math by Infusing it into Technology Courses

Analyses of labor market success of young men and of job performance in the military indicate that young people who expect to have jobs in which they use or maintain complicated pieces of equipment should receive a thorough technology education (Bishop 1990; Hunter Crossen and Friedman 1985; Maier and Grafton 1981). Computer classes are one example of the kinds of courses needed. High school sophomores described their computer classes as "Very Useful" for their career 53 percent of the time and as of "No Use" only 6 percent of the time (LSAY, Q. AACOMF).

The Principles of Technology (PT) course developed by a consortium of vocational education agencies in 47 states and Canadian provinces in association with the Agency for Instructional Technology and the Center for Occupational Research and Development is another example of a course that meets this need very well. This two-year applied physics course is both academically rigorous and practical. Each six day subunit deals with the unit's major technical principle (e.g. resistance) as it applies to one of the four energy systems--mechanical (both rotational and linear), fluid, electrical, and thermal. A subunit usually consists of two days of lectures and discussion, a math skills lab, two days of hands-on physics application labs, and a subunit review. This approach appears to be quite effective at teaching basic physics. When students enrolled in regular physics and Principles of Technology courses were tested on basic physics concepts at the beginning and end of their junior and senior year in high school, the PT students started out behind the regular physics students but obtained an average score of 81 at completion as compared to an average of 66 for those completing a physics course (Perry, 1989). Another study by John Roper (1989) obtained similar results. Comparable courses need to be developed for other fields of technology. This is an area of study that needs much more attention than it has been getting from educational reformers and curriculum developers.

Expand Advanced Placement Courses

The Advanced Placement program is a cooperative educational endeavor which offers course

descriptions, examinations, and sets of curricular materials in 28 different academic subjects. Students who take these courses and pass the examinations receive college credit for high school work. Unlike the SAT, the ACT and all other standardized aptitude and achievement tests which employ the multiple-choice answer format exclusively, students are expected to write essays and to work out complicated science and mathematics problems. Hence they are similar in format and roughly comparable in difficulty to French Bacalaureates, English A Levels, and other exams taken by European secondary school students. The College Board is developing a parallel set of exams for high school level courses such as principles of technology, algebra, history, English and other subjects. This will give larger numbers of 10th and 11th graders and students not planning to attend 4 year colleges a chance to have their accomplishments certified.

Expanding the AP program should be a centerpiece of any effort to promote excellence in American high schools. The numbers of students taking AP exams more than doubled between 1983 and 1988. Nevertheless, only 8,022 of the 22,902 US high schools participate in the Advanced Placement Program and only 52 AP exams are taken on average in each participating high school. In the Class of 1990 only 3.8 percent took the AP English Literature and Composition exam, 3.6 percent took the American History exam, 3.0 percent took the AP calculus exam, 1.3 percent took the AP biology exam, .8 percent took the AP chemistry exam and .7 percent took the AP physics exam. (The College Board 1988).

Federal and state governments can facilitate the growth of the AP program by underwriting the development of AP exams for new subjects, by financing summer institutes for the teachers of AP courses, by subsidizing the fees charged for taking the exam and by offering AP Excellence Awards to students who achieve passing scores on the exam. The amount of the scholarship award might depend both on the level of student's pass and the eligibility of the student for Pell grants. In 1990, 326,025 students would have been eligible for an AP excellence award, so a scholarship program awarding an average of \$250. per recipient would have cost only \$82 million.

Students and their parents are generally unaware that taking one or more AP course is almost a requirement for admission at many selective colleges. At Cornell's Engineering College, for example, over 90 percent of the freshman class had taken an AP calculus and/or science course(s) in high school. If a large group of colleges were to announce and publicize this policy, high schools that do not currently offer AP courses would be pressed to offer them and enrollment in the courses would increase.

4.3 GENERATING ADDITIONAL RECOGNITION AND REWARDS FOR LEARNING

Cooperative Learning

One effective way of inducing peers to value learning and support effort in school is to reward the group for the individual learning of its members. This is the approach taken in cooperative learning. Research results (Slavin 1985) suggest that the two key ingredients for successful cooperative learning are as follows:

- o A cooperative incentive structure--awards based on group performance--seems to be essential for students working in groups to get really involved in tutoring and encouraging each other to study.

- o A system of individual accountability in which everyone's maximum effort must be essential to the group's success and the effort and performance of each group member must be clearly visible to his or her group mates.

For example, students might be grouped into evenly matched teams of 4 or 5 members that are heterogeneous in ability. After the teacher presents new material, the team works together on work sheets to prepare each other for periodic quizzes. The team's score is an average of the scores of team members, and high team scores are recognized on a class bulletin board or through group certificates of achievement.

What seems to happen in cooperative learning is that the team develops an identity of its own, and group norms arise that are different from the norms that hold sway in the student's other classes. The group's identity arises from the extensive personal interaction among group members in the context of working toward a shared goal. Since the group is small and the interaction intense, the effort and success of each team member is known to other teammates. Such knowledge allows the group to reward each team member for his or her contribution to the team goal.

Honoring Academic Achievement

The medals, trophies, and school letters awarded in interscholastic athletics are a powerful motivator of achievement on the playing field. Academic pursuits need a similar system of reinforcement. Awards and honors systems should be designed so that almost every student can receive at least one award or honor before graduation if he or she makes the effort.¹⁰ The standard for making an award should be criterion referenced: if greater numbers achieve the standard of excellence, more awards should be given. The trophy case and bulletin board at the entrance of the school should be used to recognize academic achievements not athletic achievements.

Award Scholarships on the Basis of Past Academic Achievement as well as Need

In addition to need based scholarship programs, states should award scholarships on the basis of academic achievements assessed by criteria external to the school such as the Advanced Placement exams, New York State's Regents Exams and California's Golden State examinations. The purpose of scholarships is to reward effort and accomplishment not "talent" or IQ; so aptitude tests should not be used to select winners. Rank in class and GPA should also not be the basis for these awards. The size of the award would depend on financial need.

League Competitions between Schools in the Academic Arena

Band and athletic programs receive very generous support from the community because the band and the team are viewed as representing the entire high school to neighboring communities and the rest of the state and because their accomplishments are highly visible. A similar spirit of competition between communities needs to be developed in the academic arena. States should examine the feasibility of establishing a system of highly visible competitions for each academic subject and for extracurricular activities like debate, Junior Achievement, school newspaper, and the stock market game. As many students as possible should participate. This can be accomplished by arranging separate competitions for each grade, requiring (where possible) the school to field a team that includes all students taking a particular course and

having the share of the student body that is on the team be one of the criteria by which schools are judged. As in sports, fair competition can be insured by placing small schools and schools serving disadvantaged populations in a separate league or by establishing a handicapping system.

The competitions should not be a glorified Trivial Pursuits game. While cable TV broadcasts of High School Bowl like contests might be a component of the program, most of the points obtained by a school's team should come from assessments of the performance of the entire team on authentic tasks like writing an essay, giving a speech, determining the chemical composition of a compound, working out long mathematics problems, writing a computer program, or fixing a car. As much as possible the tasks should be aligned with the state curriculum for that subject.

Mastery Learning

Students who are not learning at the desired rate might be expected to commit additional time to the task after school and during the summer. At the beginning of the school year school personnel would meet with the student and his or her parents to set goals. Students who are not performing at grade level in core subjects and who do not make normal progress during the school year would be kept after school for tutoring and remedial instruction and required to attend summer school. Course grades and teacher evaluations would be a central part of the assessment process, but there should be an external yardstick as well. The external yardstick might be a competency check list, a mastery test keyed to the textbook, or an exam specified by the state, the school or collectively by the teachers in that grade level or department. The reason for the external yardstick is that it helps insure that students perceive the standard to be absolute rather than relative to others in the class, and it helps create a communality of interest between teacher and student. Teachers need to be perceived as helping the student achieve the student's goals not as judges meting out punishment. Since students will want to avoid being required to get remedial instruction after school and during the summer, this will be a powerful incentive for them to devote themselves to their studies.

V. EFFECTS OF PROPOSED REFORMS ON UNDER-REPRESENTED MINORITIES

The two blue ribbon commissions that recommended improvements in the signaling of academic achievement to colleges and employers included substantial representation from the minority community.¹¹ Nevertheless, the reader may be wondering about the likely impacts of the reform proposals just described on the labor market chances of minority youth. Since minority students receive lower scores on achievement tests, it might appear at first glance that greater emphasis on academic achievement will inevitably reduce their access to good colleges and to good jobs. This is not the case, however, for four reasons.

If academic achievement becomes a more important basis for selecting students and workers, something else becomes less important. The consequences for minorities of greater emphasis on academic achievement depends on the nature of the criterion that becomes deemphasized. Substituting academic achievement tests for aptitude tests in college admissions improves minority access because minority-majority

differentials tend to be smaller (in standard deviation units) on achievement tests (e.g. the NAEP reading and math tests) than on aptitude tests (e.g. the SAT). Greater emphasis on academic achievement improves the access of women to high level professional, technical, craft, and managerial jobs because it substitutes a criterion on which women do well for criteria--sex stereotyped beliefs about which jobs are appropriate for women--which have excluded women in the past.

For the same reason, greater emphasis on academic achievement when selecting young workers will not reduce minority access to jobs if it substitutes for other criteria which also place minority youth at a serious disadvantage. The current system in which there is almost no use of employment tests and little signaling of high school achievements to the labor market clearly has not generated jobs for minority youth. In October 1985, 1986, 1987, 1988, 1989 and 1990, an average of only 46 percent of the previous June's black high school graduates not attending college were employed (Bureau of Labor Statistics 1989). One reason why minority youth do poorly in the labor market is that most of the criteria now used to make selections--previous work experience, recommendations from previous employers, having family friends or relatives at the firm, proximity of one's residence to stores which hire youth, performance in interviews, and prejudices and stereotypes--work against them. These criteria will diminish in importance as academic achievement becomes more important. One cannot predict apriori whether the net result will help or hinder minority youth seeking employment. In some models of the labor market the relative position of minority workers improves when academic achievement is better signaled (Aigner and Cain, 1975).

The second way in which minority youth may benefit from improved signaling of school achievements is that it will give recent high school graduates, both black and white, the first real chance to compete for high-wage, high-training content jobs. At present all youth are frozen out of these jobs because primary labor market employers seldom consider job applicants who lack considerable work experience. Experience is considered essential partly because it contributes to productivity but also because it produces signals of competence and reliability that employers use to identify who is most qualified. Recent high school graduates have no such record and information on the student's high school performance is not available, so the entire graduating class appears to employers as one undifferentiated mass of unskilled and undisciplined workers. A black personnel director interviewed for a CBS special on the educational reform proudly stated, "We don't hire high school graduates any more, we need skilled workers" (CBS, September 6, 1990). Surely this generalization does not apply to every graduate, but those who are disciplined and have skills currently have no way of signaling this fact to employers. State exams, competency portfolios and informative graduation credentials would change this unfair situation and give students a way of demonstrating that the stereotype does not apply to them. Young people from minority backgrounds must overcome even more virulent stereotypes and they often lack a network of adult contacts who can provide job leads and references. By helping them overcome these barriers to employment, competency portfolios are of particular help to minority youth.

The third way in which these proposals will assist minority students is by encouraging greater numbers of firms to undertake affirmative action recruitment. The creation of a competency portfolio data

bank that can be used by employers seeking qualified minority job candidates would greatly reduce the costs and increase the effectiveness of affirmative action programs. Affirmative action has significantly improved minority representation in managerial and professional occupations and contributed to a substantial increase in the payoff to schooling for blacks (Freeman 1981). One of the reasons why it has been particularly effective in this labor market is that college reputations, transcripts and placement offices provide brokering and pre-screening services which significantly lower the costs of recruiting minority job candidates. The competency portfolio data bank would extend low cost brokering and pre-screening services to the labor market for high school graduates. The creation of such a data bank would almost certainly generate a great deal of competition for the more qualified minority youth in the portfolio bank.

The final and most important way in which these reforms will benefit minority youth is by bringing about improvements in academic achievement and productivity on the job. Student incentives to study hard, parental incentives to demand a better education, and teacher incentives to both give more and expect more from students will all be strengthened. Because of the way affirmative action is likely to interact with a competency profile data bank, the rewards for learning will become particularly strong for minority students. Learning will improve and the gap between minority and majority achievement will diminish. Society has been making considerable progress in closing achievement gaps between minority and majority students. In the early National Assessment of Educational Progress (NAEP) assessments black high school seniors born between 1952 and 1957 were 6.7 grade level equivalents behind their white counterparts in science proficiency, 4 grade level equivalents behind in mathematics, and 5.3 grade level equivalents behind in reading. The most recent National Assessment data for 1986 reveal that for blacks born in 1969, the gap has been cut to 5.6 grade level equivalents in science, 2.9 grade level equivalents in math, and 2.6 grade level equivalents in reading (NAEP 1988, 1989). Koretz's (1986 Appendix E) analysis of data from state testing programs supports the NAEP findings. Hispanic students are also closing the achievement gap. These positive trends suggest that despite their limited funding, Head Start, Title I, and other compensatory interventions have had an impact. The schools attended by most minority students are still clearly inferior to those attended by white students, so further reductions in the school quality differentials can be expected to produce further reductions in academic achievement differentials.

The student body of James A. Garfield High School in Los Angeles is predominantly disadvantaged minorities; yet in 1987 only three high schools in the nation (Alhambra High School in California and Bronx Science and Stuyvesant High School in New York City) had a larger number of students taking the AP calculus exam. This high school and its two calculus teachers, Jaime Escalante and Ben Jimenez, were responsible for 17 percent of all Mexican Americans taking the AP calculus exam and 32 percent of all Mexican Americans who pass the more difficult BC form of the test (Matthews, 1988). There is no secret about how they did it; they worked extremely hard. Students signed a contract committing themselves to extra homework and extra time in school and they lived up to the commitment. What this success establishes is that minority youngsters can be persuaded to study just as hard as the academic track students in Europe and that if they do they will achieve at world class levels.

Appendix A
THE PAYOFF TO LENGTHENING THE SCHOOL YEAR

Studies which have administered mathematics tests to students both in the spring and the fall of a calendar year find that mathematics competence declines during the summer months (Heyns 1986, 1987). Entwisle and Alexander's (1989 Table 1) study of 1st and 2nd graders in Baltimore, for example, found no gain in mathematics skills between the April test administration and the October test administration, even though that period contained two full months of classroom study of arithmetic. If children were learning during the 2 months of classes included in the summer gap period at anything like the rate they learn during the rest of the school year, their reading and math skills must have declined during the summer months. The learning loss is particularly large for disadvantaged students and for minority students (Heyns 1987).

Direct evidence on this issue can be found in the evaluation of STEP. In this study the initial test was administered after the end of school in June and the end of summer administration was prior to the beginning of school in the fall. In this study the control group which received no instruction during the summer experienced very large declines in mathematics and substantial declines in reading.

In most classrooms the first few weeks are spent reviewing and practicing skills taught in previous years. Old material can probably be relearned at a more rapid rate than new material is learned, so this is likely to be a period of particularly rapid rise in test scores. Mc Knight et al (1988) severely criticize this practice of allocating so much time to review of old topics rather than to the presentation of new material. These findings suggest that school attendance is essential if math and reading skills are to improve and that a longer school year would not only increase learning time but also reduce forgetting time. Adding a month to the school year could very well produce a more than proportionate increase in learning.

Studies of the effect of summer school confirm the educational impact of additional instruction time. The best study of this issue used a random assignment control group methodology to evaluate the Summer Training and Employment Program (STEP), a program for disadvantaged youth that combines a part time summer job with about 90 hours of remedial instruction. It found that adding the instruction to the summer job raised academic achievement by .5 grade level equivalents above that of youth receiving only a part time job. (Sipe, Grossman and Milliner 1988). The success of the STEP intervention has resulted in its replication (with federal support) in 33 different school systems.

This evidence indicates that extending the school year would not only raise educational standards generally, it would also help children from educationally and economically disadvantaged backgrounds keep up with their more advantaged peers.

Accelerating the Pace of Instruction

Increasing the time devoted to learning by one-ninth or more has major implications for the curriculum. The learning objectives specified for each year would need to be changed. In subjects which follow a sequence such as mathematics, reading, and spelling, material taught at the beginning of third grade might be moved to the end of second grade, eighth grade topics might be taught in seventh grade, etc. In mathematics, for example, coverage of probability and statistics (which is necessary for implementing

statistical process control) might be greatly increased. For students headed for college, the final two years would be given over to AP courses. College freshman would arrive much better prepared than they are now. A decision would have to be made whether (a) the bachelors degree should become a three year degree, (b) the number of credits for graduation should be increased, or (c) college courses should be made more rigorous with a corresponding reduction in the number of credits that students can carry per semester.

The Costs and Benefits of Lengthening of the School Year

The most significant barrier to this reform is the cost. If teachers are to spend 11 percent more time teaching, yearly salaries must be increased by a comparable percentage. Since current public expenditures on elementary and secondary education were \$156 billion for the nation as a whole in 1988 (US Bureau of the Census 1989, Table 229) some of which would not have to be increased (e.g. central office staff already have 11 month contracts), the taxpayer cost would be about \$15 billion. This is not really as big a number as one might think. For comparison, between 1985 and 1988 total compensation of employees rose \$73 billion in state and local government as a whole and rose \$50 billion in the health care industry. Since more than half of the mothers of school children work, the savings in day care costs would be substantial. If one-fifth of the 45 million school children attending school an extra 20 days would have required day care costing \$3.00 an hour for 6 hours a day, the savings would be \$3.24 billion. Since most teachers and students do not work in the summer, the increase in learning time would come primarily out of leisure not work time. GNP would immediately increase because the rise in teacher pay and labor released by the reduced demand for child care would be larger than the induced decline in summer job earnings of teachers and students. If GNP rises, taxes will rise as well, so the change would be partially self financing.

The long term benefits would be very large. Because a longer school year reduces summer forgetting as well as increasing learning time, it is quite possible that a more than proportionate learning response (on a grade level equivalent scale) would result. Let us, however, make the conservative assumption that the 11 percent increase in learning time increases 12th grade achievement scaled in grade level equivalents by 11 percent or 1.33 U.S. grade level equivalents. Student cohorts experiencing the longer school year for 13 years would have their compensation increased by about 5.2 percent or \$830 a year.¹²

The productivity effects of test score increases are 50 percent larger than wage rate effects (Bishop 1987a, 1987b). Consequently, increasing the school year by 20 days and is estimated to raise the productivity of the average adult by \$1248 per year (7.7 percent of mean compensation). Since a one year age cohort contains 3.7 million people, the benefit is about \$ 4.62 billion dollars per year. The yearly real rate of return is 30.7 percent on the taxpayer contribution to the additional learning investment.¹³ Only investments in R&D have real rates of social return this high. If the real rate of social discount is 6 percent and the growth of labor productivity is projected at 2 percent per year, the ratio of present discounted benefits to costs is 4.9 to 1.¹⁴ Even if the additional month of school produces only a third or a half month of learning gains, the investment has a higher payoff than most other uses of taxpayer dollars.

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