

WHY DO NORTHERN EUROPEAN SECONDARY SCHOOLS OUTPERFORM AMERICAN SECONDARY SCHOOLS?

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I. Introduction

Despite similar standards of living, the secondary education systems of France, the Netherlands, Britain and the United States produce very different levels and patterns of achievement. American primary school students compare favorably to their counterparts abroad. They are ahead in reading, above average in science and only slightly behind Europeans in mathematics. However, when eighth graders were compared at the beginning of the 1980s, the French and Dutch were about 1.3 to 1.5 grade level equivalents ahead of the Americans in math and science.

Analyzing Trends in International Math and Science Study (TIMSS) and Programme for International Student Assessment (PISA) data allows us to compare recent achievement levels of 8th graders and 15 year olds in over 60 countries. Table 1 compares the latest TIMSS and PISA test scores for the U.S. to the scores for six other countries: Netherlands, Sweden, United Kingdom, France, Korea and Brazil. Both the TIMSS and PISA assessments are designed to have an international standard deviation of 100 for Organization of Economic Cooperation and Development (OECD) countries. Some of the differentials—eg. US lagging behind Korea by 89 points on TIMSS-Math assessment and by 73 points on PISA's Math assessment—are very large. To help people without a testing background get a feel for how important score differentials of this magnitude are, let's compare them to the improvement that occurs from having one additional year of instruction in the subject. American 8th graders scored 24 points higher on the TIMSS math assessment than 7th graders (in 1995 when both grades were assessed). The grade-level differential for the TIMSS science test was 26 points. Taking 25 points on these international tests as a rough estimate of one US grade-level equivalent (US-GLE), Dutch students are 1 to 2 US-GLEs ahead of their American counterparts in math and 0.3 to 1.3 US-GLEs ahead in science. British secondary school students are about one US-GLE ahead in science and on average a half a US-GLE ahead in math. French students are about one US-GLE ahead in math.

Table 1---2004-07 U.S. Lead / Lag relative to:

	Nether-lands	Swe-den	UK	France	Korea	Brazil
% Attend School 15-19	-10	-9	3.5	-7	-8	1.5
% Grad Upper Secondary	<-10	0	-11	<-10	-15	19
Math 8 th grade	-32	17	-5	-38	-89	--
Science 8 th grade	-9	9	-22	15	-33	--
Reading at 15- 2003	-18	-19	-19	-1	-21	92
Math at age 15	-57	-28	-21	-22	-73	104
Science at age 15	-36	-14	-26	-6	-33	99

Table 2: Level and Variance of Student Achievement--PISA

	United States	Canada	United Kingdom	Ireland	France	Nether-lands	Finland	Brazil	Chile
Science 2006	489/ -10	534/ +4	515/ -17	508/ -5	495/ -5	526	563/ +25	390/ -3	438
Reading 2006	[495]	527/ -7	495/ -24	517/ -9	488/ -17	507/ -6	547/ 0	393/ +3	442/ +32
Math 2006	474/ -9	527/ -5	495/ -34	501/ -1	496/ -15	531/ -7	548/ +4	370/ +13	411/ +33
Total Var. of Achievement	111	93	107	89	---	97	76	100	99
Within-Sch variance	82.8	73.9	82.0	71.8	---	36.3	70.1	52.5	54.5
Mean ESCS	.14	.37	.19	-.02	-.09	.25	.26	-1.12	-.70
SD of ESCS	.91	.81	.81	.86	.92	.89	.79	1.25	1.18

Row 1-3 PISA test scores in 2006 with the change since 2000 indicated after the /.

Row 4: Ratio of 2006 Total Achievement Variance for the country as a % of the average total variance across all OECD countries (all subj. combined). PISA 2006, Tables 4.1a, 4.1d & 4.1g.

Row 5: Ratio of 2006 Within-School Variance as a % of the average total variance across all OECD countries (Math, reading and science combined) From PISA 2006, tables 4.1a, 4.1d & 4.1g.

Row 6 & 7: Country mean and standard deviation for Economic, social and cultural status (ECES) scale. From Table 4.4a of PISA 2006.

In the final year of secondary school American students lag even further behind. In mathematics U.S. high school seniors were 99 points behind the Dutch, 91 points behind Swedes, 62 points behind the French and 58 points behind the Canadians. American students taking AP calculus lagged 65 points behind advanced math students in France and 20 points behind math specialists in Sweden. The Swedes specializing in science scored 99 points higher on the TIMSS physics test than Americans taking AP physics (Mullis et al, 1997; Takahira et al, 1998, table 2.1, 5.1 and 8.1).

Education policy makers have proposed a host of different explanations for the low levels of achievement in American secondary schools. Many of the proposed explanations have in common an accusation that some key actors in the learning enterprise (students, parents, teachers, administrators and/or school boards) are giving insufficient priority to the goal of academic achievement. Some other goal--eg. leisure, avoiding controversy, being popular with other students, low taxes, equity--is taking precedence over the academic achievement of students.

Regardless of which of the proposed proximate causes of poor academic performance are the most important, a more fundamental question remains: **"Why do American students, parents, teachers, administrators and school boards apparently place a lower priority on the goal of academic achievement than their counterparts in Europe and East Asia."** The paper's answer for this question is summarized in the next paragraph.

The fundamental reason why American students, teachers, parents, and voters in school elections are comfortable with significantly lower academic achievement than their counterparts in Northern Europe is the absence of good signals of learning in secondary school and consequent absence of powerful rewards for effort and learning in secondary school. In the United States the only signals of learning that generate substantial economic rewards are diplomas and years of schooling. In most other advanced countries mastery of the curriculum taught in high school is assessed by a series of 3-hour subject-specific examinations set and graded at the national or regional level. Grades on these exams signal the student's achievement to 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, college admissions decisions are influenced by a single 3 hour long aptitude test (either the SAT and ACT) that are not intended to assess the learning that has occurred in most of the classes taken in high school. The primary signals of high

school achievement are grades and rank in class--criteria that assess achievement relative to other students in the school or classroom, not relative to an external standard.

The remedy for these problems, it will be argued, is a system of externally set curriculum- based examinations that have real consequences for students like the French Baccalaurate or the English GCSE, A levels and vocational qualifications. Most countries have such systems. The countries without such curriculum-based external examinations have lower levels of achievement at the end of secondary school (see Section IV).

What causes differences in secondary school achievement across these four nations? Eight hypothesized proximate causes of these differentials are evaluated in section II. Five hypotheses can be rejected. The rest cannot: teacher quality, priority given to academics and student engagement and time on task.

Section III then tackles the more fundamental question: "Why do American students, teachers, parents and school administrators place a lower priority on academic achievement than their counterparts abroad?" Why, for example, is student engagement in learning higher in France and the Netherlands? Some place the blame on culture, American anti-intellectualism, or historical tradition. Such ad hoc explanations cannot be ruled out (or in) by the analysis to follow. Our purpose is, instead, to propose an alternative explanation based on institutionally caused differences in rewards and incentives. Section IV reviews the latest evidence on the impact of curriculum-based external exit exams.

II.--Possible Proximate Causes of Achievement Differentials

American elementary school students do not lag behind their counterparts in Europe. Indeed, in reading they are substantially ahead and in science slightly ahead. What then caused the large deficits in achievement in mathematics and science at the end of secondary school? Let us start by looking at eight proposed proximate causes of achievement differentials across countries.

- 1) Diversity
- 2) Near universal enrollment in upper-secondary school
- 3) Teacher quality and salaries
- 4) Overall Spending per pupil
- 5) Priority given to academic achievement
- 6) Availability of vocational programs of study

- 7) Time devoted to instruction and study
- 8) Engagement—Effort per unit of scheduled time

Our purpose is not to select a single most important explanation for the U.S. lag behind France, Britain and the Netherlands. Rather our objective is the more modest one of narrowing the list of possible causes.

1) Diversity

Non-Hispanic whites and Asians score nearly one grade level equivalent (GLE) higher than the overall U.S. average on National Assessment of Educational Progress (NAEP) reading, math and science tests. If all French and Dutch students are compared to the two-thirds of American students who are neither black nor Hispanic, the European advantage is considerably smaller (NCES 2009, Table 100, 123-140,).

But, is it really appropriate to compare the non-Hispanic white and Asian population of the US to the total population of France, Britain and the Netherlands? The U.S. is not the only country challenged by diversity. The share of students who are taught in a language different from their mother tongue is 6% in France, 4.6% in the Netherlands, 3.8% in the UK, 9% in the United States and 11% in Canada (PISA 2003 Table 4.2g). If one is to adjust test scores for the ethnic background of students, why not hold parent's education constant as well. A larger share of American parents have college education than in Northern Europe. Students with college educated parents score more than 2.0 GLE's better in the US than students whose parents have only completed secondary education. Since American parents are more likely to be college graduates, the French/ Dutch/British lead over the U.S. would probably increase if parent's education were held constant.

2) Near Universal Enrollment in Upper Secondary Education

When the first round of IEA studies were conducted 40 years ago (Husen 1967), it was often said that low achievement was the price that the US had to be pay for near universal participation. The first two rows of Table 1 demonstrate how false this excuse was. Enrollment rates and high school graduation rates are now significantly higher in Northern Europe than in the United States and yet the learning gap persists. In 1991 graduation rates were 82.2 percent in the Netherlands, 75.8 percent in France compared to 75.5 percent in the United States. Now graduation rates are about 10 points higher in France, Netherlands and Britain. This clearly shows that high standards of achievement can be made

compatible with near universal enrollment in secondary school.

Swedes are one year older when they start elementary school, so they are older when they complete upper secondary school. Some programs of study in France and the Netherlands take more than 12 years to complete. Students having difficulty with the fast-paced curriculum typically do not drop out; rather, they repeat grades and thus gain extra time to prepare for the demanding external exams. As a result, the most recent OECD data indicates that share of 18 year olds in secondary school is 93% in Sweden, 61% in Holland, 48% in France versus 26% in the US and the UK. This is one of the ways demanding programs achieve high graduation rates. The high graduation rates are also a result of Northern Europe's emphasis on career preparation during upper-secondary school. Over 60 percent of French and Dutch upper secondary students are in pre-vocational and vocational programs that combine study of mathematics, science, history and literature with courses specific to their chosen profession. These programs typically lead to further study in non-university tertiary education (OECD, *Education at a Glance* 2009, Table A2.1).

The benefit of the early completion of secondary school in the U.S. is that large numbers of students enter tertiary education at a young age. However, some of the material covered during the first two years of college in the United States is covered in upper-secondary school in Britain, France and the Netherlands.

3) Teacher Quality and Compensation

The quality of the people recruited into teaching is very important. The teacher's general academic ability and subject knowledge are the characteristics that most consistently predict student learning (Hanushek 1971, Strauss and Sawyer 1986, Ferguson 1990, Ehrenberg and Brewer 1993, Monk 1992).

Secondary school teaching does not pay well in the United States and it does not attract the kind of talent that is attracted into the profession in France and the Netherlands. Since university admission standards are higher in Europe, the university graduate pool from which European secondary school teachers are recruited is better educated on average than the college graduate pool out of which American teachers are recruited. In 2008/9 the Math Scholastic Aptitude Test (SAT) score of intended education majors was .32 standard deviations (SDs) below the overall average, one SD below engineering and physical science majors. The Verbal SAT of intended education majors was .25 SDs below the overall average (NCES, Digest, 2009, Table 145). In this respect, Britain is similar; entrants

into programs preparing primary school teachers have significantly lower A level grades than average for university entrants (O'Leary 1993).

In France, by contrast, secondary school teachers must do a double major in the two subjects for which they seek certification and then pass rigorous subject matter examinations. In 1991 only 31.3 percent of those who took the written exam for the *Certificat d'Aptitude au Professorat de l'Enseignement du Secondaire* (the most common of these examinations) passed it. The best teaching jobs go to those who pass an even more rigorous examination, the *Agregation Externe*, which had a pass rate of 17.7 percent in 1991 (Ministere de l'Education Nationale et de la Culture, 1992 p. 205 & 206). French and Dutch secondary school teachers tend to be recruited from the middle (not the bottom half) of a pool of graduates of tertiary education which is in turn a selected sample of the nation's population.

Furthermore, American teachers are often not very expert in the fields they teach. Recent college graduates recruited into math or science teaching jobs spent only 30 percent of their college career taking science and mathematics courses. Since 46 percent had not taken a single calculus course, the prerequisite for most advanced mathematics courses, it appears that most of the math taken in college was reviewing high school mathematics (NCES 1993b, p. 428-429). Many of the best American colleges and universities dropped the undergraduate major in education. Not wanting to spend more than a year taking education courses of dubious value to get a Masters of Arts in Teaching, their graduates headed for Wall Street and other more lucrative careers. Hopefully this is changing with the growth of Teach for America and other programs that offer highly talented college graduates an opportunity to show they can make a difference by teaching in schools in some of the worst neighborhoods in the country.

Teacher Compensation

The high academic standards for entry into upper secondary teaching in France and the Netherlands are sustainable only if wages and conditions of work are attractive. Data on the relative compensation of secondary school teachers is presented in rows 1 and 2 of Table 3.

American upper secondary teachers start at a wage that is 14 percent below that of the average worker and after 15 years of experience they earn only 33 percent more. Starting salaries are equally low in England. However, in France starting salaries are 6 percent above the all worker average and in the Netherlands they are 39 percent higher. In France, England and Scotland upper secondary school teachers with 15 years of experience are paid 61 to 63 percent more than the average worker and in the

Netherlands they are paid 132 percent more than the average worker. For primary school teachers, by contrast, American pay levels are comparable to their Dutch and French counterparts (see row 6).

The lower pay in the United States is not compensation for more attractive conditions of work (see rows 7-13 of Table 3). In the early 1990s teachers at French Lycees were in front of a classroom only 532 hours per year. Their American counterparts taught 825 hours per year. Teaching hours were similar to U.S. levels in England and Scotland (776 and 886 respectively), but class sizes were substantially smaller. Dutch upper secondary teachers were the only group that clearly had heavier teaching loads than American teachers (Nelson and O'Brien 1993).

When the salaries of college graduates are compared, those who enter teaching come out at the very bottom. Starting salaries of U.S. mathematics and physical science majors who entered teaching were 42 percent below the salaries of those who obtained computer programming and system analyst jobs and 35 percent below the starting salaries of those obtaining jobs in mathematics or physical science (NCES 1993b, p. 26). University graduates who majored in physical science earned 78 percent more and economics majors earned 92 percent more than education majors over the course of their working lifetime (Kominski and Sutterlin 1992). Since Americans with university training in mathematics and science can earn much more outside of teaching, those with talent in these areas are difficult to recruit into high school teaching. This results in most American teachers of mathematics and science being less well prepared than their counterparts in Northern Europe. The fact that American primary school teachers are paid almost as much as French and Dutch primary school teachers may also help explain why American 9-10 year olds compare favorably to their counterparts abroad.

4) Overall Spending per Pupil

Data on pupil-teacher ratios and spending per pupil are presented in row 13 and 14 of Table 3. Pupil-teacher ratios are quite similar in the five countries, as is the ratio of spending per pupil to per capita GDP. Consequently, "low" overall levels of spending on K-12 education are not the cause of the lag in U.S. achievement.

5) Priority Given to Academic Achievement

If American spending per pupil is comparable to that in our four comparison countries, why are salaries lower? What happens to the money saved by paying lower teacher salaries? The money is used

to hire additional non-teaching staff. Non-teachers accounted for nearly one-half of the employees in K-12 education in the U.S, but only one-fifth of employees in the Netherlands and only 36 percent of secondary education employees in France (see the bottom row of Table 3). These staff perform services (such as bus transportation, sports activities, before and after school day care, assisting handicapped students, counseling and career guidance) that are either not offered or provided by non-school entities in many other nations. The money also pays for the more attractive buildings, sports facilities, large school libraries, the numerous computers and colorful texts that are typical of American secondary schools. In part, this reflects the fact that books, computers and buildings are cheaper (relative to teachers of constant quality) in the United States.

American spending patterns also reflect different goals. Academic achievement is the overarching goal (some would say the **only** goal) of French, British and Dutch secondary schools. In the U.S., academic achievement must compete with other goals. American schools are also expected to foster self-esteem, to provide counseling and career guidance, supervised extra-curricular activities, musical training, health services, community entertainment (eg. interscholastic sports), drivers education and to do all this in a racially integrated setting. These other goals require additional staff and different kinds of staff. They may not be served by hiring teachers with a strong background in calculus or chemistry, so resources are diverted from paying the high salaries necessary to recruit excellent chemistry teachers. Unlike France, selection into teaching is not based almost solely on competence in the subject matter.

6) **Availability of Vocational Education**

The founders of the American Republic believed all citizens should be educated. But, “they wanted an education that was practical and useful..... a different kind of education from those of the Old World---’***An useful American Education***’ said Jefferson, with everyone ***‘instructed in general, competently in the common business of life’*** and genius employed its talents ***‘to the useful arts, to inventions for saving labor and increasing the comforts , to nourishing our health, to civil government, military science, etc.’***”(Wood, 1991, p. 349 quoting from Jefferson’s letter to John Banister, Jr. Oct 15 1785; see also Cremin 1980, 249-344). Concrete expressions of Jefferson’s vision can be found in the Morrill Act of 1862 creating Land-Grant Universities and the Smith-Hughes Act of 1917 providing federal support for vocational education in secondary schools.

America’s high schools were attempting to teach a classical liberal arts curriculum in 1900.

Latin was the second most common subject. But only 10 percent of 14-17 year olds were attending. After surveying 14-16 year olds not in school, a commission appointed by the governor of Massachusetts concluded “The chief blame for [students leaving school to work in factories]...lay in the ‘dissatisfaction’ students felt with their schoolwork and the fact that ‘the parent does not know where to find an occupation for his child’ other than the unskilled labor available at the textile mills and other factories” (Kliebard, 1987, 101-102 quoting from the 1906 Report of the Massachusetts Commission on Industrial and Technical Education). The Commission concluded that attracting children from immigrant and working class families into upper secondary education, would require public schools to offer practical subjects like metal working, typing, shorthand and bookkeeping that could lead to better paying jobs. A recent study by Claudia Goldin and Lawrence Katz (2010) has found that these subjects did indeed generate larger payoffs than traditional academic secondary education at the beginning of the twentieth century. Adult males in Iowa who had spent a year or so at private business schools teaching typing, shorthand, bookkeeping, real estate and other commercial subjects earned 34 percent more in 1915 than people who had the same number of years in school. Unmarried females who had attended these schools earned 47 percent extra (Goldin and Katz, 2010, p. 37-39, 43). Vocational subjects entered the public school curriculum partly because of federal support from the Smith-Hughes Act, but also because local employers needed a supply of well-trained workers and students considered the clerical and skilled blue collar jobs the high school vocational program would prepare them for a big improvement over the unskilled jobs they would otherwise be eligible for. By 1927/8 vocational courses were three times more popular than Latin, about half of 14-17 year olds were attending high school and 27 percent of the age cohort was graduating from high school (more than triple the rate in 1900). If public high schools had remained purely academic, their graduates would have soon had difficulty getting good jobs and secondary enrollment would have grown more slowly.

Introducing vocational options at the secondary level has also helped spur expansions of secondary school attendance elsewhere. In 1950 when almost all upper-secondary students in Britain, and France were in purely academic programs, high school enrollment rates were substantially lower than in the U.S. Northern European education systems now offer a greater variety of pre-vocational or vocational programs than most American school districts. Not surprisingly, they now have higher enrollment and graduation rates than the U.S. (Fig. 1 and 2).

Figure 1--Availability of Career-Tech in Secondary School and Upper-Secondary Graduation Rates

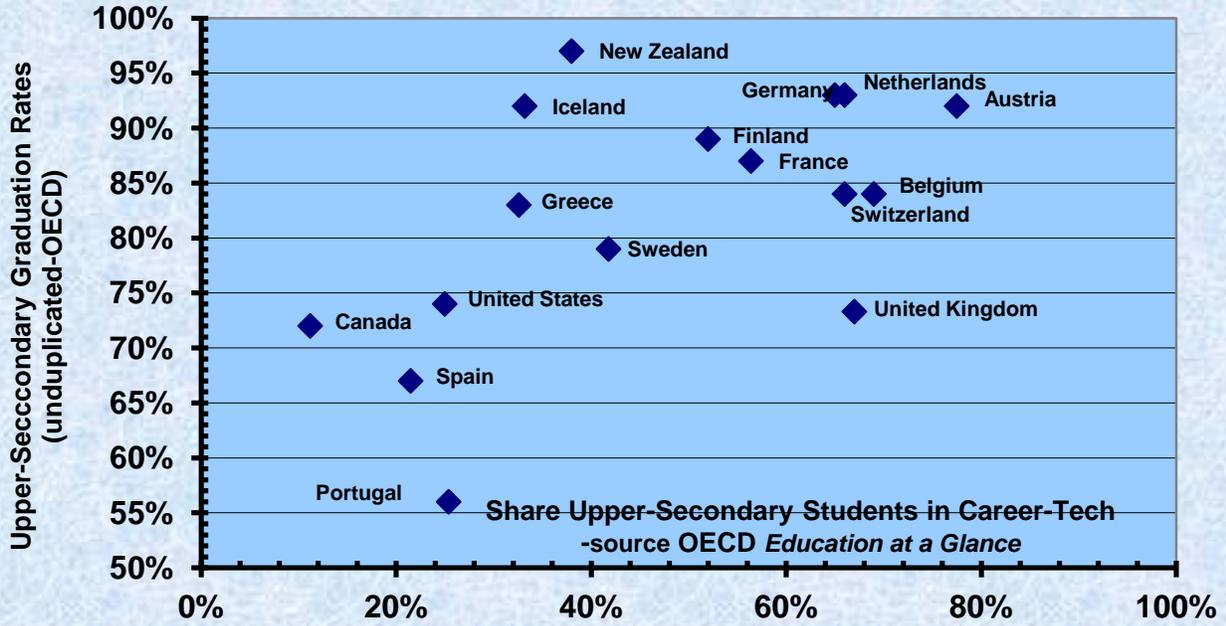
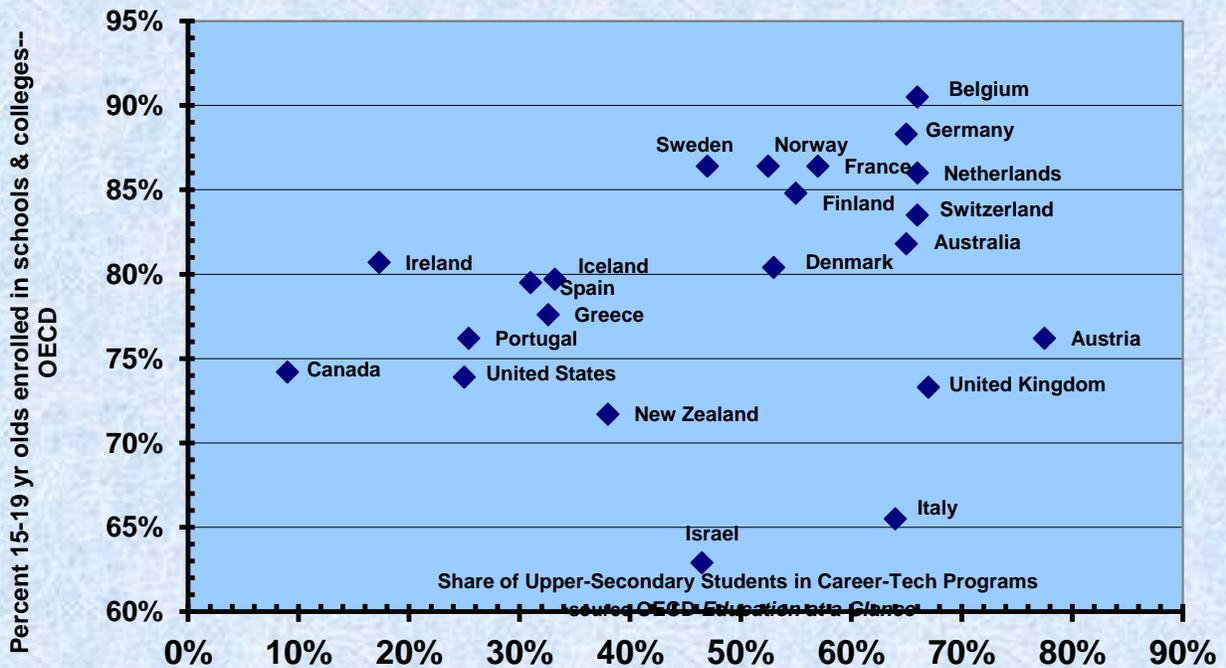


Figure 2--Availability of Career-Tech in Secondary School and Enrollment of 15-19 yr olds in Schools & Colleges



The consequences are visible even now. Figures 1 and 2 present Organization of Economic Cooperation and Development (OECD) data on graduation rates and school attendance rates in Europe, Australia, New Zealand and North America and how they correlate with the vocational share of upper-secondary enrollments. The four countries--the US, Canada, Spain and Portugal--that offer the least robust set of vocational and pre-vocational options have significantly lower levels of school attendance by 15 to 19 year olds and lower graduation rates from upper secondary school.

Note also that the countries where the majority of upper secondary students are in vocational or prevocational programs do not have lower reading and mathematics achievement in PISA assessments of 15 year olds (see Figure 3 and 4). These conclusions also from multivariate analysis of these data (Bishop and Mane 2004).

Students have diverse interests, diverse talents and diverse learning styles. The labor market is similarly diverse in the skills and talents that it seeks. A "one size fits all" upper secondary education is likely to fail many students. North European nations have decided to offer youth the opportunity to choose a career goal and start preparing for that career in upper-secondary school and then to continue that preparation in tertiary education if they choose. Students who dislike academic subjects or find them too difficult have an honorable exit from the fast academic track to university. The skills they are learning will help them obtain a good job and be immediately useful in that job. This keeps the vocational students in school and allows the purely academic go-straight-to university programs to set higher academic standards than would otherwise be possible.

7) Time Devoted to Instruction

Many studies have found a strong relation between time on task and learning (Wiley 1986). How do the five countries differ in the time that students spend in classrooms and doing homework? Table 4 reports the results of a variety of studies that compare time devoted to instruction. Estimates of total amount of time students in a country spend in school seems to depend on whom you ask and how the question is worded. The data quality problem was dealt with by averaging across studies. The total hours of instruction per year for each country was first expressed as a ratio to the U.S. level. Then a mean ratio was calculated by averaging the ratios from the studies that provided a comparison with the U.S. Sources are given in Table 4's footnotes.

Figure 3--Relationship of Availability of Career-Tech in Secondary School to Reading Literacy of 15 yr olds in PISA

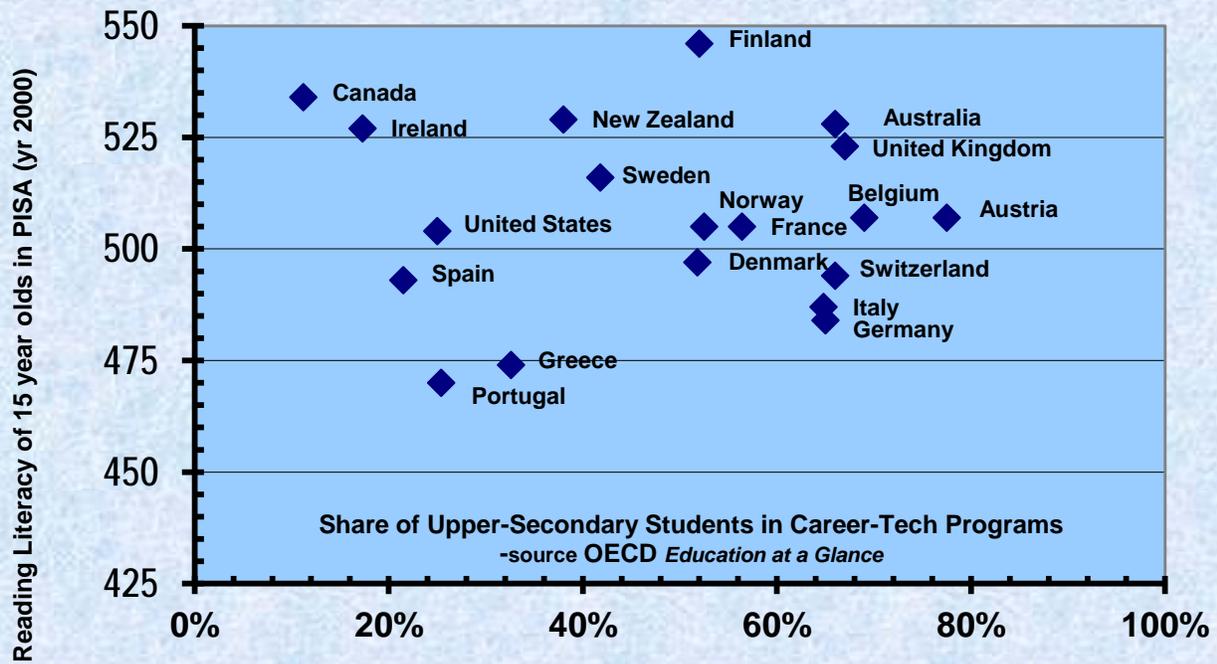
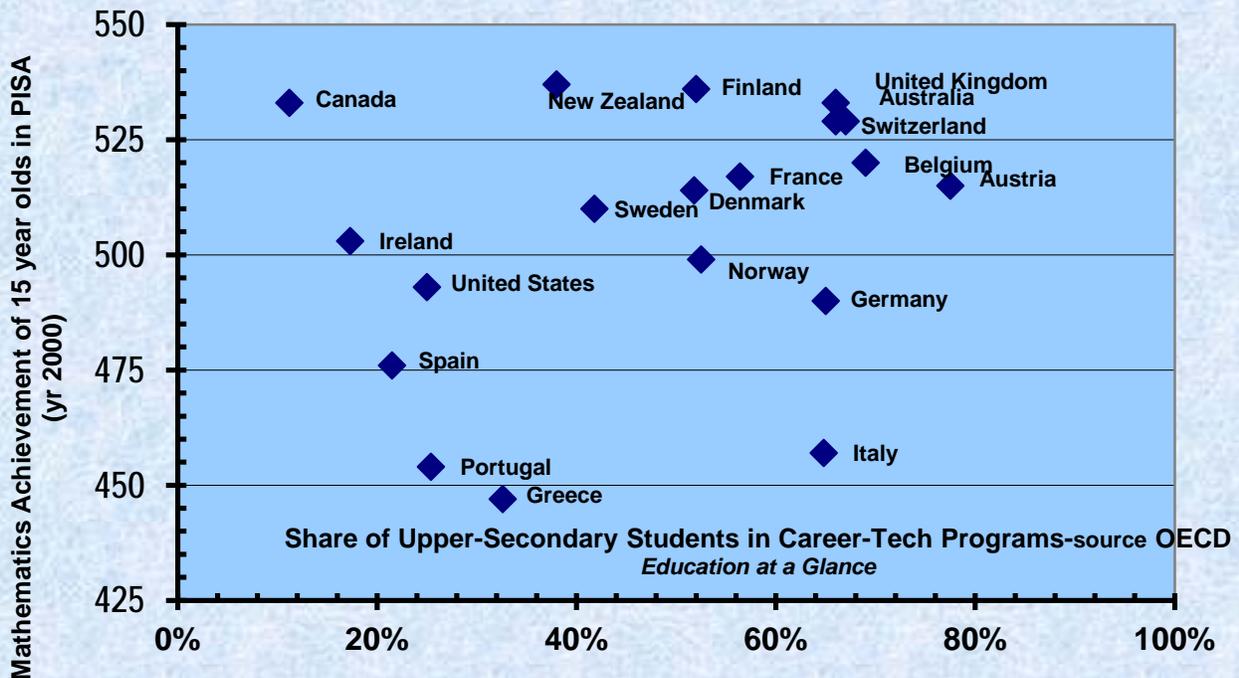


Figure 4--Relationship of Availability of Career-Tech in Secondary School to Mathematics Achievement of 15 yr olds in PISA



While estimates vary across studies, the pattern for secondary school students in the 1980s and 90s is that French, Dutch and Scottish students spent slightly more time in school than U.S. students. English students, by contrast, spent slightly less time in school than U.S. secondary school students.

Differences in instruction time may explain some achievement differentials between countries. But they do not explain the generally poor showing of U.S. secondary school students in mathematics and science. While American students spend less total time in school, they get more mathematics and science instruction time than French, Dutch and Scottish students. Heavy European time commitments to foreign language study tend to crowd out mathematics and science instruction. In lower secondary school, British students study one foreign language and French and Dutch students generally study two. In America, by contrast, few lower secondary school students study a foreign language and, by the end of high school in 2005, graduates had taken an average of only 1.97 years of foreign language in high school (NCES 2009, Table 149).

European students learn mathematics and science more thoroughly than American students even when they spend less time on it. For example, in the IAEP study, mathematics instruction time was the same in France and the U.S., yet French students knew about 1.47 U.S. grade level equivalents more mathematics than American students. In science, by contrast, instruction time was one hour per week less in France, yet Americans still lagged about one-third of a U.S. grade level equivalent behind French students. Why does an hour of instruction in French and Dutch classrooms produce more learning than in American classrooms? Could heavier homework assignments be the explanation?

Homework

Harris Cooper's (1989) meta-analysis of studies of homework's effects on learning in high school found that students assigned homework scored about one-half of 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.

French lower secondary school students spent more time doing mathematics homework and homework of all types (see Table 4). In 1991, French 13 year olds averaged 2.03 hours of math homework a week compared to 1.65 hours in the United States, 1.33 hours in England and 1.07 hours in Scotland. This is consistent with their lead in mathematics achievement. In science, however, there is no evidence that Dutch and French students got more homework than American students.

Furthermore, English and Scottish lower secondary school students do less homework (and have less instruction time) in mathematics and science than American students and yet outperform them.

8) Engagement--Effort per Unit of Scheduled Time

Classroom observation studies in American secondary schools have found that many students are off task much of the time. A study of schools in Chicago, for example, 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.

Even more important is the intensity of the student's involvement in the process. The American high school teachers surveyed by Goodlad ranked "lack of student interest" as the most important problem in education. 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).

Formal studies comparing ratios of on-task time to scheduled time are not available. Nevertheless, people who have visited classrooms in France or the Netherlands and the U.S. report that European teachers are less likely to be talking about extraneous matters and European students are more likely to be paying attention and doing what they have been assigned. My school visits in France and the Netherlands generated similar impressions.

Summing up—Proximate Causes

Five of the eight proposed explanations for the U.S. lag in mathematics and science behind France, Britain and the Netherlands can be ruled out: diversity, restricted access, spending per pupil, availability of vocational courses and time for instruction. The hypotheses that survive the first round of tests are: lower quality teachers, lower priority attached to academic achievement goals and lower levels of student engagement. With only 5 data points, no further narrowing of the list of hypothesized proximate causes is possible. Now let us look behind these proximate causes for ultimate causes. **WHY does an hour of instruction and homework time apparently have larger learning effects in England, France and the Netherlands than in America? WHY do French and Dutch secondary school mathematics and science teachers apparently expect more than American teachers?** The next section of the paper proposes some tentative system level answers to these **WHY** questions. Our purpose is to

show that the incentives facing students, teachers and school administrators are quite different in Northern Europe and that these differences provide a plausible explanation for the large system level differences in goals and learning efficiency demonstrated above.

III. Signaling As Ultimate Cause: External Examinations as Standard Setters

Examination Systems

When questions such as those placed in bold type above are put to French citizens and educators, they point to the high standards and pervasive influence of the *Baccalaureate*? In 1992, 71 percent of the age group took a *Baccalaureate* (*Bac*) exam and fifty-one percent of the age group passed. In 2008 sixty-four percent of the age cohort passed a *Bac* examination (83.5% of those who took a *Bac* examination). *Bac Technologique* or *Bac Professionnel* (ie. in vocational lines) accounted for thirty-eight percent of the *Baccalaureats* awarded in 1992 and forty-six percent in 2008 (Ministere de L'Education Nationale 1993). This was a major accomplishment, for *Bac* exams are set to a high standard. The three-year *lycee* programs that prepare 43 percent of the age cohort for the *Bac General* are quite rigorous. *Bac* Exams in mathematics, history/geography and French are set and marked by 23 regional *academies*. School based assessments are used in other subjects (Madeus and Kellaghan 1991, p. 17). The *Bac* exams taken in one's area of concentration appear to be at least as demanding as the Advanced Placement (AP) exams taken by American students seeking college credit for high school work. Cornell University, for example, generally awards advanced placement credits to recipients of the *Baccalaureate General*.

The payoff to higher education is high, so access to university is highly prized. A *Bac* is necessary for university admission and the line pursued and the *mentions* obtained on the exam influence which university program one can enter. About 13 percent of those obtaining a *Bac General* enter *Classe Préparatoire* programs that prepare them for the exam that regulates admission to the elite *Grandes Ecoles*. The job market also rewards young people who have passed the *Bac*. There are alternative lower level examined upper-secondary qualifications for employment such as the *Brevet d'Enseignement Professionnel* (BEP) and the *Certificat d'Aptitude Professionnelle* (CAP), but the *Baccalaureate* confers greater access to preferred jobs. In 1987, unemployment rates for 15 to 24 year olds were 37 percent

for those without a diploma, 22 percent for those with CAPs or BEPs, 18 percent for those with a Bac and 10 percent for university graduates (Ministere de l'Education 1992b, p. 25).

Dutch university graduates earn 65 percent more than secondary school graduates at age 45 to 64 (OECD, Education at a Glance, 1992, 1993), so access to higher education is highly prized in the Netherlands as well. Grades on the curriculum-based exit examinations set by the Ministry of Education influence access to postsecondary education. The Ministry of Education sets an exam that has both essay and multiple choice components. The multiple choice component which represents half the written paper is graded centrally. The essay component is marked by the student's own teacher and by a teacher from another school with the aid of rubrics supplied by the Ministry. Oral components are administered by the student's teacher. In both France and the Netherlands questions and answers are published in newspapers and available on the internet. The published exams signal the standards that students and teachers must aim for.

Nine-tenths of English youth now take the General Certificate of Secondary Education (GCSE) exam at the end of 11th grade and an increasing number take A levels two years later. Scotland also has a system of external examinations. For the United Kingdom as a whole, the ratio of the number of school leavers passing at least one A level (or the Scottish equivalent) to the number of 19 year olds was 23 percent in 1991 (Government Statistical Service 1993, p. 8). Completing an A level qualification lowers unemployment rates for 25-34 year olds from 16.9 to 6.9 percent and graduating from university lowers it further to 4.3 percent. Grades on the GCSE and A level exams are included on resumes and requested on job applications, so employment opportunities depend on school results as well (Raffe 1984). University graduates earn 66 percent more than secondary school graduates at age 45 to 64 (OECD Education at a Glance, 1992, p. 111). Performance on GCSE and A level examinations and the equivalent Scottish exams determine whether one can continue one's schooling and which university and program one can enter. There is a timing problem, however, because A exams grades become available months after most students have applied to university. The solution that has been developed is quite ingenious. Universities base admissions offers on GCSE results and teacher predictions of how the student will do on her A levels. If the student does not achieve the A level grades that are predicted, the student may find that their admission to the specific university program is canceled. Even though teacher predictions tend to over-predict A level results, few school leavers suffer this fate. Nevertheless, the possibility is enough to keep British students studying hard up through the A exam.

In the United States, by contrast, admission to the best colleges depends on teacher assessments of relative performance--rank in class and grades--and aptitude tests that are **not** assessing the material taught in secondary school classrooms. With the exception of New York and a few other cities, high quality vocational programs are typically a long and difficult commute in the middle of the day and seldom lead to examined credentials that have national or regional credibility.

External assessments of achievement that directly affect access to preferred educational and job outcomes have clearly increased rewards for studying in these four European countries. They also change the structure of rewards for learning and, therefore, the incentive environment of students, teachers and administrators. These issues will be discussed under seven headings:

1. Peer group norms
2. Teacher incentives
3. Administrator incentives
4. Competition among upper secondary schools
5. High standards in the external exams
6. *Redoublement*, grade repeating, as Mastery Learning and an Incentive to Study
7. Choice of Specialization as Goal Setting

1. Peer Group Norms

Peer pressure was discussed in my interviews of school staff and students in England, the Netherlands and France. The French educators I interviewed reported that peer pressure not to study occurred sometimes, but only in some lower secondary school classes, not at the *lycee* serving upper-middle class students that I visited. In lower secondary schools the pressure appeared mild by American standards. In upper secondary schools particularly in the math-science line, the peer pressure was to excel. Discussions with Dutch and English students and educators produced similar observations.

2. Teacher Incentives

Most American secondary school teachers do not feel individually accountable for the **learning** of their students. The lack of accountability for learning stems from: (1) the rarity of examinations assessing student achievement in particular subjects relative to an external standard, and (2) the fact that most secondary school students receive instruction in a given subject from many teachers. Only coaches, band conductors and teachers of advanced placement classes are exceptions to this norm.

They teach in environments where student achievement is visible to parents and colleagues and as a result feel accountable for outcomes.

In France and the Netherlands, by contrast, upper secondary students are in small classes that take most subjects together and generally remain intact for two or more years. Fewer than three teachers share responsibility for preparing each class for the external exams in the subject. In the Netherlands where schools are small, many subjects are taught by only one teacher. Since important rewards accrue to those who pass or do well on these exams, everyone takes them very seriously. The number of students taking and passing each exam is public knowledge within the school and among parents. Exam results influence teachers' reputations. Responding to such informal pressures, upper secondary school teachers strive to prepare their students for the external exam.

3. Administrator Incentives

In many European countries the record of each school in the external examinations (the numbers passing or getting high grades) is published in local and national newspapers. Recent reforms in England and Scotland, for example, resulted in schools publishing annual reports that contain the grades received by last year's students in each examined subject. These reports are sent to parents of current and prospective students. The school league tables have important effects on school reputations. Administrators seeking to strengthen their school's reputation are thus induced to give teaching effectiveness (as assessed by the external exam) first priority.

4. Competition among Upper Secondary Schools

For generations French and Dutch upper secondary schools have faced a competitive environment that is similar in many ways to the one faced by American colleges and universities. Funding has been on a per student basis, so schools experiencing an increase in applications have had an incentive to expand up to the capacity of their physical plant. Schools with strong reputations get more applications than they can accept and are, in effect, rewarded by being allowed to admit the "best" from their pool of applicants.

In the U.S. access to quality teaching and supportive peers depends on the parent's ability to buy or rent a home in a school district with excellent schools. In France and the Netherlands access to the best upper secondary schools depends primarily on achievement in lower secondary school. This means that parents who want their child to attend the best upper secondary schools must make sure their child

studies hard in lower secondary school.

The Netherlands has three types of general secondary school--the VWO, the HAVO and the MAVO--and a system of lower vocational schools, LBO/LEAOs and KVBOs, which prepare students for both occupation specific and general education exams. The first year curriculum is supposed to be the same in all schools so that students can transfer between schools at the end of the year. In succeeding years, however, curricula and rigor diverge. Rigor and work loads are greatest at the six year VWOs, somewhat less demanding at the five year HAVOs and still less demanding in the four year MAVOs. These schools also differ in the foreign languages offered and the pace of the curriculum. Students who complete a MAVO or HAVO program can then transfer into the next higher level and complete the longer cycle program in two (rather than one) additional year. The LBOs devote considerable time to occupationally specific curricula, so less time is available for general studies. Advise to parents about which type of school is appropriate for their child is based on the pupil's record in primary school and in some cases standardized tests as well (Nijhof & Streumer 1988). Parents have the right, however, to select the type of school and which school of that type their child will enter. There are three parallel systems of education--a locally administered public system, a Catholic system and a Protestant system--so parents have a great deal of choice.

A couple of decades ago English and Scottish parents were given the right to send their children to schools outside their zoned attendance area. Two years after choice became operational in Scotland, 9 percent of pupils entering secondary school nationally (11 to 14 percent in urban areas) attended a school outside their catchment area (Adler and Raab 1988). Scottish parents who made this choice appeared to be behaving rationally for they tended to choose schools that had higher SES student bodies and that were also more effective than the school in their own catchment area. An analysis of school choice in the Fife Education Authority found that the schools chosen by those leaving their catchment area had better examination results than would have been predicted given the pupil's primary school test scores and family background and the average SES of pupils at the school (Willms and Echols 1993 Table 4). Consequently, the free choice of secondary schools that prevails in our four European nations generates a competitive pressure on schools to excel that doesn't have any counterpart in the U.S. outside of cities with large numbers of charter and magnet schools.

5. Standards of the External Exam

External examinations at the end of secondary school may be necessary for high achievement levels, but they are not sufficient. Effects will be small if the exams signal only that the student has exceeded a minimum cut-off score, if they are taken by a small minority of students (AP examinations in the US), or do not generate substantial rewards for successful students.

High passing standards on external exams are clearly associated with high achievement levels. Does this reflect a cause and effect relationship? Yes, but causation runs both ways. High passing standards for graduating from high school are politically sustainable in the U.S. only when at least 90% of high school seniors are able to meet or surpass the standard.

Does the passing standard also influence student effort? Yes it does. In *High School and Beyond* data, those taking more rigorous courses learned a good deal more between sophomore and senior year, even though their grade point average suffered as a result (Gamoran and Barends 1987). Kulik and Kulik's meta analysis (1984) of the educational literature found that students chosen to skip a grade or to a compressed and accelerated curriculum score 75 percent of a standard deviation higher on tests (a few years later) than the matched non-accelerated students. Repeating a grade effectively lowers learning goals and reduces the retained child's achievement a few years later by about 30 percent of a standard deviation (Holmes 1989).

Over a hundred experimental studies have been conducted of the effect of goal difficulty on various kinds of achievement. The effects are quite large: on highly complex tasks like school and college course work, specific hard goals raised achievement by 47 percent of a standard deviation (Wood, Mento and Locke 1987). In the laboratory and field settings used by psychologists conducting this research, the subjects have generally accepted the goal set for them by the researcher. Achievement goes up, but the probability of failing to reach the goal rises as well. In most studies more than two-thirds of those in the "hard goal" condition failed to achieve their goal (Locke 1968 p. 163-165). Most of the studies examine behavior over relatively short periods of time. One would imagine, however, that if such experiments lasted a couple of years, those who consistently failed to achieve their goal might lower their goals or give up altogether.

Stedry (1960) found that when subjects who had already set their own goals were assigned even higher goals by the study director, they rejected the assigned goal and achievement did not rise. This appears to be what happens in American secondary schools. Most students reject the goals teachers set because the rewards for success are small. Others reject them because they appear unattainable.

How do European education systems induce upper secondary students to set difficult learning goals and work toward them? They do not, as some have proposed for the U.S., set a single high year-long standard that everyone is expected to meet. Young people are too different from each other for such a policy to work. External exams need to signal the level of a student's achievement, not just whether the exam was passed. Dutch external exams are graded on a 1 to 10 scale. Excellence on the *Baccalaureate* exams results in the award of a *Mention Tres Bien*, a *Mention Bien* or an *Mention Assez Bien*. These results are reported on resumes. European employers ask about scores on graduation exams on job applications and base their selection decisions, in part, on the information. Universities use the information as well. Graduates with the strongest exam results have options not available to those with weak results, and the outcome is a system of graduated rewards. When the variance of achievement is high, incentives for effort are stronger on average under a graduated rewards system than under a single large reward attached to achieving a fixed standard (Kang 1985).

The English GCSE and Scottish "Lowers" Examinations are taken by 90 percent of 16 year olds. They generate substantial and graduated rewards for learning what appears on the exams. Indeed the rewards for doing particularly well on these external exams appear larger than those in the Netherlands.

In the U.K., access to 6th form programs preparing for university, vocational technical programs of various kinds and employment depend on the student's performance on the GCSE and Scottish lowers. Since A level results are not available at the time initial university admission decisions are made, A level teachers predict what their students will get on their exams and that information combined with GCSE results influence which university and which field of study a student is admitted to. In the Netherlands the passing standard is high, but exceeding it by a large margin generates few rewards because the external exam results are only part of the student's overall grade and access to the most popular university fields of study is largely on a first-come first-serve basis.

6. Redoublement as Mastery Learning and an Incentive to Study

Social promotion of students is the rule in the United States. A survey of teachers by Peter Hart Research Associates (1994) found that 46 percent reported pressure to "pass students on to the next grade who are not ready."

The situation is very different in France and the Netherlands. Pupils who fail more than one of their courses are generally required to *redoubler* or "to repeat the grade." In 1990 Dutch *redoublement*

rates were 7.5 percent per year in academic lower secondary schools, 5.1 percent per year in LBOs, the vocational lower secondary schools, and 13.3 percent per year in academic upper secondary schools (Central Bureau Voor De Statistiek, 1993 pp. 19, 20 & 29). French rates of *redoublement* ranged from 6.8 and 11.0 percent per year during the four years of general lower secondary education, ranged from 12.1 to 18.4 percent per year in the three year academic upper secondary schools and averaged 8.4 percent per year in the first two years of vocational upper secondary schools (Ministere de l'Education Nationale et de la Culture 1992, p. 77, 93 & 99. According to H. D. Lewis, the "basic motivation is to help the child himself, to ensure that the pupil is sufficiently well prepared so that he may fully benefit from work at a more demanding level (1985 p. 5)" For French teachers, *redoublement* is a form of Mastery Learning, a way of allowing some students extra time to achieve very demanding learning goals. Consequently, in 1992, 33.8 percent of French 19 year olds and 41.6 percent of Dutch youth were still in secondary school in 1992. Indeed, 14.7 percent of Dutch 21 year olds were still attending secondary school. By contrast, secondary school enrollment rates of 19 year olds were 4.3 percent for Britain and 5.6 percent for the United States (OECD, Ed at a glance, 1995 Table P04).

Redoublement is not inflicted only on children from lower class backgrounds. Often high aspirations can be achieved only by *redoublement*. The two Dutch professors with grown children with whom I have discussed this matter both had a child who was required to *redoubler*. In France selective upper secondary schools serving upper middle class communities have grade repeating rates that are nearly as high as schools serving lower income communities. For example, *Lycee Charlemagne*, an upper secondary school serving one of the richest neighborhoods in Paris, asked 14 percent of its entering class to repeat the year in 1992.

For French and Dutch teenagers, the threat of having to *redoubler* is a strong incentive to study. When I asked how the students who must redouble feel about it, I was told that they feel "**dishonored.**" Since *redoublement* is a public event, parents also feel stigmatized, so they have an incentive to see that their child studies hard. In the Netherlands, students struggling with the fast paced VWO or HAVO curricula are often given a choice: either repeat the year or transfer to a less demanding school. At the VWO I visited in the Netherlands, one third of the entering class transfers to a HAVO or a less demanding VWO before the beginning of the third year. VWOs offer a fast paced six year university preparation program. Parents who want their child to enter a VWO are generally accommodated even when primary school teachers advise against it. The child's performance in school determines whether the

parents' aspirations are realized or whether a transfer to a less demanding type of school is necessary. Being forced to transfer to a HAVO or a MAVO does not foreclose university attendance. With good grades at the end of the five year HAVO program the student can transfer to a VWO, complete the final two years and then enter a university. In addition, numerous vocationally oriented higher education options are open to HAVO and MAVO graduates and transfers to university are feasible with good grades.

While other routes to university are possible, pupils who choose the fast track in 7th grade, a VWO, do not want to be forced "to get off the train." Students in the Netherlands and France are formed into classes that take most subjects together and which remain intact for two years and sometimes longer. Friendships tend to develop within this class. When I asked a Dutch student who, despite long hours of study, had been required to repeat a grade, why she had studied so hard, she responded "*I wanted to stay with my class!*" Students do not want to have to repeat the grade because it effectively severs the friendships they have made in the class. Apparently, trying to keep up academically (ie. accepting the academic goals of the school) is viewed positively by peers because it expresses commitment to the group. Indeed, I was told that Dutch teachers encourage better students to help the struggling members of the class and that this forestalls retention in most cases. In these two countries peer pressure seems to encourage lagging students to study, not discourage them as in the U.S.

The argument against retention is that it effectively lowers the learning goals being set for the student in subsequent years. Cross-section studies of U.S. primary school children indicate that retention reduces subsequent learning (Holmes 1989). It also, apparently, increases future dropout risks (Grissom and Shepard 1989). The optimal strategy appears to be to encourage student and parent perceptions that retention will result if effort and achievement standards are flouted, but work very hard to avoid getting to that point.

7. Choice of Specialization and School as Goal Setting

All education systems give upper secondary students (and their parents) the right to select a specialty and also the right to choose the rigor and difficulty level of the school, the academic program or of specific courses.

In France four academic lines--literature and languages (A), economics and social science (B),

mathematics and physical sciences (C), and biology (D)--have roughly equal numbers of students and together account for most of the *Baccalaureate Generales* awarded. The Mathematics-Physics-Chemistry line (C) is the most difficult, carries the greatest prestige and gives one the best chance of being admitted to a preparatory school for one of the elite *Grandes Ecoles*. Admission to the C line within a *lycee* is competitive. The Netherlands has a similar though less elaborated system of specialization within general upper secondary education. As in France the math-science line has the reputation of being the most difficult.

In France and the Netherlands, picking one's school and specialization effectively sets a specific learning goal. The prevalence of grade repeating and transfers to easier schools suggests that most students and parents initially set difficult goals. The goal setting literature tells us that working toward a specific and difficult goal leads to greater effort and performance than being told to "do your best" or setting easy goals (Stedry 1960, Mento 1984, Locke 1968). Thus the Northern European pattern of setting very ambitious goals, maximizes average achievement levels even while it increases the number of students who fail to achieve the goal they initially set. **Why do French and Dutch parents select secondary schools and programs that are so challenging that many must repeat grades to keep up or transfer into easier programs and schools?** There are three reasons. First, the goal selected is visible to parents, relatives and neighbors and going for difficult goals confers prestige. Second, achieving difficult learning goals is rewarded by admission to preferred universities and fields of study and access to better jobs. Finally, the choice is generally made by the parent, not the child. Parents are better informed about the long term benefits of achieving difficult goals and their own prestige rises when their child attends a selective school or pursues a difficult line of study. Parents may view the extra studying necessary in a rigorous specialty as a plus not a minus.

North European upper-secondary systems encourage students to choose a program emphasizing the subjects she likes and anticipates will lead to success. Classmates will tend to bond with each other around their shared interest in the field and its associated careers (a pro-learning/pro-effort orientation) rather than building an oppositional sub-culture that views effort toward the teacher's learning goals to be a betrayal of group solidarity.

In America, by contrast, selecting difficult goals generates much weaker rewards. Everyone in the school district (of which there are 15,000+) or attendance zone (for large urban districts) attends the same school. Students select individual courses (50 minutes of classroom time per day for either 90 or

180 days), not programs of study or schools. Subjects are taught at very different levels, but the rigor of these courses is not well signaled to parents, relatives, neighbors, employers and colleges. Until recently most colleges did not factor the rigor of the courses taken into their admissions decisions (Breland et al 1986). This is changing and selective colleges now 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. However, grades on AP courses taken senior year become available long after admissions decisions are announced, so many seniors do not put much effort into their courses during the final semester of high school and skip the AP exam.

IV. Evidence that CBEEES improve achievement

Considerable evidence has accumulated that externally set curriculum-based external examination systems (CBEEES) have significantly increased the achievement of secondary school students. This hypothesis has been tested by comparing nations and provinces that do and do not have such systems. In most studies of impacts, national mean test scores (for an age group or a grade) were regressed on per capita gross domestic product deflated by a purchasing power parity price index, a dummy for East Asian nation and a dummy for Universal CBEEES. Analyzing 1995 Third International Math and Science Study (TIMSS) data, Bishop (1996, 1997) found that 13 year old students from countries with medium and high stakes Universal CBEEE systems outperformed students from other countries at a comparable level of economic development by 1.3 U.S. grade level equivalents (GLE) in science and by 1.0 GLE in mathematics. Analysis of data from the 1990-91 International Association for the Evaluation of Educational Achievement's study of the reading literacy of 14 year olds in 24 countries found that students in countries with universal CBEEES were about 1.0 GLE ahead of students in nations that lacked a universal CBEEES (Bishop 1999). Analysis of data from both 1995 and 1999 waves of TIMSS data collection also implies that universal CBEEES have highly significant effects (of about 1.5 GLEs) on the math and science achievement in 8th grade (Bishop 2003). Analyses of year 2000 data on 15 year olds from the Program for International Student Assessment (PISA) also yields large statistically significant estimated effects of CBEEES on reading, mathematics and science literacy of native-born students (Bishop 2003). Achievement gaps between high and low SES students are also significantly lower in nations that have a universal CBEEES (Bishop and Mane 2004)

Four other studies (Ludger Wößmann (2000, 2003a, 2003b; Fuchs and Wößmann 2004) have

conducted hierarchical analyses of the entire TIMSS and PISA micro data sets and included a comprehensive set of controls for family background, teacher characteristics, school resources and policies at the individual and school level. Wößmann (2000) found that 8th graders in Universal CBEEES nations were about 1.1 international grade level equivalents ahead in mathematics and about 0.8 international grade level equivalents ahead in science. He also found that learning gains between 7th and 8th grade were significantly larger in Universal CBEEES nations.

Another five studies compare students living in different provinces/states in Germany, Canada and the United States. German provinces with centralized secondary school exit examinations have significantly higher scores on the TIMSS assessments (Jurges, H., Schneider, K. and Buchel, F., 2003). Students attending school in Canadian provinces with universal CBEEES were a statistically significant one-half of a U.S grade level equivalent ahead in math and science of comparable students living in provinces without universal CBEEES (Bishop 1997, 1999a). In 1990 New York State's Regents exam system was the only example of a voluntary curriculum-based external exit exam system in the United States. Graham and Husted's (1993) analysis of 1991 SAT test scores in the 37 states with reasonably large test taking populations found that New York State students did much better than students of the same race and social background in other states. Bishop, Moriarty and Mane (2000) confirmed Graham and Husted's SAT findings and also found that 1992 NAEP math scores of New York 8th graders were significantly higher than in other demographically similar states. Analyzing NELS-88 data Bishop, Mane, Moriarty and Bishop (2001) found that New York students learned about a half a GLE more between 8th grade and 12th grade than comparable students in other states. Controlling for ethnicity, social background and other standard's based reform policies, 8th graders in New York and North Carolina in 1996-98 were about one-half of a GLE ahead of comparable students in other states in reading, math and science. In these cross section analyses state minimum competency tests had small (less than 10 percent of a GLE) non-significant effects on achievement (Bishop, Mane, Moriarty and Bishop 2001, Jacob 2001).

What was the primary mechanism by which universal CBEEES increase student achievement? The impacts of universal CBEEES on school policies and instructional practices have been studied in the TIMSS data and in the Canadian International Assessment of Educational Progress data. Universal CBEEES were not associated with higher teacher-pupil ratios nor greater spending on K-12 education. They were, however, associated with higher minimum standards for entry into the teaching

profession, higher teacher salaries, a greater likelihood of having teachers specialize in teaching one subject in middle school and a greater likelihood of hiring teachers who have majored in the subject they will teach. Teacher satisfaction with their job was significantly lower, possibly because of the increased pressure for accountability that results from the existence of good signals of individual student achievement. Schools in universal CBEEES jurisdictions devoted significantly more hours to math and science instruction and built and equipped better science labs. For homework time the Canadian and TIMSS studies got contradictory results (Bishop 1997, 1999b).

What about the quality of instruction and student attitudes toward the subject? Students in universal CBEEES nations and Canadian provinces were significantly less likely to say that memorization is the way to learn the subject and significantly more likely to do experiments in science class. Quizzes and tests were significantly more common in Canadian CBEEES provinces, but in other respects these provinces were not significantly different on a variety of indicators of pedagogy. They were just as likely to enjoy the subject and they were significantly more likely to believe that science is useful in everyday life and more likely to talk with their parents about schoolwork. Students in the TIMSS study were significantly more likely to get tutoring assistance from teachers after school. Madaus's (1991) prediction that students would avoid opportunities to learn material that is not likely to be on the exam was not supported. Students in Canadian provinces with CBEEES spent significantly more time reading for fun and watching science documentaries (Bishop 1996). The study using TIMSS data found no relationship between CBEEES and reading for fun. (Bishop 1999b, 2003, 2005).

V. Summary and Conclusions

In the Netherlands, Britain and France, learning in secondary school is assessed by difficult subject-specific external examinations that carry high stakes for students, teachers and school administrators. The reputations of teachers and schools are influenced by student achievement on these exams. Parents base their selection of the upper-secondary school their child will attend and which academic or vocational program he/she will pursue, in part, on these reputations. Parents tend to set difficult goals for their children, so most students enter programs of study that for them are pretty demanding. Students are organized in classes that take almost all subjects together, often remain intact for two years or more and become the student's circle of friends. Students who fall way behind must

either repeat the grade or switch to an easier curriculum. Either outcome would sever the friendships they have developed in their class, so they are strongly motivated to keep up with their studies to prevent that from happening.

In the United States, subjects are taught at very different levels, but the rigor of the courses and the learning achievements that result are not well signaled to parents, neighbors, colleges and employers, so rewards for setting difficult goals are small (Breland et al 1986, BNA 1986). Teachers are expected to pass almost all students, so if the class fails to study hard, the teacher is forced to lower the passing standard of the course (Hart 1995; Bradley 1993). Students are graded and ranked relative to classmates. Reacting to the zero-sum nature of academics, students encourage each other to focus on sports and socializing not class work. Nerds and geeks who publicly rebel against these norms are harassed by some and avoided by most everyone else (Bishop et al 2004). Some students hide their efforts to learn from classmates. One interviewee described her strategy as follows:

I dumbed myself down to get along with others. My grades did not suffer, but I kept them very private. You never saw my papers hanging on the refrigerator door when my friends came over. In essence, I presented myself as less intelligent than I was in order to belong.

Only a small minority of American students (those in Advanced Placement courses or in states with End-of-Course graduation examinations) study for and take externally set curriculum-based exams.

The important lesson is that incentives--both their strength and structure--matter. In my view, these are the primary underlying reasons for the gap between the academic achievement of American upper-secondary students and their counterparts in Northern Europe.

The French, British and Dutch models of secondary education combine in one system many of the reforms proposed for the United States and under discussion among educational reformers in Brazil:

- 1. Externally set subject-specific achievement exams taken by almost all secondary school graduates that supplement teacher assessment of students. University admission decisions depend on results on these exams. Scores on these exams are also routinely requested on job applications and influence employer hiring decisions for years after secondary school is completed.**
- 2. Parental/student choice of upper-secondary school and program of study with government support for educational institutions following the student's choice. Students can choose to build advanced skills in segments of the academic curriculum – foreign languages, music, science, etc.—or choose between an extensive array of vocational and pre-vocational programs. Each program yields a distinctive graduation credential that signals skills to the**

labor market and confers the right to enter various kinds of tertiary education.

- 3. Mastery learning with teeth (those who fail two or three subjects in secondary school are required to either repeat the grade or transfer to a less demanding school or program).**
- 4. Secondary teaching jobs are available only to those who demonstrate high levels of competence in their subject. High entry standards are sustained by offering high wages and good working conditions.**

Brazil and the United States both have highly diverse populations and a very decentralized and unequal system of funding and managing secondary schools. The Northern European style student/parent choice between different schools and programs of study and (b) external curriculum-based graduation exams tied to the specialization/program chosen are quite different from current educational practice in Brazil and the United States. Any evolution towards the Northern European model would require a long consensus building approach.

American secondary education appears to be slowly moving towards more choice and more external assessment of student achievement. Opportunities to choose a secondary school different from the comprehensive high school serving your district (or attendance area) have grown. The share of students attending religiously affiliated high schools increased from 6% in 1993 to 9% in 2007. Students attending publicly funded schools of choice—charter schools, magnet schools, themed schools-within-a-school and career academies—grew from 11 percent of upper secondary enrollment in 1993 to 16 percent in 2007 (Grady & Bielick 2010). Participation in Advanced Placement Exams is growing rapidly. The proportion of high school graduates taking one or more AP courses grew from 10 percent in 1988 to 26.5 percent in 2008 (College Board 2009). Many states have begun shifting from minimum competency tests as a graduation requirement to End-of-Course exams for specified subjects such as Algebra, Geometry, Biology, American History etc. (Center for Education Policy 2008). These End-of-Course exams are both a final exam for the course and a minimum requirement for getting a regular high school diploma. However, none of the state university systems are using their state's End-of-Course exam grades as one of their admissions criteria. Employers also fail to request information about high school grades and exam scores when seeking new employees. Consequently, nothing like the interlocking system of options and incentives characteristic of the Northern European secondary schools is likely to develop anytime soon.

In both countries, the controversial nature of specifying and assessing what young people should

know and be able to do requires a slow consensus building approach. Consequently, it will probably be decades before external examinations in specific subjects are widespread in either the United States or Brazil. School cultures are resistant to change, so significant improvements in achievement will take even longer.

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Table 3--Teacher Compensation and Conditions of Work

	France	Nether-lands	Eng-land	Scot-land	United States
<u>Compensation--Teacher/All Employees¹</u>					
Upper Sec. Teacher--Start.	1.06	1.39	.87	.91	.86
Mid Career (15 yrs)	1.61	2.32	1.63	1.61	1.33
Lower Sec. Teacher--Start.	.95	1.12	.87	.91	.86
Mid Career (15 yrs)	1.44	1.58	1.63	1.61	1.33
Primary Sch. Teacher-Start.	.93	.97	.87	.91	.84
Mid Career (15 yrs)	1.34	1.39	1.57	1.61	1.30
<u>Teacher Class Contact Hrs/Yr²</u>					
Upper Secondary School 532	943	776	887	825	
Lower Secondary School 706	943	776	887	748	
Primary School	875	1014	1013	950	1098
<u>Class Size³</u>					
Upper Secondary	29	24	16	15	25.6
Lower Secondary	24	28	16	20	26.8
Primary	23	25	25	20	24.0
Sec. School Students/Teachers ⁴	14.0	15.9	14.7	14.7	15.5
Sec. School Expenditure/student Relative to GDP per capita ₅	28.1%	24.7%	28.0%	28.0%	29.4%
Share of Staff not Classroom Teachers ⁶	36 %	20 %	---	---	47 %

¹ Compensation of secondary teachers was calculated by multiplying their salary by the ratio of compensation to wages for manufacturing workers. This estimate of teacher compensation was then divided by average compensation of all workers. The figure for French upper secondary teachers is a weighted average of salaries for Agrege (20%) and others (80%). (Nelson and O'Brien, 1993, pp. 73, 74, 90 & 91).

² Mean number of students in each class. (Nelson and O'Brien, 1993, Table II.2.)

³ Mean number hours teaching a class per week times the mean number of weeks in the school year. (Nelson and O'Brien, 1993, Table II.3. & II.4.) Time devoted to preparation, in service training and to non teaching activities are not included in this total.

⁴ The ratio of the number of full-time-equivalent pupils enrolled in public and private secondary schools to the number of full-time-equivalent secondary school teachers (OECD 1993, p. 104).

⁵ Data on expenditure relative to GDP per capita is from OECD, Education at a Glance, 1993, p. 95.

⁶ Share of all staff employed in publicly funded elementary and secondary schools and ministries of education that are not classroom teachers. The non-teaching staff includes administrators at all levels, teachers aides, guidance counselors, librarians, nurses, custodial staff, food service workers, bus drivers, and clerical workers. The Dutch figure is for all three levels of schooling (OECD 1993 p. 100). The French figure is for secondary education only (Ministere de l'Education Nationale et de la Culture 1992, p. 184). The U.S. figure is for public elementary and secondary schools and does not include people working for State Departments of Education (NCES 1992, p. 88). In the U.S. teachers aides account for 8.8 percent of school staff.

Table 4
Student Time--Instruction and Homework

	France	Nether- lands	Eng- land	Scot- land	United States
<u>Total Hours of Instruction/Year</u>					
Primary Sch.-1971 ¹	918	1040	900	1040	900
5th Grade in 1982 ²	---	---	984	---	1070
4th Grade in 1991 ⁵	840	975	---	---	954
Secondary Sch-1971 ¹	775	1120	900	1080	900
9th Grade in 1982 ²	---	1007	1025	---	1141
8th Grade in 1982 ³	1187	1000	896	1067	1008
9th Grade in 1991 ⁵	1030	1092	---	---	792
Age 13 in 1991 ⁴	1073	---	960	1031	1003
<u>Hours of Homework in All Subjects</u>					
Hrs/wk--9th Grade in 1982 ²	--	8.4	6.0	--	9.6
Hrs/wk--8th Grade in 1982 ³	8	5	5	3	5
Hrs/wk-12th Grd Math Stud (1982) ³	--	--	--	--	9
Hrs/wk-12th Grd Sci Stud (1982) ²	--	--	11.5	--	9.8
Hrs/wk in 4th Grade (1991) ⁵	.53hrs	.13hrs	--	--	1.89hrs
Hmwk GT 2 hrs/day-Age 13 (1991) ⁴	55%	--	30%	15%	30%
Hrs/Wk on Language Arts-4th Grade ⁵	9hrs	7hrs	--	--	11hrs
# LangA Hmwk Assign/wk Grd 9-1991 ⁵	1.6	.4	---	---	2.3
<u>Time Devoted to Mathematics</u>					
Math Share--8th Grade (1982) ³	12%	10%	13%	14%	14%
Hrs/wk Math Instr-Age 13 (1991) ⁴	3.85	--	3.04	3.52	3.90
Hrs/wk Math Hmwk--Age 13 (1991) ⁴	2.03	--	1.33	1.07	1.65
Hrs/wk Math Hmwk--8th Gr (1982) ³	4.0	2.0	1.0	2.0	3.0
<u>Time Devoted to Science</u>					
Science Share--5th Grade (1971) ¹	8%	2%	3%	3%	7%
Science Share--5th Grade (1982) ²	--	--	4%	--	10%
Science Share--9th Grade (1971) ¹	8%	7%	8%	5%	10%
Science Share--9th Grade (1982) ²	--	25%	10%	--	20%
Hrs/wk Science Instr-Age 13-1991 ⁴	2.86	--	3.34	2.91	3.90
Hrs/wk Science Hmwk-Age 13-1991 ⁴	.80	--	1.03	.62	1.13

¹ First International Science Study, Passow, Noah, Eckstein and Mallea, 1976, 262,268.

² Second International Science Study, Postlethwaite and Wiley, 1992, 14-33.

³ Second International Mathematics Study, Robitaille and Garden, 1989, pp. 36 & 79. ⁴ International Assessment of Educational Progress, 1992a & 1992b.

⁵ Lundberg and Linnakyla (1992, pp. 20-25, 57-59) analysis of the 1991 International Association for the Evaluation of Educational Achievement study of Reading.