
Looking Where the Answers Are

**Educational Innovation
through
Information Technology**

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Looking Where the Answers Are

This talk is about the educational system.

Everyone has gone to school, but....

Do we have a clear sense of the system as a whole?

How many students per teacher are there --

in American elementary schools?

in American secondary schools?

Are the American ratios lower than the --

French?

Japanese?

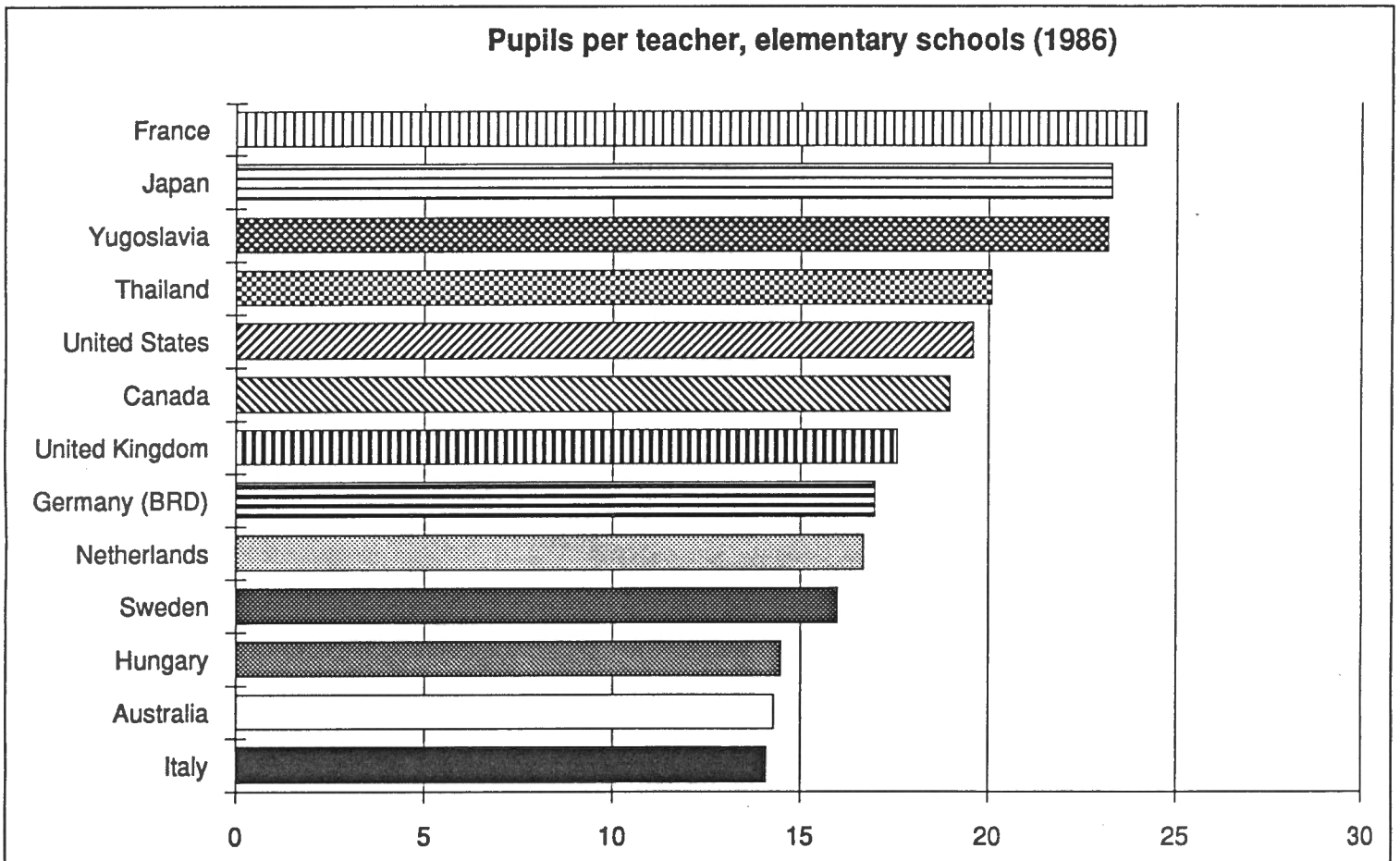
Swedish?

Italian?

Hungarian?

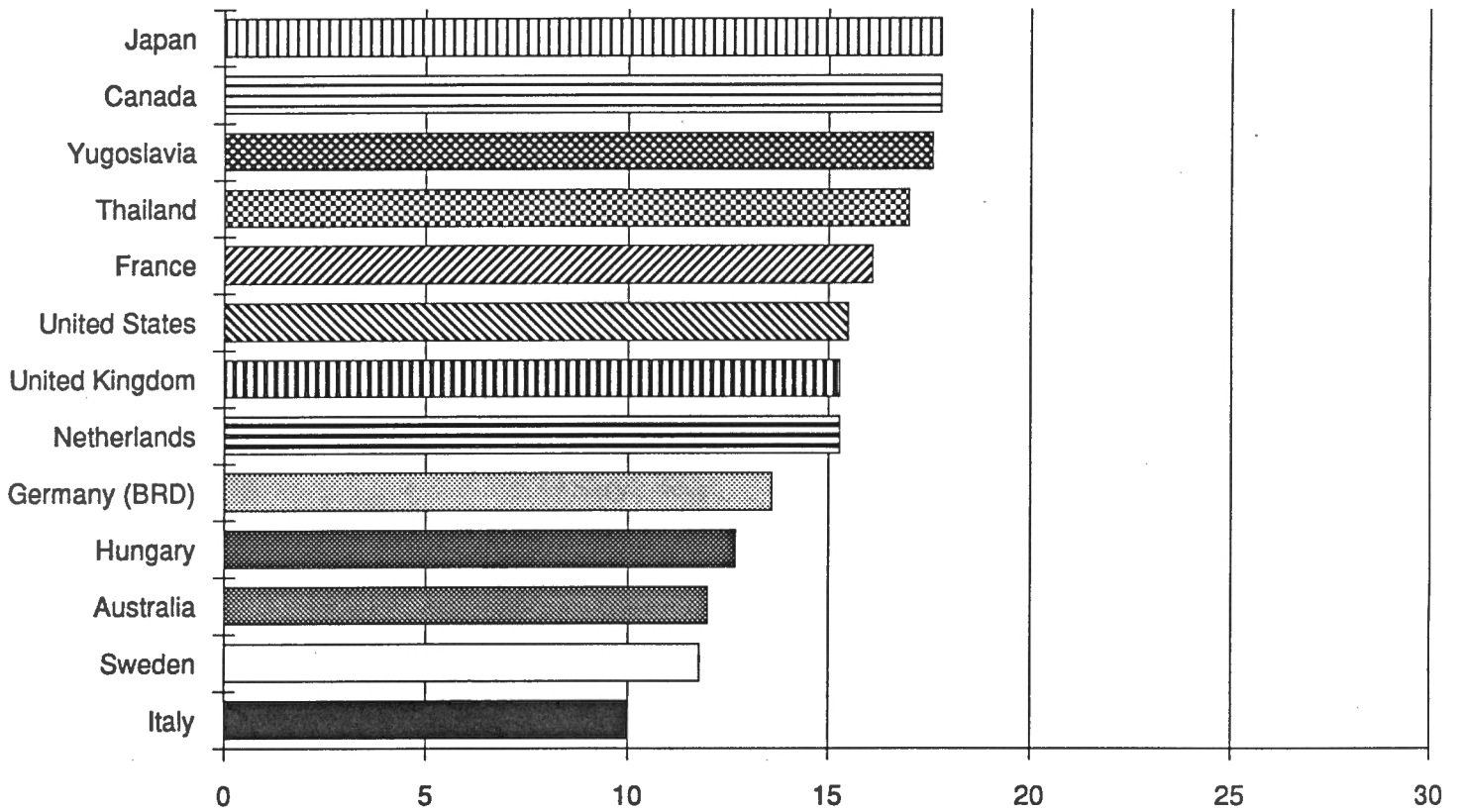
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Pupil-teacher ratios are generally lower than many expect.



Is the ratio a key to educational success?

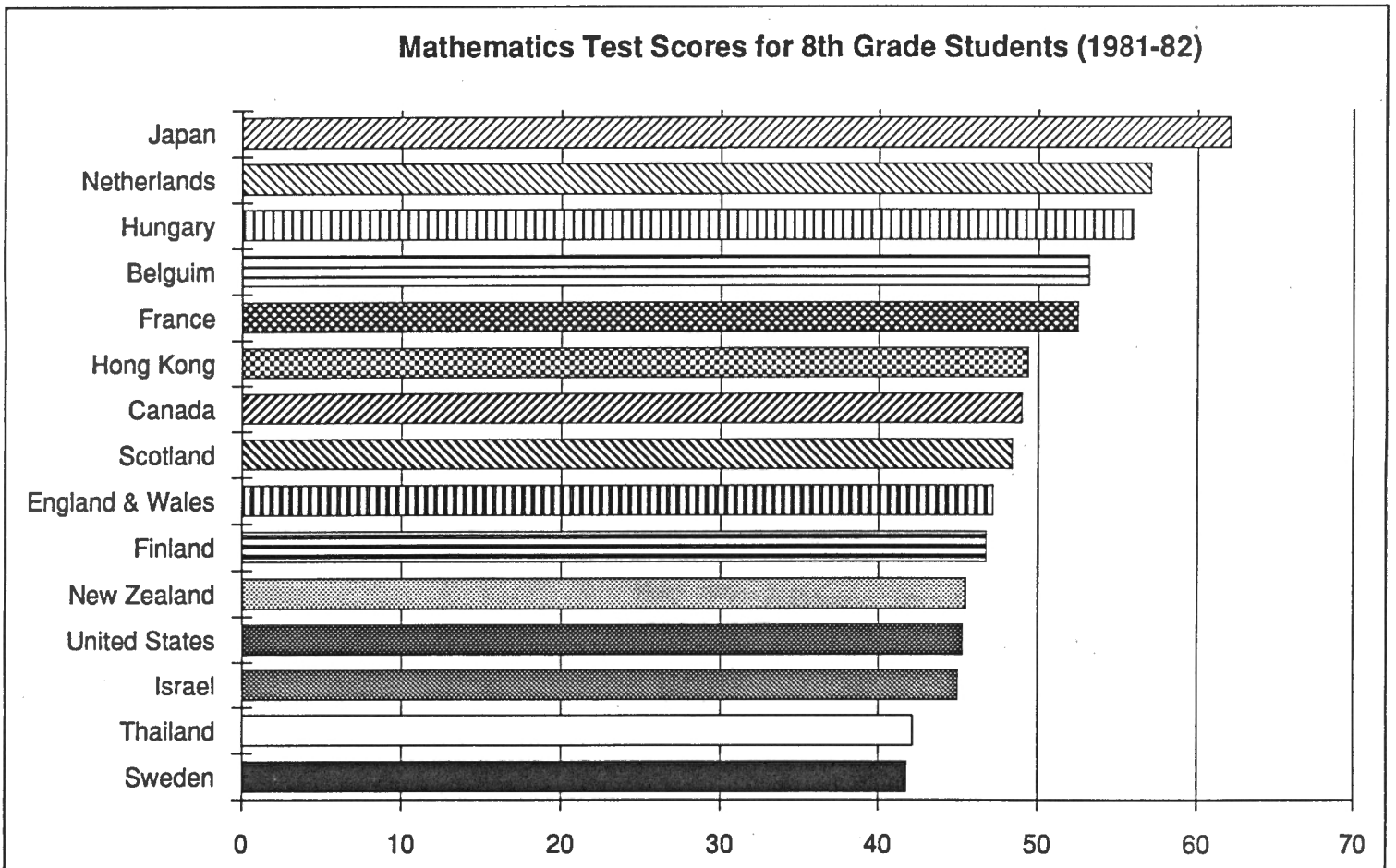
Pupils per teacher, secondary schools (1986)



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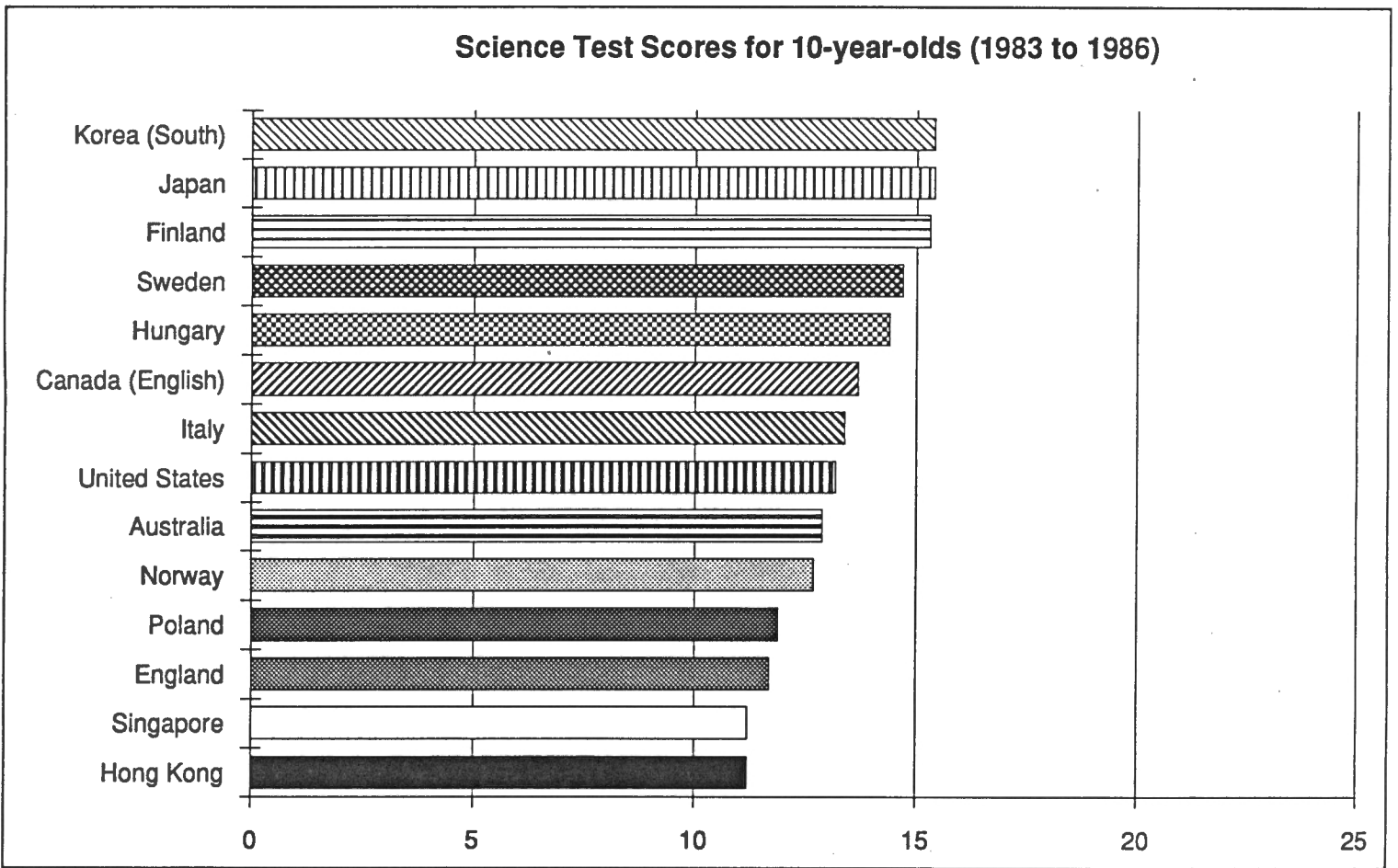
With respect to the system, significant differences become interesting similarities.

An example....



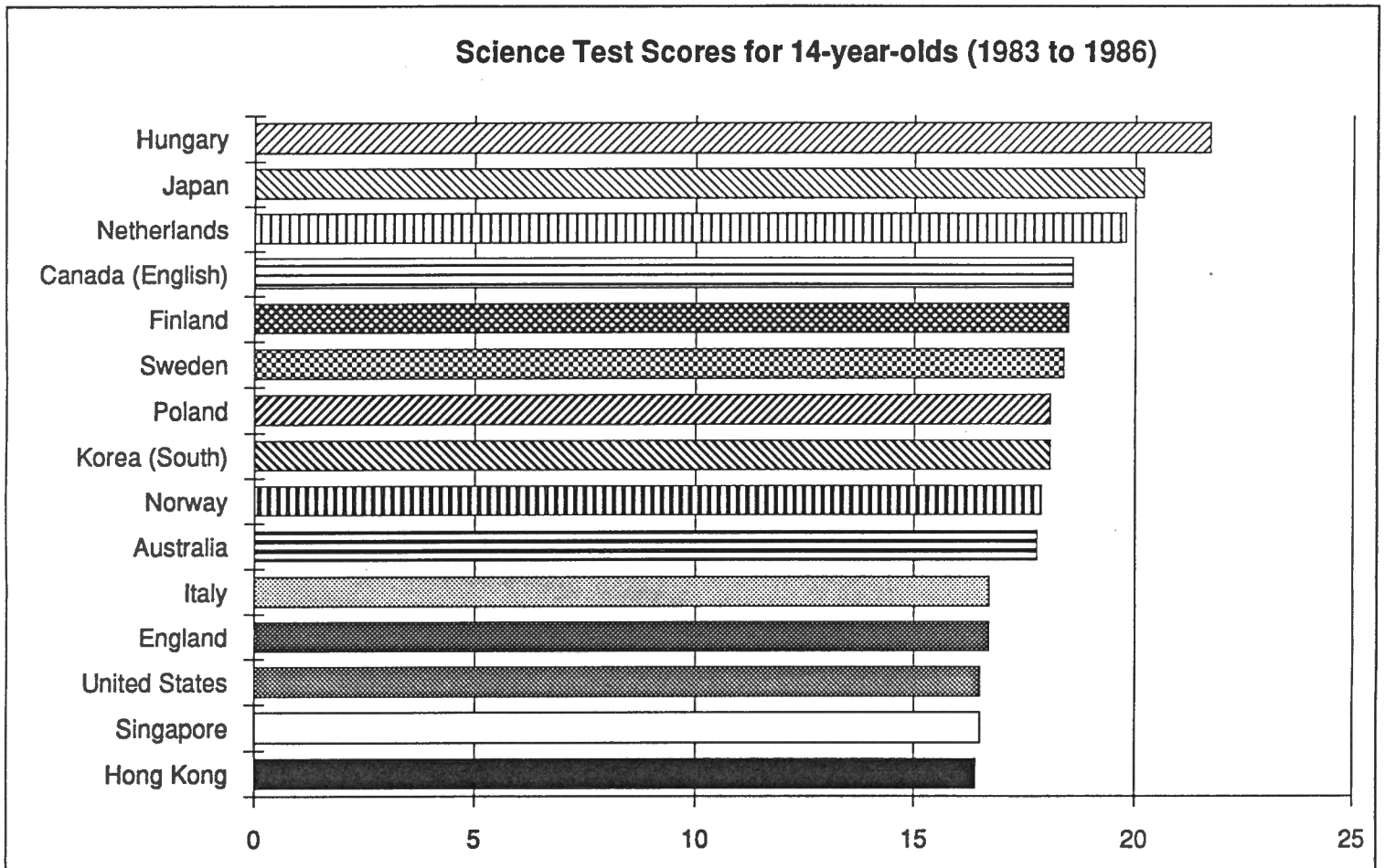
Another example....

Science Test Scores for 10-year-olds (1983 to 1986)



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With some interesting variations....



4 countries -- Japan, Australia, Singapore, and Hong Kong -- remain in the same relative place.

Hungary goes from 5th to 1st.

Canada from 6th to 3rd.

Korea from 1st to 7th.

the U.S. from 8th to 12th.

This talk is about the educational system.

**With respect to the educational system,
let us ask three questions:**

- ❶ Why are educational innovations hard to implement in the present system?
- ❷ What are the key structural features of the educational system?
- ❸ Can a different educational system develop, and if so how?

Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

Educational innovations are hard to implement because

- ① The educational system is huge and decentralized.
- ② It has a weak management structure.
- ③ It is labor intensive with relatively low turnover in its key job category, teaching.
- ④ It spends relatively little on material resources that might drive innovation through technological change.

Some illustrations....

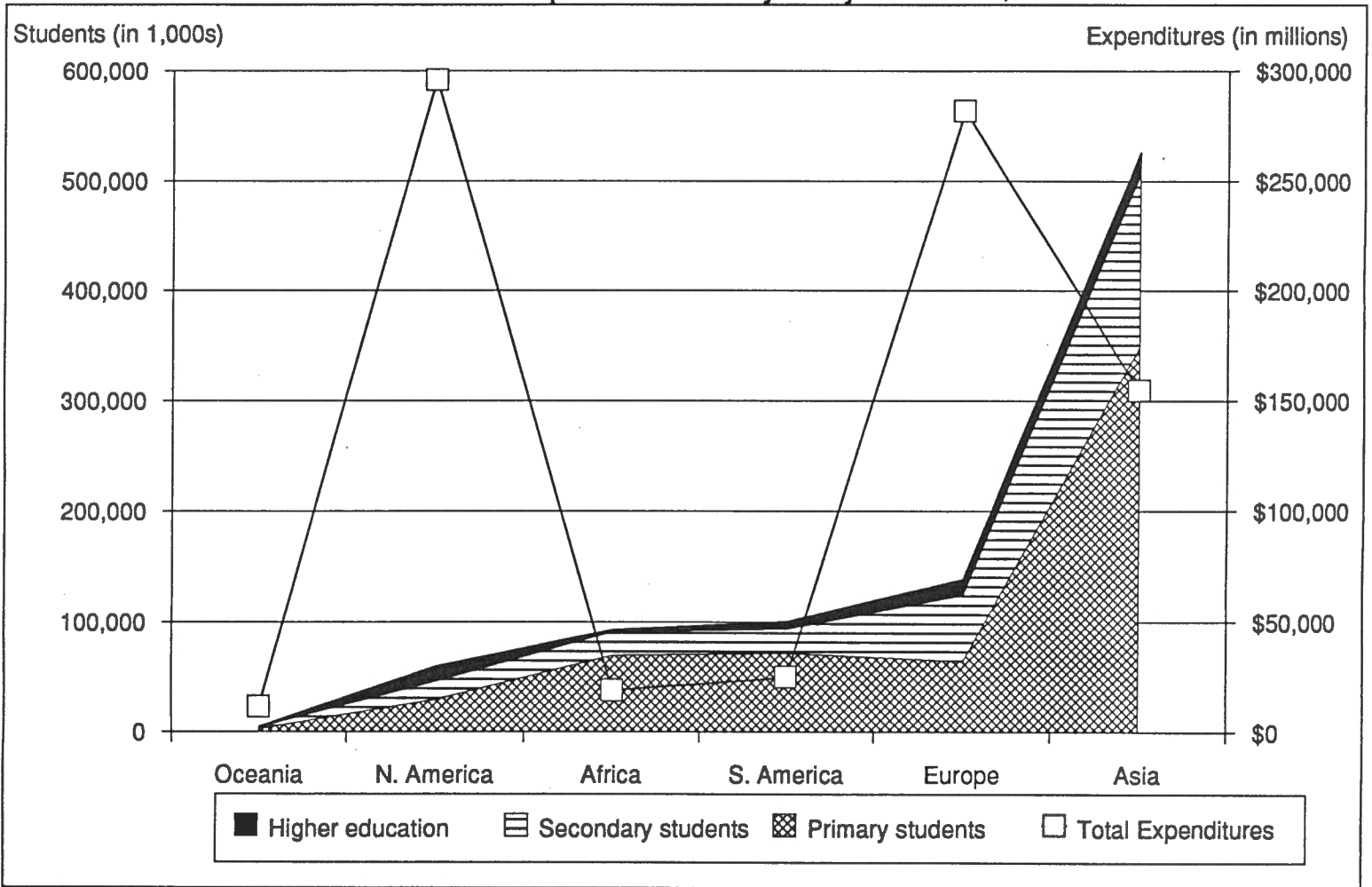
Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

Educational innovations are hard to implement because

- ① The educational system is huge and decentralized.

Enrollments and Expenditures by Major Areas, 1985-86



World Totals:

Primary	585,405,000
Secondary	278,502,000
Higher	57,996,000
Expenditures	\$786,414,000,000

Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

U.S. Totals, 1987

Public School Districts	15,684
Public Elementary Schools	61,490
Enrolling	24,415,000
Public Secondary Schools	22,937
Enrolling	15,709,000
Employing together	4,312,469
Spending together	\$160,900,000,000
Private Elementary Schools	20,252
Enrolling	4,118,000
Private Secondary Schools	7,387
Enrolling	1,229,000
Spending together	\$14,200,000,000
Public and Private Totaling	\$175,100,000,000
Public Higher Institutions	1,500
Enrolling	9,975,000
Spending	\$75,000,000,000
Private Higher Institutions	1,900
Enrolling	2,793,000
Spending	\$40,800,000,000
Higher Education Totaling	\$115,800,000,000
All U.S. Formal Education	\$290,900,000,000

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Why are educational innovations hard to implement in the present system?

Educational innovations are hard to implement because

- ② The educational system has a weak management structure.

Consider the following averages for 1987:

District officials, per school	0.89
Superintendent's salary	\$64,580
Assistant superintendent	\$53,656
Instructional services head	\$48,810
Subject area supervisor	\$38,763
School administrators, per school.....	1.58
Support staff, per school.....	2.24
Employees, per school administrator	29.69
Support staff, per school administrator	1.42
Service employees, per administrator.....	7.78
Other professionals, per school administrator .	0.89
Teacher aides, per school administrator	2.53
Teachers, per school administrator.....	17.07
Principal's salary, elementary	\$41,536
Assistant Principal, elementary.....	\$34,347
Principal's salary, secondary	\$47,896
Assistant Principal, secondary.....	\$39,758
Teacher's salary, average.....	\$26,731

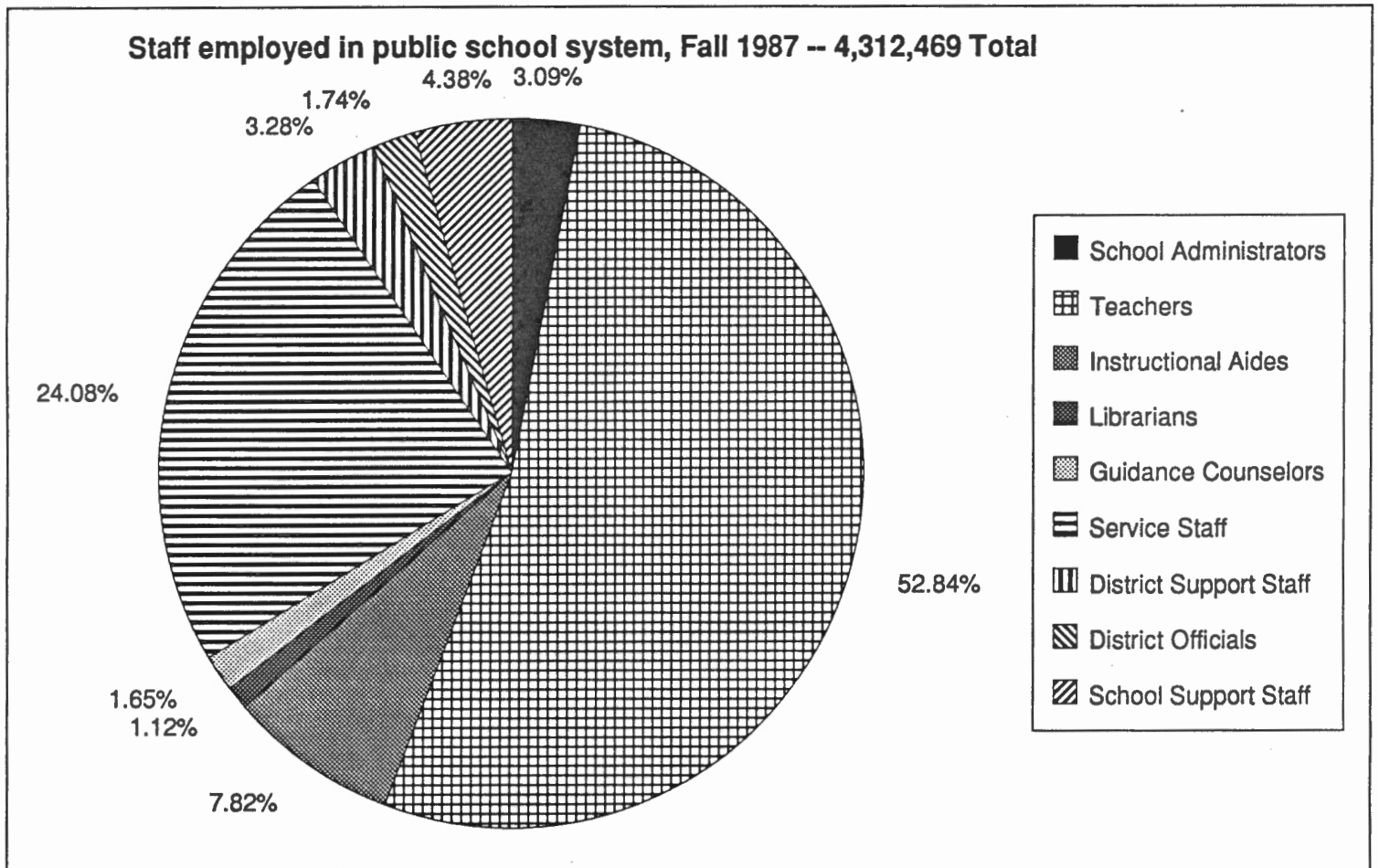
Of necessity, teachers manage what takes place in the classroom.

Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

Educational innovations are hard to implement because

- ③ The educational system is labor intensive with relatively low turnover in its key job category, teaching.

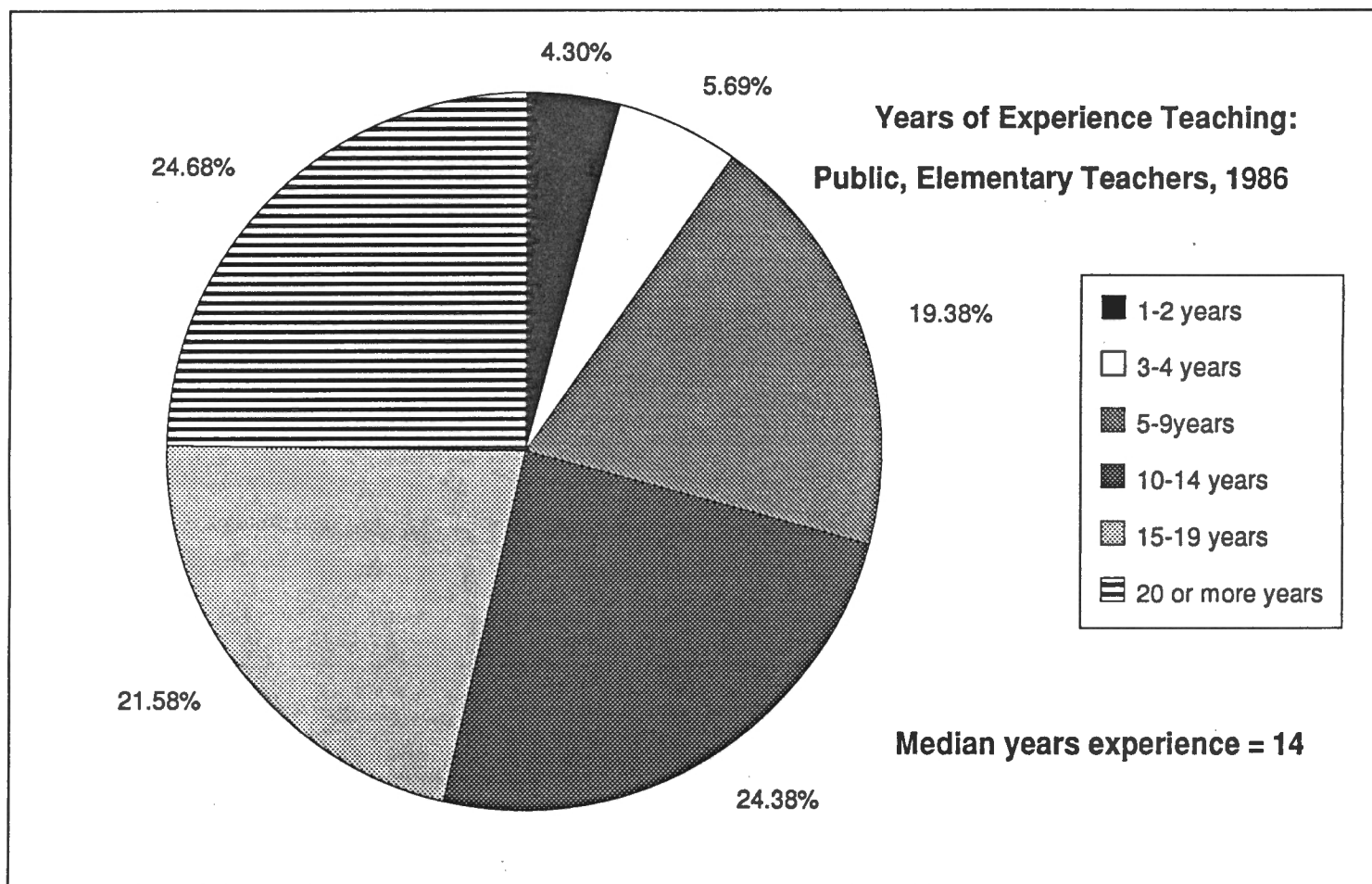


More than half the staff employed in public schools are teachers.

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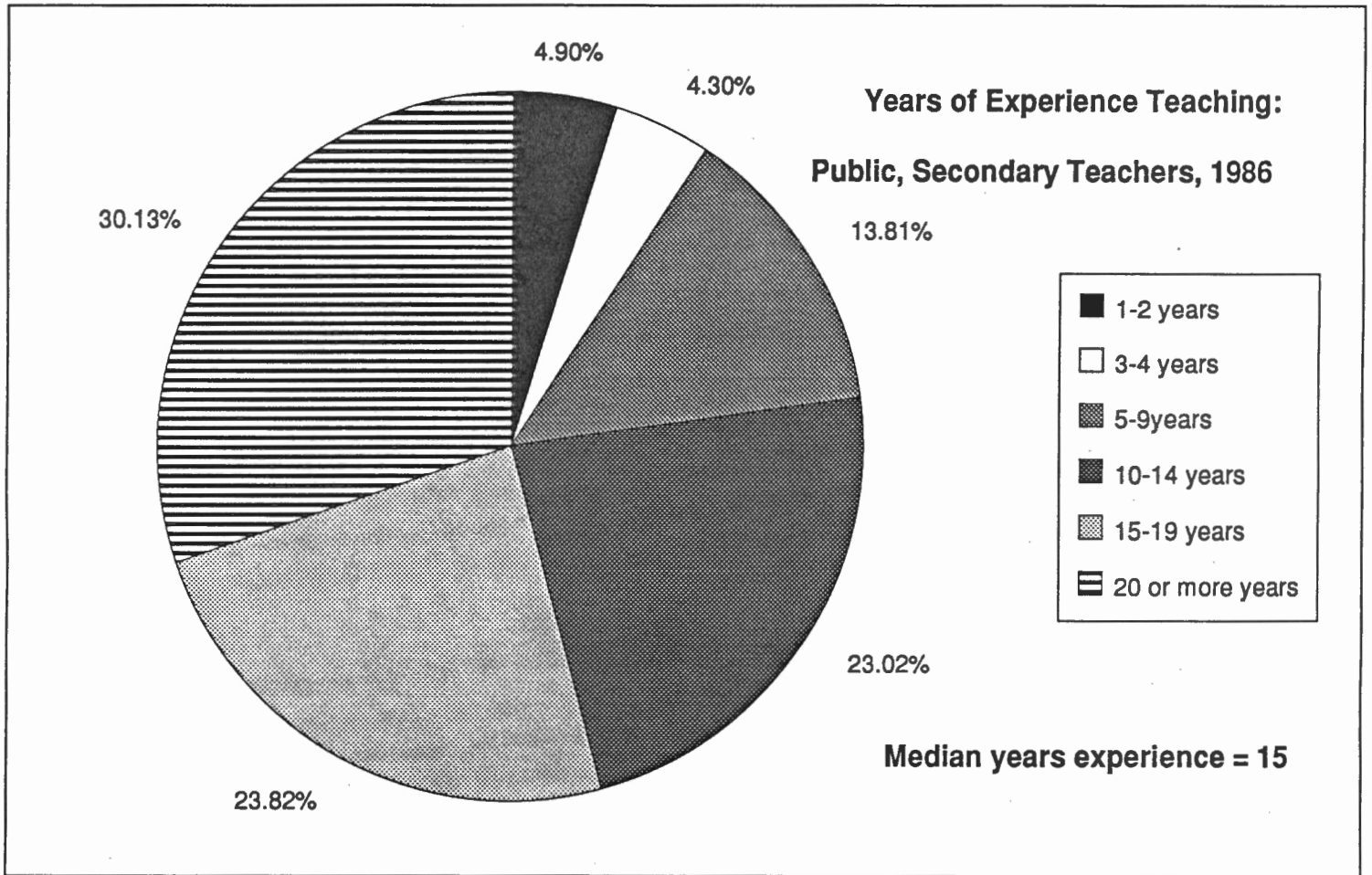
Elementary teachers have much experience.



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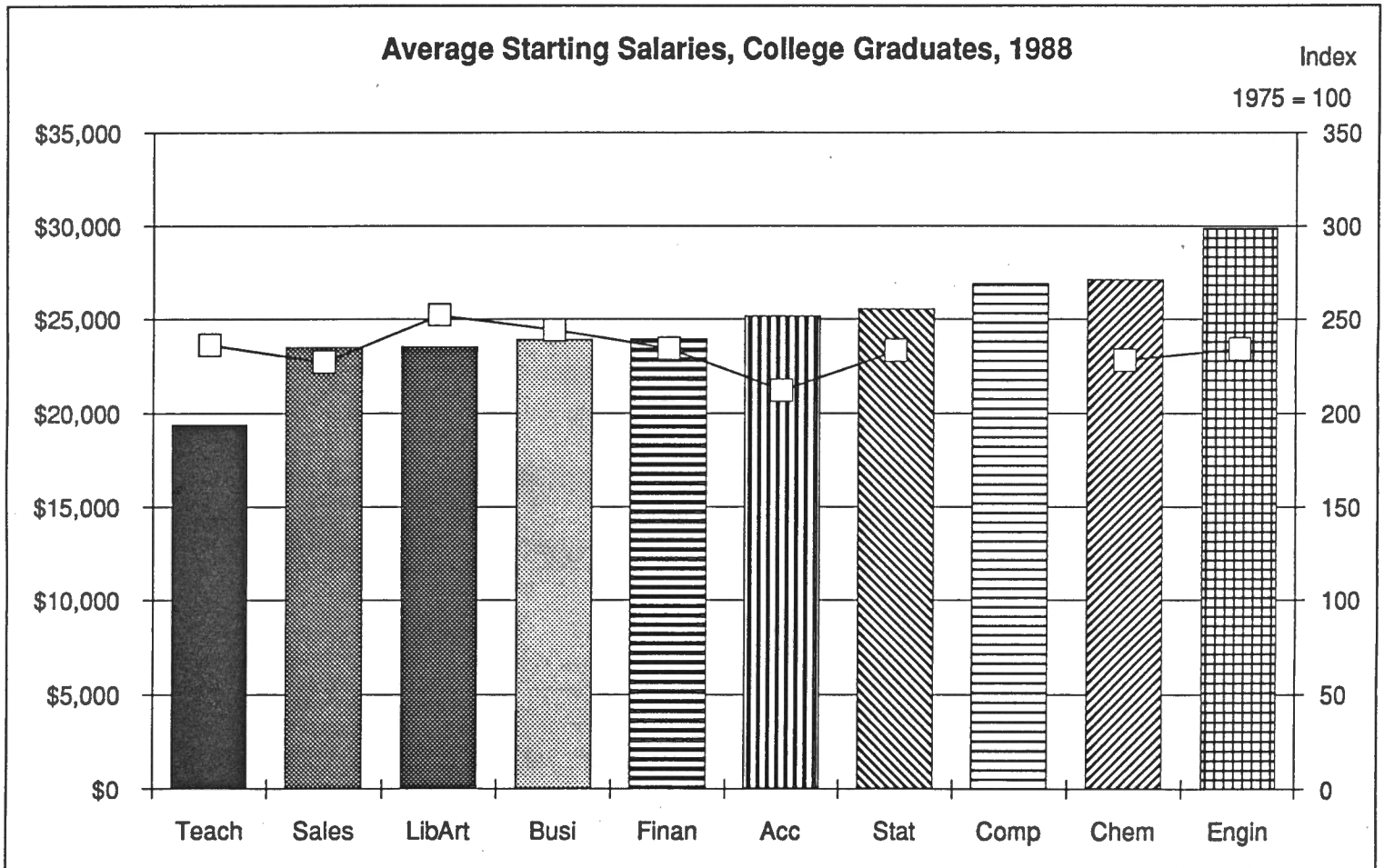
As do secondary school teachers.



Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

Transforming education by renewing the teaching corps will be costly.

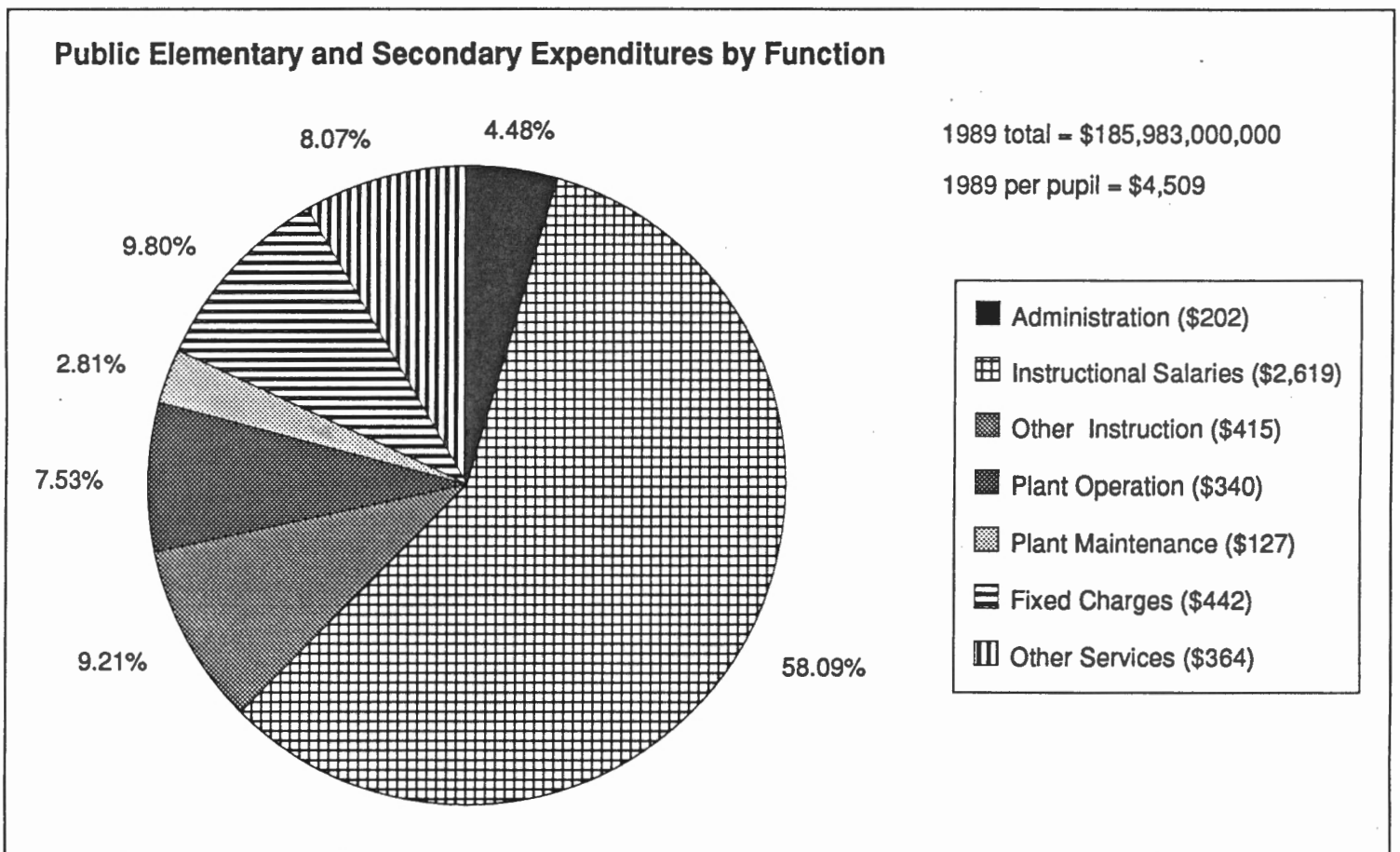


Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?

Educational innovations are hard to implement because

- ④ The educational system spends relatively little on material resources that might drive innovation through technological change.

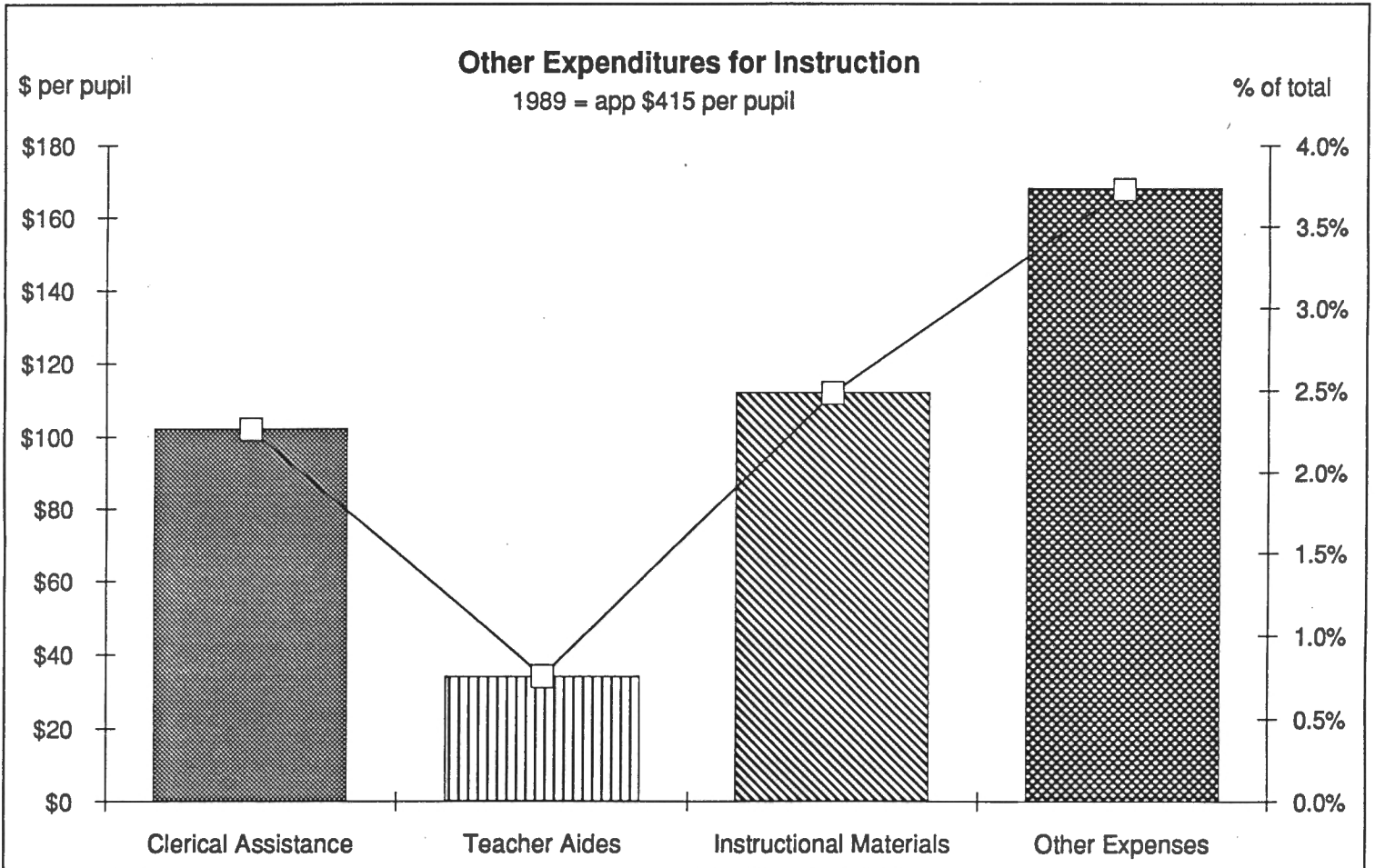


Instructional salaries are the main expenditure per pupil.

What does "Other Instruction" include?

Looking Where the Answers Are

Why are educational innovations hard to implement in the present system?



"Instructional Materials" comprise

Free Textbooks \$32

School Library Books \$21

Teaching Supplies \$60

"Instructional Materials" do not offer
much leverage for implementing innovations.

Looking Where the Answers Are

What are the key structural features of the educational system?

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The problem of seeing what is transparently second-nature, looking at, not through, the windowpane.

Some key characteristics:

A Literate Culture:

People find the knowledge of most worth in books and related materials.

Teaching from the Text:

Teachers and students have in common a set of specific texts.

Age Grouping:

Educators group students by age, and sometimes ability, and sequence studies accordingly.

Scope and Sequence:

Educators divide knowledge into subjects, each with a scope and sequence, according to which students can learn each subject, predictably and efficiently.

Competitive Motivation:

Educators track and compare what students learn and motivate students competitively by rewarding those who perform well.

Didactic Design:

Educators use a psychology of learning to design texts and train teachers on how to best ensure that students absorb the contents of these.

Looking Where the Answers Are

What are the key structural features of the educational system?

Most of the key structural characteristics of the educational system were invented in the sixteenth and seventeenth centuries.

Luther (1483-1546) -- the Literate Culture

Erasmus (1466-1536) -- Teaching through the Text.

Johann Sturm (1507-1589) -- Age Grouping.

Peter Ramus (1515-1572) -- Scope and Sequence.

Loyola (1491-1556) -- Competitive Motivation

Comenius (1592-1670) -- Didactic Design

Looking Where the Answers Are

What are the key structural features of the educational system?

More recent innovations:

Adapting the curriculum to a developmental theory of childhood.

Compulsory school laws and other legal mandates to be implemented through techniques of bureaucratic organization.

Use of public transportation to consolidate small schools into larger ones.

Standardized testing to create ability groupings and to track and compare the performance of national and international cohorts.

What general innovations within the existing system will permit widespread, substantive gains the quality of education?

Looking Where the Answers Are

Can a different educational system develop, and if so how?

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A Literate Culture → A Multimedia Culture

Do people find the knowledge of most worth primarily in printed sources, or in a multiplicity of media?

Teaching from the Text → Learning with the Smart Machine

Can teachers and students have in common computer-based multi-media, multi-cultural resources?

Age Grouping → Flexible Groupings

Can educators use the flexibility of digital information systems to permit students to group according to interest and opportunity?

Scope and Sequence → The Cumulative Curriculum

Can each student at any time access whatever he or she wishes in an extensive, high-grade sampling of our cultural resources?

Competitive Motivation → More Cooperative Learning

Can students gain appropriate reward for learning by cooperating, as well as competing, with their peers?

Didactic Design → Learning by Construction

Can educators provide students with tools that will empower them to construct a sound understanding through inquiry and study?

Looking Where the Answers Are

What are the key structural features of the educational system?

Data used in the preceding foils derives from diverse tables in the following publications.

Statistical Abstract of the United States, 1990, the National Data Book. 110th ed. LC 04-18089. (Illus.). 1017p. 05/1990. Incl. folder. Paper. \$28.00 perfect bdg. (ISBN 0-16-021846-2). United States Government Printing Office.

Snyder, Thomas D. *Digest of Education Statistics, 1989*. (Education Department Publication Ser.: No. 25). 496p. 12/1989. Paper. \$25.00 perfect bdg. (ISBN 0-16-006773-1). United States Government Printing Office.

Gerald, Debra E. *Projections of Education Statistics to the Year 2000*, No. 19. (Education Department Publications NCES: No. 89- 648). (Illus.). 226p. 12/1989. Paper. \$11.00 perfect bdg. (ISBN 0-16-006774-X). United States Government Printing Office.