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SOME STATISTICS OF U.S. SECONDARY SCHOOLS, 1964-1965.

BY- NSTA STAFF

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PRESENTED IS STATISTICAL INFORMATION ABOUT UNITED STATES SECONDARY SCHOOLS AND THE TEACHERS WHO COMPRISED THE SCIENCE AND MATHEMATICS FACULTIES OF THESE SCHOOLS DURING 1964-65. DATA INCLUDE ANALYSES OF PUBLIC AND PRIVATE SECONDARY SCHOOLS ACCORDING TO GRADES AND TOTAL SCHOOL ENROLLMENT. SCIENCE AND MATHEMATICS TEACHERS ARE ANALYZED ON THE BASES OF SEX, TEACHING LOAD, AND TYPE OF SCHOOLS IN WHICH THEY TAUGHT. THIS ARTICLE IS PUBLISHED IN "THE SCIENCE TEACHER," VOLUME 32, NUMBER 6, SEPTEMBER 1965. (AG)

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• **Robert Pariser.** "Mutation of Proteus Vulgaris by Enzymatic Action of Staphylococcus Aureus—A Study in Competitive Existence of Two Bacterial Species" is the title of Robert's award-winning study at Norfolk Academy, Norfolk, Virginia, where he is now a senior and also president of the science club and editor-in-chief of the school newspaper. He has won other awards in science fairs and in the Virginia Junior Academy of Science, which he represented at the American Junior Academy of Science meeting in Montreal in 1964. He was a first alternate in the NASA-NSTA Youth Science Congress at Langley, Virginia. He hopes to enter biology, probably research. *Regional Silver Plaque and $100 American Osteopathic Association Awards.*

• **Eric Robert Pearson.** Eric's awards were won while he was a senior at North Quincy High School in Quincy, Massachusetts. His topic was "An Investigation into the Tensile Strengths of Alpha-Aluminum Oxide Whiskers." Through his science projects on ferromagnetism and whiskers, he has received honorable mentions and awards in local and regional science fairs and in the NSTA-NASA New England-New York regional contest. He is entering Massachusetts Institute of Technology. *Regional Silver Plaque and $100 American Society for Metals Award.*

• **Joseph Egidio Pizzorno.** "Magnetic Forming" won this year's award for Joseph. He graduated from Don Bosco Technical Institute, South San Gabriel, California, and is now attending Harvey Mudd College in Claremont. Many of the honors he has received were the result of his science project. These included the grand prize from his school science fair, awards at local and state science fairs, Cyanamid, Varney, and at the Jets Cal Poly Science Fair, also Bank of America awards, and many others. Joseph is planning to study metallurgy and physics, do post graduate work, and then make a career in physics. *Regional Silver Plaque and $100 American Society for Metals Award.*

• **William Carl Purdon.** William spent the summer at the University of Tennessee Summer Science Institute and is now a junior at Terry Parker High School in Jacksonville, Florida, where he conducted his award-winning project. Last year, he won an honorable mention from the Ford-FSA awards program. The idea for his project came from an article in *Scientific American,* and he did much of his work at the library of Jacksonville University. He plans a career in chemistry or electrical engineering. *Regional Silver Plaque and $100 American Dental Society Award.*

• **Terry Readdick.** Terry's interest in amino acids in the pitcher plant, *Sarracenia minor* has led to several independent investigations. His award-winning paper reported "Chromatographic Analysis of Free Amino Acids in *Sarracenia minor* with Varying Substrates." Work was carried out in the special science facilities of Glynn Academy, Brunswick, Georgia, where Terry is a student. Last year he won an honorable mention in the Ford-FSA program, and in addition to its awards this year, he has received other science awards, appeared on TV, and will be working in science at the University of Georgia this summer. *Regional Silver Plaque and $100 American Cancer Society Award.*

• **Clark D. Reeds.** "Fuel Cells" was the paper Clark wrote at Beacon High School, Beacon, New York, and which won him his award. He is continuing his studies toward electrical engineering at Carnegie Institute of Technology. Clark has received "firsts" in high school, Dutchess County, and New York State science fairs from the eighth to the twelfth grades and in a science congress sponsored by the New York State Science Teachers Association. His school paid for the materials, and the equipment he built for the project is being given to the school for use of other students. He plans to study physics. *Regional Silver Plaque and $100 American Nuclear Society Award.*

• **John Paul Saxon.** John graduated this year from Zundelowitz Junior High School, Wichita Falls, Texas—a school with 10 Ford-FSA honors this year. He conducted his investigation on "Effects of Air on Corrosion of Steel by Salt Water." He has several science fair awards as well as athletic honors to his credit. He is now a freshman at Wichita Falls High School. *$25 Regional Savings Bond and $100 American Society for Metals Award.*

• **John Eric Sirny.** John was a ninth-grade student at Fairview Junior High School in St. Paul, Minnesota, when he wrote his award-winning paper on "Studies of Proteins and Amino Acids and Their Separation by Thin-Layer Chromatography and Paper Electrophoresis." He won awards in the Ford-FSA program in the two previous years as well, and participated in the 1963 NSTA-NASA Youth Science Congress at Lakewood, Ohio. He has also won awards in the Minnesota state essay and science fair contests, sponsored by the Minnesota Academy of Science. *Regional Silver Plaque and $100 American Dental Society Award.*

• **Dennis Stasel.** As a ninth-grade student at Skinner Junior High School, Denver, Colorado, Dennis chose for his project a "Home Made X-Ray Machine with a Van De Graff Generator as Source of Power." It won two science fair awards as well as the Ford-FSA recognition. Earlier awards were won with a scale model of a nuclear reactor (seventh grade) and experiments with light and lenses (eighth grade). He looks forward to a future in science research. *Regional Silver Plaque and $100 American Society for Metals Award.*

• **William Weckstein.** As a student at Rutgers Preparatory School, Somerset, New Jersey, William has won Ford-FSA awards before, having won two honorable mentions and two regional awards in the past. This year's paper, "X-Radiation and Ultrasound: Biophysical and Biochemical Studies" brought him another award. He was a semi-finalist in the Westinghouse Science Talent Search this year. After taking a course in physics at Rutgers during the summer, he is now majoring there in biology. He plans to go on to medical school and pursue a career in medical research. *Regional Silver Plaque and $100 American Dental Association Award.*

• **Jan Wisseman.** As a senior at Delaney Senior High School in Cockeysville, Maryland, Jan carried out her project on "Observations on the Intracellular Digestion of Non-pathogenic Yeast by Human Leukocytes in Skin Window Preparations." She has received prizes in school and Baltimore regional science fairs and a previous regional award from Ford-FSA. She is enrolling at the University of Pennsylvania in the General Honors program, and is considering the field of Asian Studies, with a career in international relations in mind. *Regional Silver Plaque and $100 American Osteopathic Association Award.*

• **Alan Witherby.** Alan drew ideas for his project on "Numerical Controlled Lathe" from his curiosity on the concept of numerical control. He built the lathe and wrote the report while he was a student at Don Bosco Technical Institute, San Gabriel, California. He is now entering California Polytechnic College to major in electronic engineering. Previous engineering awards have been from a local science fair, Bank of America, and the Junior Engineering Technical Society. He was also invited to display his project at the WESCON exhibition in San Francisco last month. *Regional Silver Plaque and $100 American Society for Metals Award.*

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Some Statistics of U.S. Secondary Schools, 1964-65

An NSTA Staff Report

THERE is frequent need for up-to-date information about U.S. secondary schools and the teachers who comprise their science and mathematics facuities. How many secondary schools are there? How many of these are public schools; how many non-public? How are they distributed by student enrollment? How many "junior high schools" are there, and how are they distributed by the school grades included in their organizational patterns? How many teachers of science and mathematics are there? How many of these are male, female? How many have their major teaching responsibility (50 percent or more) in science? How many teach biology? Chemistry? Other sciences?

These questions and literally dozens or hundreds of others are frequently asked both in terms of "the national picture" and in terms of a breakdown by states. Unfortunately, in the past such data have not been available to a degree even approaching a complete picture; or, such data as have been compiled have tended to lag from two or three to perhaps five years behind the current situation.

We can now answer many of these questions, because much up-to-date statistical information of the kinds called for above for the school year 1964-65 are now available. For several years the National Science Teachers Association has compiled a U. S. Registry of Junior and Senior High School Science and Mathematics Teaching Personnel. This project has been supported by the National Science Foundation and has enjoyed the full cooperation of the National Council of Teachers of Mathematics and the National Association of Secondary-School Principals (plus occasional other organizations and agencies). One of the subdivisions of this project has been the development of an Institutional Registry of U. S. Secondary Schools, and it was through the use of this list during 1964-65 that the data given later in this report were collected. NSTA is pleased to have had the opportunity to undertake the study and to be able to publish, promptly, with NSF approval, certain of the findings. We do this as a service not only to members of NSTA and readers of *TST* but to the profession at large. Reprints of this report are available and may be obtained in reasonable numbers upon request. It is expected that NSF will publish a more detailed report of the study later, but meanwhile NSTA will attempt to answer requests for state breakdowns or inquiries for more details.—R.H.C.

The NSTA Institutional Registry of U. S. Secondary Schools lists approximately 31,000 schools that include two or more of grades 7 through 12. Survey returns with usable data were received from 21,562 public schools and 3,485 private or non-public schools, a total response of 25,047 replies or 81 percent of the total. If these totals are projected to approximately 100 percent, it appears that in the United States there are about 27,000 public and about 4,400 private or non-public secondary schools. In several of the tables that follow, round-number projections to an approximate 100 per cent base are given, although the level of confidence to be attached to the projections must be left to the reader.

1. *How are U. S. secondary schools distributed according to the school grades included in their organizational pattern?* (See Table 1; projections to 100 percent obtained by multiplying by 5/4.)

The figures in Table 1 emphasize the variety of plans of secondary school organization in the United States as concerns secondary schools as institutions.

(a) It appears that "the separate junior high school" (including two or more of grades 7-9) is still a minority plan of school organization for U. S. secondary schools. Such schools, which internally are about 2½ to 1 of grades 7-9 over grades 7-8, account for only

TABLE 1. Distribution of secondary schools in the United States according to grades included (projections to nearest 50)

Grades Included	Public Schools			Non-public Schools			Totals		
	Number	Percent	Projection to 100 Percent	Number	Percent	Projection to 100 Percent	Number	Percent	Projection to 100 Percent
7–8	1,541	7.2	1,900	76	2.2	100	1,617	6.5	2,000
7–9	3,679	16.5	4,600	109	3.1	100	3,788	15.1	4,700
7–12	6,102	28.2	7,600	561	16.1	700	6,663	26.8	8,300
8–12	799	3.7	1,000	127	3.7	150	926	3.7	1,150
9–12	4,441	20.3	5,550	1,915	50.5	2,400	6,356	25.4	7,950
10-12	1,880	8.7	2,350	30	0.9	50	1,910	7.6	2,400
1–12	2,324	10.7	2,900	372	10.7	500	2,696	10.8	3,400
Others	796	3.7	1,000	295	8.5	400	1,091	4.0	1,400
Totals	21,562	100.0	26,900	3,485	100.0	4,400	25,047	100.0	31,300

TABLE 2. Distribution of secondary schools in the United States according to total pupil enrollment (projections to nearest 50)

Pupil Enrollment	Public Schools			Non-public Schools			Total		
	Number	Percent	Projection to 100 Percent	Number	Percent	Projection to 100 Percent	Number	Percent	Projection to 100 Percent
Under 100	1,159	5.4	1,450	454	13.0	600	1,613	6.4	2,050
100–199	2,394	11.1	3,000	723	20.3	900	3,117	12.4	3,900
200–299	2,420	11.1	3,000	592	17.0	750	3,012	11.9	3,750
300–499	4,078	18.9	5,100	769	22.0	950	4,847	19.3	6,050
500–999	6,622	30.3	8,300	700	20.0	900	7,322	29.2	9,200
1000–1499	2,703	12.5	3,400	182	5.2	250	2,885	11.4	3,650
1500–1999	1,191	5.5	1,500	40	1.1	50	1,231	4.8	1,550
2000–2499	567	2.6	700	11	0.3	.....	578	2.3	700
2500–up	428	1.9	550	14	0.4	.....	442	1.8	550
Totals	21,562	100.0	27,000	3,485	100.0	4,400	25,047	100.0	31,400

about 6,700 institutions out of a total of more than 31,000. We should not hastily conclude, however, that the same percentage (21.6) of the pupils in grades 7-9 are enrolled in such schools.

(b) The dominant pattern of organization of U. S. secondary schools combines one or more of the junior high school grades (7-9) with all three grades (10-12) of senior high school. Schools that include grades 8-12 are relatively few (1,150 out of 31,300), but those organized on a 7-12 basis and on a 9-12 basis (in almost equal numbers) add up to approximately 16,250 or nearly 50 percent of all U. S. secondary schools.

(c) The "pure" senior high school (10-12), like the true junior high school, is a minority group institution. The number of such schools in all of the United States is apparently less than 10 percent of all secondary schools (about 2,400 out of 31,300). The distribution of these schools by states, and internally within the states, should make an interesting study.

(d) It may come as a surprise that the United States appears to have about 3,400 schools that enroll pupils from grade 1 all the way through grade 12. There are more of this type institution than of 10-12 senior high schools. First thoughts as to why there are so many such schools and where they might be found lead to a variety of suggestions. Looking into the statistics a bit further reveals that 982, or about one-third of the 2,696 schools of this type that reported, enroll fewer than 300 pupils, while 1,422 (somewhat more than half) of the schools reported enrollments between 300 and 999, thus leaving only one-sixth (about 450) of the 1-12 schools with enrollments of 1,000 or more pupils. A sampling of state breakdowns of such schools shows that Maine reported 10, Florida 81, Nebraska 74, Kentucky 54, California 32 (only 8 of which are public schools), and New York 167 (of which 94 are public schools with enrollments of 300 to 1,499).

2. *How are U. S. secondary schools distributed according to total pupil enrollment?* (See Table 2; projections to 100 percent obtained by multiplying by 5/4.)

The data in Table 2 reveal the numbers and wide range of U. S. secondary schools—based on pupil enrollment—from about 2,000 that enroll fewer than 100 pupils to only a few more than half that number (1,250) that enroll as many as 2,000 or more pupils. Other observations that seem justified are as follows:

(a) The United States still has nearly 10,000 secondary schools that enroll fewer than 300 pupils (thus providing graduating classes in the range of perhaps 40-60 seniors).

(b) Predominant among U. S. secondary schools are those in the range of 300 to 1,000 pupils, such schools accounting for approximately 48.5 percent (about 15,250) of the total.

(c) Turning to the "larger" schools, we find that approximately 2,800 U. S.

TABLE 3. Division of teachers of science and mathematics in U. S. secondary schools according to their teaching responsibilities (projections to nearest 1,000)

Teaching Responsibility	Reported Number of Teachers	Projection to 100 Percent
Teaching one or more classes in science or mathematics	183,508	230,000
Teaching one or more classes in science	102,564	128,000
Teaching one or more classes in mathematics	119,768	150,000
Teaching some science and some mathematics	39,846	50,000
Teaching some science but no mathematics	63,229	79,000
Teaching some mathematics but no science	80,433	100,000
Teaching 50 percent or more of time in science	69,331	87,000
Teaching 50 percent or more of time in mathematics	74,573	93,000
Teaching one or more classes in:		
General science	47,061	59,000
Biology	33,088	41,000
Chemistry	21,988	28,000
Physics	16,882	21,000
Earth science	9,200	11,000
"Other science"	12,325	15,000
Math, grades 7-8	48,456	61,000
Math, grades 9-12	80,137	100,000

secondary schools enroll 1,500 pupils or more.

3. *How are teachers of science and mathematics in U. S. secondary schools divided according to their teaching responsibilities?*

The data in Table 3 may be interpreted to bring out the following characteristics about teaching assignments in science and mathematics in U. S. secondary schools:

(a) Of 183,508 individuals in the U. S. Registry of Junior and Senior High School Teaching Personnel in Science and Mathematics:

- 102,564 teachers had assignments of one or more classes in some science.
- 119,768 teachers had assignments of one or more classes in mathematics.
- 39,846 of these teachers had assignments of one or more classes in both mathematics and science. These teachers represent 39.0 percent of all science teachers and 33.4 percent of all mathematics teachers.
- 69,331 teachers devoted 50 percent or more of their teaching time to science, or about 68.0 percent of the total who taught one or more classes in science.
- 74,573 teachers devoted 50 percent or more of their teaching time to mathematics, or about 62.0 percent of the total number teaching in this field.
- The reported numbers of teachers with one or more class assignments in the "standard curriculum" in science were 47,061 in general science (overwhelmingly in the junior high school grades), 33,088 in biology, 21,988 in chemistry, and 16,882 in physics. Internal examination of these Registry figures and the elimination of duplication of names of teachers with assignments in more than one field reveals that *all classes* in biology, chemistry, and physics are handled by only 56,223 different teachers (not by the sum of the preceding separate counts).
- The number of teachers in the emerging field of earth science was 9,200, and 12,325 were reported as teaching classes in science with course titles other than the five already enumerated.

(b) By projecting the Registry data to a 100 percent base, it appears that in the United States there are approximately 230,000 teachers with teaching assignments that include one or more classes in science or mathematics in secondary schools and that of these teachers:

- About 128,000 teach in some area of science, and about 150,000 teach in the field of mathematics.
- Approximately 50,000 teachers have assignments including both science and mathematics.
- There are approximately 87,000 "full-fledged" science teachers (50 percent or more of their time in science) and about 93,000 such teachers in mathematics.

4. *How are U. S. secondary school science and mathematics teachers distributed by sex?*

The statistics in Table 4 indicate that, in practice, teaching both in science and in mathematics at the level of secondary schools is "men's work" by ratios of nearly 3 to 1 in science and by more than 5 to 3 in mathematics. Examination of breakdowns of other data by sex (a) in schools with grades 7-8 and 7-9, and (b) in schools with under 500 total enrollment reveals that

- Of 13,951 individuals teaching science in the junior high schools, 9,693 (or 69.5 percent) are men and 4,258 (about 30.4 percent) are women—

TABLE 4. Teachers of science and mathematics in U. S. secondary schools distributed by sex (Registry figures only; no projections)

Category (All Schools)	Male Number	Female Number	Total Teachers	Percent Male	Percent Female
Total in Science	46,465	16,979	63,444	73.4	26.7
Total in Science-Math	28,675	11,411	40,086	71.6	28.5
Total in Math	50,300	30,785	81,085	62.3	37.8

TABLE 5. Distribution of U.S. secondary school science and mathematics teachers according to types of schools in which they teach and total enrollments of these schools (Registry figures only; no projections)

Schools by Grades	Total Science, No Math	Percent of Total (63,447)	Total Math, No Science	Percent of Total (81,088)	Total Science and Math	Percent of Total (40,085)
7–8	2,504	3.9	3,662	4.5	2,200	5.5
7–9	11,447	18.0	19,641	24.2	6,881	8.5
7–12	14,954	23.4	17,793	21.9	10,903	27.3
8–12	2,543	3.9	3,034	3.7	1,511	3.8
9–12	17,578	27.6	20,715	25.6	10,028	25.0
10–12	9,127	14.3	9,782	12.0	3,165	7.9
1–12	3,630	5.7	4,222	5.2	4,041	10.1
Other	1,664	2.6	2,239	2.7	1,356	3.4
Total Enrollments						
1–99	1,141	1.8	1,178	1.4	1,729	4.3
100–199	3,085	4.7	3,388	4.2	3,464	8.6
200–299	3,666	5.8	4,311	5.3	3,900	9.7
300–499	7,606	11.9	9,477	11.7	6,912	17.2
500–999	19,102	30.0	25,731	31.8	12,824	32.0
1000–1499	12,364	19.5	16,918	20.8	5,931	14.8
1500–1999	7,536	11.8	9,637	11.8	2,670	6.7
2000–2499	4,380	6.9	5,429	6.7	1,449	3.6
2500–up	4,567	7.2	5,019	6.2	1,206	3.0

a ratio of somewhat less than 5 to 2.

- Of 23,303 teachers of junior high school mathematics, 13,635 (or 58.5 percent) are men and 9,668 (or 41.3 percent) are women—a ratio of about 3 to 2.
- Of 15,495 science teachers in small schools, 11,278 (or 73.0 percent) are men and 4,217 (or 27.0 percent) are women—again a ratio approaching 3 to 1.
- Of 18,351 junior high school mathemathics teachers in small schools, 11,455 (or 62.5 percent) are men and 6,896 (or 37.4 percent) are women—a ratio of somewhat less than 2 to 1.

5. *How are U. S. secondary school science and mathematics teachers distributed according to types of schools in which they teach and by total enrollments of these schools?* (See Table 5; Registry figures only, no projections; also refer to Tables 1 and 2 for number of schools in each category.)

From Table 2 it is seen that secondary school science and mathematics teachers listed in the 1964-65 Registry were distributed among different types and sizes of schools in essentially the same pattern of percentages; e.g., 27.6 percent of the science-no mathematics teachers and 25.6 percent of the mathematics-no science teachers were found in schools with grades 9-12, while schools with enrollments of 500-999 accounted for 30.0 percent of all such science teachers and 31.8 percent of the comparable mathematics group. Further study of the data in Table 5 shows that in 1964-65:

- 45,335 teachers in junior high schools (grades 7-8 and 7-9) taught some science and some mathematics and that 9,081 (about 20 percent) were primarily combination science-math.
- At the other end of the scale, schools organized 9-12 and 10-12 accounted for 70,395 science and mathematics of which 13,193 (about 18.7 percent) were combination teachers.
- The smaller schools of under 300 enrollment included 25,862 teachers of science and mathematics, thus accounting for 13.8 percent of all such teachers (184,620) but 31.0 percent of all secondary schools (from Table 2).
- The larger schools with enrollments of 1,000 or more pupils had 77,106 teachers in the fields of science and mathematics, which means that about 41.6 percent of the total of all such teachers were located in only about 20.3 percent of the schools (from Table 2).

Queries and Comments

The data presented here are interesting and revealing. At the same time, however, they are admittedly incomplete in that they cover only a portion of the spectrum of science teaching data and science teachers. Many thought-provoking questions and queries related to other parts of this spectrum will surely come to mind; for example, the following:

How do the teaching conditions and work loads of science teachers compare in the smaller high schools versus the larger high schools? in junior versus senior high schools?

What is the comparative situation in regard to teacher turnover in different schools and in different organizational patterns for schools and teaching assignments?

How are teachers distributed among school types in regard to years of teaching; for example, is there a concentration of first-year teachers in particular types or sizes of schools?

How do curriculum and individual course offerings compare in schools of different sizes?

Do the total curriculum and sequence of courses year by year demonstrate more K-12 planning in schools organized in a 7-12 sequence or in school systems with definite breaks between junior and senior high school levels?

Another question might concern how opportunities and participation in youth activities—such as clubs, fairs, congresses, and awards programs—compare in small and large schools, in the 7-12 school, and in junior and senior high schools.

Another might concern professional activities and association membership among teachers in different size schools or among teachers carrying different assignments either in subject matter or in work load.—R.H.C.