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AUTHOR Bobbitt, Sharon A.; McMillen, Marilyn M.
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ABSTRACT

This report presents a statistical analysis of the frequency of teacher misassignment, with some emphasis on science, bilingual, and computer science teachers. The data were collected on the Public School Teachers Questionnaire, one of seven questionnaires in the Schools and Staffing Survey (SASS), developed by the National Center for Education Statistics and conducted by the U.S. Bureau of the Census. Four categories of qualification were derived from the data provided by the teachers. The first category of qualification indicated that the teacher had majored in the subject at the bachelor's degree level or higher and that the teacher was certified to teach the subject. The second category indicated that the teacher had majored in the subject but was not certified to teach the subject. The third category indicated that the teacher had not majored in the subject but was certified to teach the subject. And the fourth category indicated that the teacher had neither majored in the subject nor was certified to teach it. Resulting data from the survey are displayed on seven tables, a narrative analysis of the results is presented, and several questions for further research are suggested. (JD)

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Teacher Training, Certification, and Assignment[1]

A Presentation to the
American Educational Research Association
April 17, 1990

Sharon A. Bobbitt, Ph.D.
Marilyn Miles McMillen, Ph.D.
National Center for Education Statistics
U.S. Department of Education

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Introduction

Interest in the quality of the teacher workforce has increased in this era of education reform. The frequency of teacher misassignment reflects both the incidence of teacher shortages in certain subjects and the quality of education received by the students taking those subjects. Reports such as The Underachieving Curriculum--Assessing U.S. School Mathematics from an International Perspective[2] document the poor international standing of American children in technological fields such as mathematics and science. The Governors of the fifty States and President Bush recognized the importance of teacher preparation and quality in the development of their National Goals for

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[1]The results presented in this paper are from the new NCES Schools and Staffing Survey. Although they have undergone initial review, they should be viewed as preliminary since additional processing to impute for missing values, etc. is yet to be done. We believe that the general patterns that we are seeing will continue to hold when the data are finalized but individual numbers may change.

[2]The second international mathematics study was conducted by the International Association for the Evaluation of Education Achievement. The report was authored by McKnight, Crosswhite, Dossey, Kifer, Swafford, Travers, and Cooney, and was released in January of 1987.

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Education. One objective of the fourth goal on mathematics and science calls for "the number of teachers with a substantive background in mathematics and science (to) increase by 50 percent" by the year 2000. The Schools and Staffing Survey, conducted by the National Center for Education Statistics in school year 1987-88, provides an opportunity to look at the relationships among the educational background, certification status, and work assignments of our Nation's teachers. The analysis reported in this paper was performed on about 33,000 full-time regular public school teachers whose primary assignment field was one of the following: prekindergarten (PK), kindergarten, general elementary, art, English/language arts, foreign language, health/physical education, home economics, industrial arts, mathematics, music, social studies/social science, science (biology, chemistry, earth science/geology, physics, and general and all other science), special education (mentally retarded, emotionally disturbed, learning disabled, speech and hearing impaired, and other special education), and vocational education (business education, home economics, industrial arts, and general and all other vocational education).

For the purpose of this analysis, these primary assignment fields were collapsed into ten basic categories: art/music; physical education; general elementary, PK, and kindergarten; foreign language; vocational education; social studies; special education; science; English/language arts; and mathematics. Table A shows the number of teachers used in the analysis for

each primary assignment area. A crosswalk was next developed between these ten primary assignment fields and the list of major field codes used by the teacher to respond to questions about their educational preparation. This crosswalk is presented in Table B.

Four categories of qualification were next derived from the data provided by the teacher. The first category of qualification indicated that the teacher had majored in the subject at the bachelor's degree level or higher and that the teacher was certified to teach the subject. The second category indicated that the teacher had majored in the subject but was not certified to teach the subject. The third category indicated that the teacher had not majored in the subject but was certified to teach the subject. And the fourth category indicated that the teacher had neither majored in the subject nor was certified to teach the subject.

Selected Findings

All Teachers:

An analysis of the percent of teachers who fall into each of these four qualification categories by primary assignment field is presented in Table 1. About three-quarters of full-time, regular teachers both had majored in their primary field of assignment and were certified in that field. Another 23 percent were certified in their primary field of assignment, but had not majored in that field at the Bachelor's level or above. About 2

percent of the teachers surveyed, therefore, were not certified in their primary assignment field.

These results were similar, although not identical, when elementary and secondary school teachers were analyzed separately (tables 2 and 3, respectively). While about 98 percent of elementary school teachers were certified in their primary assignment field, 78 percent also majored in that field. And although about 98 percent of secondary school teachers were certified, only 72 percent had degrees in their primary assignment field.

An analysis of training and certification status by field of assignment yields some interesting differences. The percent of secondary school teachers who had both majored in and were certified in their primary field of assignment varied from about 91 percent for art/music teachers to about 60 percent for mathematics teachers. The percent of teachers who were certified, but had not majored in their assignment fields showed a reverse pattern from about 8 percent for art/music teachers, to 27 percent for mathematics teachers, to a high of 33 percent for English/language arts teachers.

For all teachers only about 1 percent had neither majored in their primary assignment field nor were certified in that field. This percentage also varied by field, from less than half a percent for art/music and general elementary, PK, and kindergarten to 3.5 percent for mathematics.

Almost one-fifth of public school teachers had taken in-service training or college courses related to their primary assignment field during the previous two school years (see table 4). The proportion of teachers with additional training did not vary very much among primary assignment fields or by qualification category. It should be noted, however, that the standard errors for qualification categories two and four (majored, but not certified and no major, not certified) were fairly large relative to the estimates due to the small number of teachers in these categories.

Science Teachers:

A more specific, and somewhat more stringent, analysis of science teachers was next performed and is presented in tables 5 and 6. This analysis was limited to secondary school teachers whose primary assignment field was biology, chemistry, physics, or earth science/geology. For each of these primary assignment fields, the only "matching" major in this analysis was a major in the same science speciality. So, for example, a teacher of physics had to major in physics at the bachelor's degree level or higher in order to fall into qualification category one (majored and certified) or two (majored but not certified).

This analysis showed a great deal of variation in the percent of teachers who both majored in the speciality and are certified in the speciality, by type of speciality. While over 60 percent of biology teachers fell into qualification category

one, only about 17 percent of earth science/geology teachers achieved this qualification status. It is very interesting to note, however, the high rate of certification in the science specialities. By adding qualification categories one and three, the percentage of teachers certified in their primary assignment field can be obtained. Using this measure, about 97 percent of specialized science teachers were certified in their assignment field. This percentage varied from about 92 percent certified in earth science/geology to almost 99 percent certified in physics. The high rate of certification coupled with the relatively low rate of majoring in these science fields may reflect a high incidence of in-service or post-graduate training in these fields.

ESL/Bilingual Teachers and Computer Science Teachers:

Two primary assignment fields fell out of the mainstream of "traditional" assignments such as the ones analyzed above. While many postsecondary institutions do not offer majors in English as a Second Language or bilingual education, many States do not offer certification in computer science. Teachers in these two primary assignment fields, therefore, looked the least qualified according to the four categories used in the analyses presented here.

Tables 7 and 8 show the percentage of computer science and ESL/bilingual teachers who fall into each of the four categories and who received additional training in their fields. For the

purpose of this analysis, ESL/bilingual teachers were considered to have majored in their field if they majored in foreign languages, bilingual education, or English as a second language at the bachelor's degree level or higher. Computer science teachers were considered to have majored in their field if they majored in computer and information sciences, mathematics, or mathematics education at the bachelor's degree level or higher.

As the tables show, only 35 percent of ESL/bilingual teachers and 20 percent of computer science teachers both majored in and were certified in their primary assignment field. These two specialities also had the highest percentage of teachers who had neither majored in nor were certified in their field at about 7 percent for ESL/bilingual and about 22 percent for computer science. As relatively new speciality fields in the U.S. public education system, clearly the definition of "teacher quality" for these groups requires further investigation and validation.

Conclusion

Further analysis of the training, certification, and assignments of our Nation's teachers needs to closely examine the nature of the term "teacher quality." Many questions for additional research spring to mind. Does years of experience in the classroom play a role in teacher quality? Can the contribution of experience be quantified? Other questions relate to the subjects that teachers received degrees in. If they did not major in their assigned field, what did they major in? How do

all of these analyses relate to the teacher's secondary assignment field? Does the teacher consider their primary or secondary assignment field to be the field in which they are best qualified? If not, what is their best qualified field and how is it related to their training and certification status? These questions about teacher quality and teacher qualifications, as well as teacher assignment and teacher misassignment, have large implications for the quality of education that can be obtained in the Nation's public elementary and secondary schools. And the definition of what constitutes a "substantive background" in mathematics and science will become extremely important in the months to come as the National Education Goals are defined and refined. Further research in this area may help us to measure our progress towards accomplishing the goal that "by the year 2000, U.S. students will be first in the world in mathematics and science achievement."

Technical Notes

Introduction

The data for this presentation were collected on the Public School Teachers Questionnaire, one of seven questionnaires comprising the 1987-88 Schools and Staffing Survey (SASS), a survey developed by the U.S. Department of Education's National Center for Education Statistics, and conducted by the U.S. Bureau of the Census.

The SASS was a mail survey which collected public and private sector data on the Nation's elementary and secondary teaching force, aspects of teacher supply and demand, teacher workplace conditions, characteristics of school administrators, and school policies and practices. The seven questionnaires of the SASS are as follows:

1. The Teacher Demand and Shortage Questionnaire for Public School Districts (LEA's).
2. The Teacher Demand and Shortage Questionnaire for Private Schools.
3. The School Administrator Questionnaire.
4. The Public School Questionnaire.
5. The Private School Questionnaire.
6. The Public School Teachers Questionnaire.
7. The Private School Teachers Questionnaire.

Sample selection

All 56,242 public school teachers in the teacher samples were selected from the 9,317 public school samples.[3]

A list which included all full-time and part-time teachers, itinerant teachers, and long-term substitutes was obtained from each sample school. Within each school, teachers were stratified by experience; one stratum included new teachers, and a second stratum included all other teachers. New teachers were those who, counting the 1987-88 school year, were in the first, second, or third year of their teaching career in either a public or private school system. Within each teacher stratum, teachers were sorted by subject (General Elementary Education, Special Education, Mathematics, Science, English, Social Science, Vocational Education, other.).

The public school teacher samples was designed to include a basic sample and a Bilingual/ESL(English as a Second Language) supplement. The bilingual/ESL supplement included teachers who use a native language other than English to instruct students with limited English proficiency (bilingual) and teachers providing students with limited English proficiency with intensive instruction in English (ESL). The supplement was funded by the Department of Education's Office of Bilingual Education in Minority Affairs (OBEMLA) in order to obtain more reliable estimates of bilingual/ESL education teachers.

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[3] The other SASS samples were as follows: 5594 public school districts, and the administrators (principals) of schools in the public and private school samples.

The basic sample of teachers required for the public school strata was allocated to the sample schools in each stratum so that the teacher weights were equal. The specified average teacher sample size for each sample school (4, 8, and 6 teachers for each public elementary, secondary, and combined school, respectively) was then allocated to the two teacher strata to obtain an oversampling of new private school teachers at a fixed rate, and proportional allocation of public school teachers. Finally, a systematic sampling scheme was then applied to select the basic sample within each teacher stratum. An independent systematic sampling scheme was applied to bilingual teachers in each sample school to select the bilingual supplement. To control the number of teachers in each of the six bilingual strata (California, Texas, Florida, Illinois, New York, and all other States), the supplement was subsampled systematically with equal probabilities by stratum. Teachers selected in both the supplement and the basic sample were unduplicated so that each teacher appears only once.

The sample sizes were as follows:

Public nonbilingual	53,394
Public bilingual	2,848

Data collection

The Teacher Questionnaires were mailed to the sampled schools in February 1988. Approximately 10 days after this mailout, a letter was sent to the survey coordinator in each

school identifying the school's sample teachers and requesting the coordinator to remind the the sample teachers to complete and return their questiornaires. Approximately six weeks after the mailout, a second set of questionnaires, for sample teachers who had not returned the first questionnaire, was sent in a package to the school coordinators for distribution to nonresponding teachers. During the time of this second mailout, each coordinator was telephoned and asked to remind those teachers who had not returned the first questionnaire to complete the second one and mail it back. A telephone follow-up was conducted during April, May, and June. Due to the large number of nonrespondents and the necessity for completing the follow-up prior to the closing of schools for the summer, only a subsample of nonresponding teachers was included in this effort. This subsample of nonresponding teachers had their weights adjusted to represent the nonresponding teachers who were not selected for the followup.

Questionnaire response rates

Weighted response rates were 86.4 percent for the Public School Teachers Questionnaire and 79.1 percent for the Private School Teachers Questionnaire.

Item descriptions

The Public School Teacher Questionnaire is shown in the Appendix.

Effects of item nonresponse,

There was no explicit imputation for item nonresponse. Not imputing for item nonresponse leads to a bias in the estimates. In tables which present averages, the nature of this bias is unknown.

Standard errors

The estimates in these tables are based on samples and are subject to sampling variability. Standard errors were estimated using a balanced repeated replication procedure that incorporates the design features of this complex sample survey. The standard errors provide indications of the accuracy of each estimate. If all possible samples of the same size were surveyed under the same conditions, an interval of 1.96 standard errors below to 1.96 standard errors above a particulr statistic would include the universe value in approximately 95 percent of the cases. Note, however, that the standard errors in the tables do not take into account the effects of biases due to item nonresponse, measurement error, data processing error, or other systematic error.

Definition of teacher

For purposes of this report, a teacher was any full-time regular teacher whose primary assignment was teaching in any teaching in any of grades K-12. Itinerant teachers were not included, nor were long-term substitutes who were filling the

role of a regular teacher on an indefinite basis. Teachers classified as Elementary or Secondary had to meet one of the following conditions:

Elementary

A teacher who checked the "ungraded" option only in item 24 (which asks for grades being taught) and was designated as an Elementary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ in the tape documentation).

A teacher who checked 6th grade or lower and no grade higher than 6th in item 24, or 6th grade or lower and "ungraded" and no grade higher than 6th.

A teacher who checked 6th grade or lower and 7th grade or higher and entered a primary assignment code of "01", "02", or "03" in item 16a.

A teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of "01", "02", or "03" in item 16a.

A teacher who checked 6th grade or lower and 7th grade or higher in item 24 and entered a primary assignment code of Special Education in item 16a and was designated as an Elementary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ).

A teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of Special Education in item 16a and was designated as an Elementary teacher on the list of

teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ).

Secondary

A teacher who checked the "ungraded" option only in item 24 and was designated as a Secondary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ in the tape documentation).

A teacher who checked 6th grade or lower and 7th grade or higher in item 24 and entered a primary assignment code greater than 03 in item 16a.

A teacher who checked 9th grade or higher, or 9th grade or higher and "ungraded".

A teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of "04" or higher but not Special Education in item 16a.

A teacher who checked 7th and 8th grades only in item 24 aand entered a primary assignment code of Special Education in item 16a and was designated as a Secondary teacher on the list of teachers obtained obtained from each sample school (code "03" or higher for variable name TSUBJ).

All other teachers who checked 6th grade or lower and 7th grade or higher in item 24, or 7th and 8th grades only, and were not categorized above as either Elementary or Secondary.

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For More Information

For more information about this report, contact Sharon A. Bobbitt, Elementary and Secondary Education Statistics Division, National Center for Education Statistics, U.S. Department of Education, 555 New Jersey Avenue N.W., Washington, D.C., 20208-5651, telephone (202) 357-6461.

Table A.--Unweighted Sample Sizes by Primary Assignment Field and Level

Primary Assignment Field	Total	Elementary	Secondary
Art/Music	1,635	287	1,348
Physical education	1,902	301	1,601
General elementary, PK, and kindergarten	11,099	11,099	0
Foreign language	730	12	718
Vocational education	3,606	7	3,599
Social studies	2,407	111	2,296
Special education	3,617	1,898	1,719
Science	2,400	118	2,282
English/language arts	3,164	182	2,982
Mathematics	2,827	189	2,638
Total sample size	33,387	14,204	19,183

Table B.--Crosswalk between Primary Assignment Field and Major Field

Primary Assignment Field	Major Field(s)
Art/Music	Fine and applied arts Art education Music education
Physical education	Health professions Physical education/ health education
General elementary, PK, and kindergarten	Elementary education Pre-elementary/ early childhood education
Foreign language	Foreign languages Foreign languages education
Vocational education	Agriculture and natural resources Business and management Architecture and environmental design Communications Engineering Agricultural education Business, commerce, and distributive education Home economics education Industrial arts, vocational, and technical education Health professions
Social studies	Area and ethnic studies Public affairs and services Economics History Political science and government Sociology Other social sciences Psychology Social studies/social sciences education
Special education	Special education, general Education of the

	emotionally disturbed
	Education of the mentally retarded
	Education of the speech/hearing/vision impaired
	Special learning disabilities
	Other special education
Science	Biological/life science
	Chemistry
	Physics
	Geology/earth science
	Other physical sciences
	Science education
English/language arts	Letters (English, literature, speech, classics)
	English education
Mathematics	Mathematics
	Mathematics education

Table 1.--Percent of public school teachers with various levels of qualification in primary assignment field, by primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	74.9%	0.8%	23.1%	1.1%
Art/Music	90.4	0.6	8.9	0.1
Physical education	88.1	1.0	10.3	0.6
General elementary, PK, and kindergarten	82.9	0.7	16.0	0.4
Foreign language	77.3	0.8	20.6	1.3
Vocational education	73.2	0.5	25.3	0.9
Social studies	68.8	1.2	28.8	1.2
Special education	68.8	1.3	28.5	1.5
Science	62.6	1.5	33.6	2.3
English/language arts	60.2	0.6	36.9	2.3
Mathematics	54.0	0.6	41.8	3.5

SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 2.--Percent of public elementary school teachers with various levels of qualification in primary assignment field, by primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	78.0%	0.8%	20.4%	0.8%
Art/Music	88.3	--	11.0	0.0
Physical education	85.3	1.7	12.2	--
General elementary, PK, and kindergarten	82.9	0.7	16.0	0.4
Foreign language	--	--	--	--
Vocational education	--	--	--	--
Social studies	23.2	--	70.2	4.7
Special education	68.3	1.5	28.9	1.2
Science	13.6	--	80.2	5.9
English/language arts	14.4	--	81.0	4.0
Mathematics	7.1	0.0	82.8	10.0

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

ıble 3.--Percent of public secondary school teachers with various levels of qualification in primary assignment field, by primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	71.7%	0.8%	26.0%	1.5%
:t/Music	91.2	0.5	8.1	0.2
ıysical education	88.9	0.8	9.7	0.6
ıneral elementary, PK, and kindergarten	--	--	--	--
ɔreign language	78.2	0.8	20.2	0.9
ɔcational education	73.3	0.6	25.3	0.8
ɔcial studies	72.0	1.2	25.9	1.0
pecial education	69.4	0.9	27.9	1.8
cience	66.6	1.6	29.8	2.0
nglish/language arts	64.4	0.7	32.8	2.1
athematics	59.7	0.7	36.9	2.8

-Too few cases for a reliable estimate.
OURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

ıble 4.--Percent of public school teachers who received additional training in primary assignment field, by level of qualification and primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	17.8%	20.0%	17.3%	18.8%
:t/Music	14.3	--	15.6	--
ıysical education	12.7	--	13.8	--
ıneral elementary, PK, and kindergarten	19.1	19.1	19.7	24.8
ɔreign language	14.7	--	15.5	--
ɔcational education	17.4	--	22.6	26.5
ocial studies	15.7	--	12.1	--
pecial education	2[illegible].2	34.5	20.9	24.4
cience	19.2	32.8	15.6	14.5
nglish/language arts	15.7	--	15.1	23.2
athematics	16.4	--	13.2	14.7

-Too few cases for a reliable estimate.
OURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 5.--Percent of public secondary school science teachers with various levels of qualification in primary assignment field, by primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	46.8%	0.4%	50.1%	2.8%
Biology	61.0	0.4	37.2	1.3
Chemistry	47.0	--	50.2	2.5
Physics	26.5	--	72.2	--
Earth science/geology	17.4	--	74.7	7.4

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

able 6.--Percent of public secondary school science teachers who received additional training in primary assignment field, by level of qualification and primary assignment field

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	14.9%	--	11.3%	8.7%
iology	16.3	--	11.6	--
hemistry	11.2	--	5.6	--
hysics	16.1	--	21.5	--
arth science/geology	10.4	--	10.5	--

--Too few cases for a reliable estimate.
OURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 7.--Percent of public school teachers with various levels of qualification in primary assignment field, by selected primary assignment fields

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
ESL/bilingual	34.7%	2.5%	56.2%	6.6%
Computer science	20.2	14.5	43.2	22.3

SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 8.--Percent of public school teachers who received additional training in primary assignment field, by level of qualification and selected primary assignment fields

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
ESL/bilingual	15.1%	--	17.3%	26.4%
Computer science	20.7	--	23.2	27.4

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 1S.--Standard errors for percent of public school teachers with various levels of qualification in primary assignment field, by primary assignment field (table 1)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	0.34%	0.06%	0.34%	0.07%
Art/Music	0.87	0.19	0.86	0.07
Physical education	0.92	0.34	0.90	0.22
General elementary, PK, and kindergarten	0.49	0.10	0.48	0.07
Foreign language	1.90	0.22	1.73	0.65
Vocational education	0.72	0.14	0.79	0.19
Social studies	1.20	0.25	1.14	0.27
Special education	0.89	0.25	0.87	0.23
Science	1.15	0.27	1.02	0.37
English/language arts	0.96	0.17	0.91	0.36
Mathematics	1.27	0.17	1.18	0.58

SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

able 2S.--Standard errors for percent of public elementary school teachers with various levels of qualification in primary assignment field, by primary assignment field (table 2)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	0.53%	0.09%	0.56%	0.09%
rt/Music	2.00	--	1.99	0.00
hysical education	2.88	1.18	2.43	--
eneral elementary, PK, and kindergarten	0.49	0.10	0.48	0.07
oreign language	--	--	--	--
ocational education	--	--	--	--
ocial studies	4.48	--	4.69	2.57
pecial education	1.34	0.38	1.35	0.32
cience	3.54	--	4.70	2.91
nglish/language arts	2.91	--	3.23	1.38
athematics	1.95	0.00	3.13	3.00

--Too few cases for a reliable estimate.
OURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 3S.--Standard errors for percent of public secondary school teachers with various levels of qualification in primary assignment field, by primary assignment field (table 3)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	0.33%	0.08%	0.33%	0.11%
Art/Music	0.86	0.20	0.83	0.09
Physical education	0.92	0.28	0.85	0.22
General elementary, PK, and kindergarten	--	--	--	--
Foreign language	1.86	0.23	1.74	0.47
Vocational education	0.72	0.14	0.78	0.18
Social studies	1.05	0.27	1.08	0.21
Special education	1.16	0.23	1.18	0.36
Science	1.14	0.30	1.05	0.36
English/language arts	1.00	0.17	0.87	0.37
Mathematics	1.25	0.19	1.19	0.47

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

'able 4S.--Standard errors for percent of public school teachers who received additional training in primary assignment field, by level of qualification and primary assignment field (table 4)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	0.36%	3.62%	0.48%	2.66%
ırt/Music	1.15	--	3.86	--
hysical education	0.89	--	3.08	--
eneral elementary, PK, and kindergarten	0.62	6.83	0.77	8.36
oreign language	1.39	--	2.74	--
ocational education	0.84	--	1.40	9.81
ocial studies	0.98	--	1.35	--
pecial educatic.	1.11	10.66	1.56	7.35
cience	0.88	9.58	1.57	6.37
ngish/language arts	1.01	--	1.25	8.39
athematics	0.92	--	1.07	4.38

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 5S.--Standard errors for percent of public secondary school science teachers with various levels of qualification in primary assignment field, by primary assignment field (table 5)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	1.63%	0.15%	1.62%	0.54%
Biology	2.36	0.22	2.33	0.54
Chemistry	3.21	--	3.05	0.81
Physics	3.69	--	3.70	--
Earth science/geology	2.98	--	2.88	1.68

--Too few cases for a reliable estimate.

Table 6S.--Standard errors for percent of public secondary school science teachers who received additional training in primary assignment field, by level of qualification and primary assignment field (table 6)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
Total of selected fields	1.46%	--	1.22%	6.15%
Biology	2.00	--	1.90	--
Chemistry	2.80	--	1.46	--
Physics	5.48	--	4.37	--
Earth science/geology	4.11	--	1.87	--

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 7S.--Standard errors for percent of public school teachers with various levels of qualification in primary assignment field, by selected primary assignment fields (table 7)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
ESL/bilingual	1.85%	0.68%	2.03%	1.10%
Computer science	2.93	3.43	3.23	3.42

SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 8S.--Standard errors for percent of public school teachers who received additional training in primary assignment field, by level of qualification and selected primary assignment fields (table 8)

Primary assignment field	Majored and certified	Majored, but not certified	No major, but certified	No major, not certified
ESL/bilingual	0.24%	--	2.83%	6.84%
Computer science	5.69	--	3.74	7.89

--Too few cases for a reliable estimate.
SOURCE: National Center for Education Statistics, Schools and Staffing Survey, 1987-88.