The Academic Preparation of Idaho's Earth Science Teachers, 1983-84 School Year

Michael W. Heikkinen

Technical Report 86-3
1986

Idaho Geological Survey
University of Idaho
Moscow, Idaho 83844

THE ACADEMIC PREPARATION OF IDAHO'S EARTH SCIENCE TEACHERS 1983-84 SCHOOL YEAR

Michael W. Heikkinen

Idaho Geological Survey
University of Idaho
Moscow, Idaho 83843

Technical Report 86-3
July 1986

CONTENTS

TABLE

FIGURE

THE ACADEMIC PREPARATION OF IDAHO'S EARTH SCIENCE TEACHERS, 1983-84 SCHOOL YEAR

by

by Michael W. Heikkinen[1]

BACKGROUND

Idaho, like many states, is experiencing a shortage of qualified teachers in the sciences (Copley, 1982; BIE Report, 1982; Dunathen, 1979; Gerlovich and Howe, 1983; Howe and Gerlovich, 1981; Guthrie and Zusman, 1982; Lashier and Ryoo, 1984; Olstad and Beal, 1981; AACTE Briefs, 1981). Although the problem is general to all sciences, it is even more critical for specific sciences such as earth science (Copley, 1982; Daly, 1983; Gerlovich and Howe, 1983).

The shortage of science teachers has led to the widespread use of unqualified teachers in science classrooms (Daly, 1982; NSTA, 1982; Yager and others, 1983). A survey of science teachers in Idaho indicated that 25 percent were teaching in areas in which they were not certified (Heikkinen and Chin, 1985). This report will document the academic preparation of Idaho's earth science teachers and compare it with that of other science teachers in the state.

---

[1] College of Education, University of Idaho

DATA COLLECTION

To determine the academic preparation of Idaho science teachers, the certification records of 436 of the 632 science teachers in Idaho's secondary schools were examined. Table 1 lists the subjects these teachers taught (since many teachers teach more than one subject, the teacher totals will be greater than 436). The Idaho Department of Education supplied the following data on all science teachers from the 1983/1984 school year: name, school district, school(s), address, subject(s) taught, and the number of classes taught, including the number of classes taught in each subject. The state Department of Education also gave permission to gather the following information from the certification files of each science teacher: subjects certified to teach, highest degree held, and science credits taken at the college level.

Categories of college science credits were biological science, physics, chemistry, earth science, other science, methods of teaching science, and mathematics. In most cases, only courses offered by science departments were counted as science courses. The exceptions were agricultural courses titled plant science or animal science, which were counted as biological sciences. Astronomy appeared under a variety of department designations including physics, astronomy, space science, earth science, and mathematics. Regardless of the department which offered the course, astronomy credits were categorized as physics for teachers having a physics major or minor. For all other teachers, astronomy courses were categorized as earth science.

Courses devoted to the teaching of science were counted as teaching methods credits rather than science credits. Courses such as history of science, philosophy of science, photography, and engineering were not counted as science credits.

In calculating mathematics credits, statistics and computer science courses were counted no matter what department offered the courses. Courses designed to teach methods of teaching mathematics were not tabulated.

Many teachers were certified to teach more than one subject. A record was kept of the number of endorsements and the type. Science endorsements were recorded in the following categories: biology, chemistry, physics, physical science, earth science, general science, and other science. If a teacher was endorsed to teach a nonscience subject, that endorsement was recorded in one of the following categories: mathematics, elementary school, physical education, or other subjects.

Since analyses were done by subject taught, teachers were included more than once if they taught more than one science. In fact, the typical science teacher taught 1.4 science subjects and 2.7 (range = 1-7) different subjects overall. This means that in addition to teaching science classes, the typical science teacher also taught one nonscience class.

EARTH SCIENCE TEACHERS

The earth sciences encompass the academic disciplines of

Table 1. Distribution by subjects taught of all Idaho science teachers in the 1983/1984 school year and those represented in the study sample.

Subject	State Total	Sample Number (%)
General Sci.	273	163 (60)
Earth Sci.	113	71 (63)
Geology	11	1 (9)
Space Sci.	2	0
Physical Sci.	99	60 (61)
Physics	83	42 (51)
Chemistry 1	99	62 (63)
Chemistry 2	15	10 (67)
Life Science	57	32 (56)
Biology 1	206	130 (63)
Biology 2	57	33 (58)
Physiology	20	19 (95)
Ecology	3	1 (33)
Environ. Sci.	11	6 (55)
All	1049	630 (60)

geology, physical geography, astronomy, oceanography, and space science. In Idaho public schools the earth sciences also include the course called earth science as well as courses in geology and space science. Since only one of the state's eleven geology teachers and no space science teachers were covered in the sample, the following analysis does not involve geology or space science teachers.

Sixty-three percent of the state's earth science teachers were included in the sample. The training of earth science teachers does not appear to be different from that of other science teachers, in that 27 percent of earth science teachers had Master's degrees, compared with 32 percent for all science teachers. However, earth science teachers had the poorest preparation in the subject matter they taught, with an average of 11.3 credits in earth science courses. As a comparison, the average academic preparation for other science teachers ranged from 16.2 credits of physics for physics teachers to 44.7 credits of biology for teachers of advanced biology.

Only 17 percent of earth science teachers had certificates to teach earth science; 76 percent of them had general science certificates. One teacher did not have a science teaching certificate. By contrast 57 percent of all Idaho science teachers were certified to teach the subjects they taught, while 8 percent were not certified to teach any science.

Only 10 percent of the earth science teachers had the equivalent of a major (30 or more credits) in earth science; 82 percent had fewer than 20 credits in the earth sciences. Forty-four percent of all Idaho science teachers had the equivalent of a

major in the subject taught; 40 percent had fewer than 20 credits in the subject taught. Figure 1 lists the credits for earth science teachers by selected subjects. It appears that earth science teachers are primarily trained to be biologists, since they average 27.7 credits in biology. Earth science teachers averaged 2.1 credits of science methods; however, 52 percent had none.

DISCUSSION

Only 57 percent of Idaho science teachers were certified to teach the subject they taught. Subjects taught by the lowest percentages of certified teachers were earth science 17 percent, physics 23 percent, physical science 34 percent, and chemistry 1 38 percent.

The main component in the training of science teachers has been the preparation in the content area to be taught. A measure of that preparation is the number of credits accumulated in that subject. In this study 30 or more credits earned in a subject was considered the equivalent of a major and 20 to 29 credits the equivalent of a minor, with 20 being the minimum number of credits needed for certification. Those subjects taught by teachers with the poorest academic preparation were earth science, physics, physical science, and chemistry 1. Earth science and physical science teachers have the poorest academic preparation with 60 percent to 82 percent not having the equivalent of a major or minor in the subject taught. By

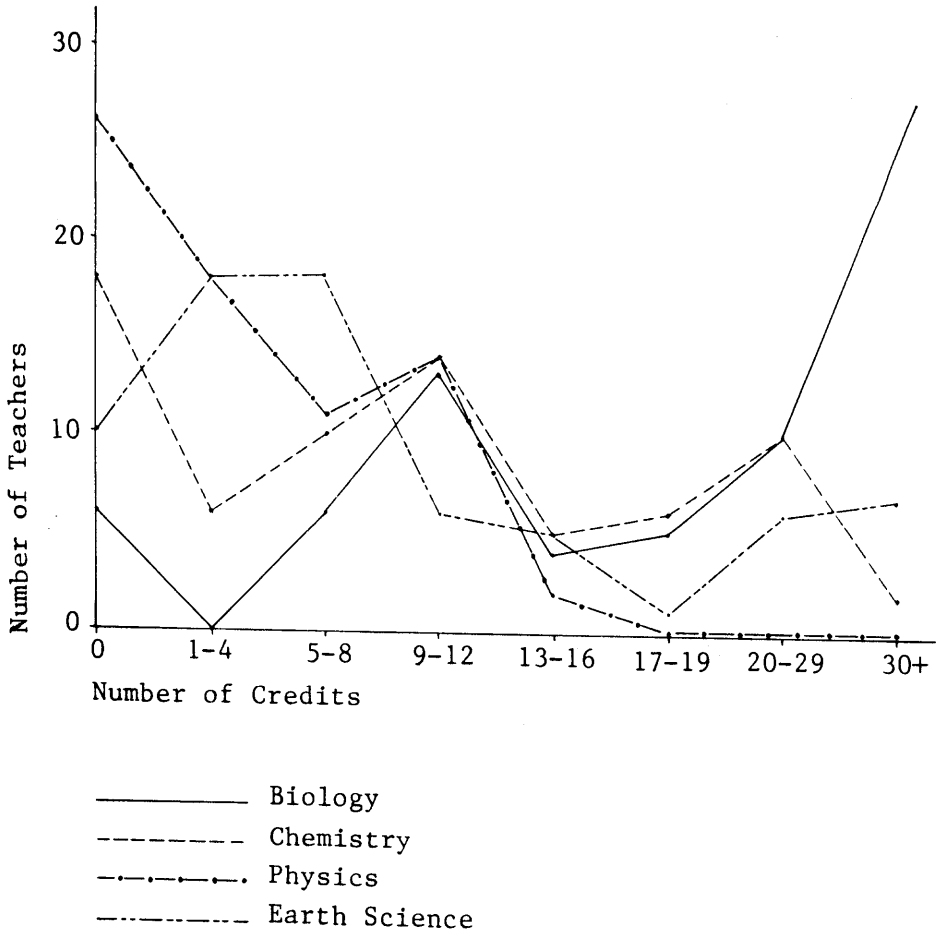

Figure 1. Distribution of earth science teachers according to number of credits earned in selected subjects.

comparison the academic preparation of biological science teachers is better; however, 18 percent to 32 percent of those teachers did not have enough credits to qualify for a minor in biology. Overall 39 percent of the science teachers in Idaho have less than a minor in the subject they teach.

REFERENCES

AACTE Briefs, 1981, Survey finds teacher shortage in four areas: AACTE Briefs, Vol. 2, p. 1, 3-4.

BIE Report, 1982, The crisis in science education: BIE Report, Vol 1, p. 1, 15.

Copley, P.O., 1982, Supply and demand of professional presonnel: An historical perspective: Panel Discussion at American Association of Colleges for Teacher Education Annual Meeting. Houston, Texas, February 1982.

Daley, N., 1982, The impact of teacher shortage and surplus on quality issues in teacher education: Washington, D.C.: American Association of Colleges for Teacher Education.

Dunathen, A.T., 1979, Midwest schools face shortage of good teachers: Phi Delta Kappan, Vol. 61, p. 121-123.

Gerlovich, J.A., and T.G. Howe, 1983, Where the jobs are: The Science Teacher, Vol. 50, p. 56-59.

Guthrie, J.W. and A. Zusman, 1982, Teacher supply and demand in mathematics and science: Phi Delta Kappan, Vol. 64, p. 28-33.

Heikkinen, M.W. and S.L. Chin, 1985, A survey of Idaho science teachers: Northwest Science, Vol. 59, p. 17-23.

Howe, T.G. and J.A. Gerlovich, 1981, Critical shortage of mathematics and science teachers in Iowa: School Science and Mathematics, Vol. 81, p. 25-33.

Lashier, W.S., Jr., and W.Y. Ryoo, 1984, A longitudinal study of the supply and demand for physics and chemistry teachers in Kansas: Journal of Research in Science Teaching, Vol. 21, p. 17-26.

NSTA, 1982, Shocking decline in high school science and math teachers: NSTA News Bulletin 1, February 1982.

Olstad, R.G. and J.L. Beal, 1981, The search for teachers: Supply and demand in Washington state: The Science Teacher, Vol. 48, p. 26-28.

Yager, R.E., B.G. Aldridge, and J. Penick, 1983, Science education in the United States, in F.K. Brown and D.P. Butts (eds.), Science Teaching: A Profession Speaks: Washington, D.C.: National Science Teachers Association.