

1972

## K-12 Science Education in Iowa: Did You Know That . . .

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### Recommended Citation

Glass, Lynn W. (1972) "K-12 Science Education in Iowa: Did You Know That . . .," *Iowa Science Teachers Journal*: Vol. 9: No. 4, Article 6.

Available at: <https://scholarworks.uni.edu/istj/vol9/iss4/6>

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K-12 SCIENCE EDUCATION IN IOWA:  
Did you know that--

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The State of Iowa encompasses 56,280 square miles of rolling farmland and is approximately 225 miles from border-to-border in a north-south direction and 340 miles from border-to-border in an east-west direction. The State had an estimated population in 1966 of 2,838,000, and a population density of 50.7 persons per square mile.

Organization of the  
K-12 Educational System

The State is divided into 15 geographical areas for the improvement of education in Iowa schools. Each area has a local board of education and the authority to levy taxes. The total K-12 enrollment ranges from a low of 16,876 in Area XIV to a high of 136,719 in Area XI. In general, these 15 areas are of approximately the same geographical size.

All 15 areas come under the jurisdiction of the State Department of Public Instruction. Certain psychological and media services are provided each school within every area. Within three of these areas (V, IX, and X) some of the counties have merged to provide free consultative help in the subject-matter areas for the public elementary and secondary schools.

The State is further divided into 453 local K-12 districts. Each district is governed by a local board. Over 300 of these districts have fewer than 1000 students. The largest school district is the Des Moines Independent Community School District with a K-12 enrollment of over 45,000 students. The second largest is the Cedar Rapids Community School District with a K-12 enrollment of over 25,000 students. The smallest school district has 172 students.

Only 13 of Iowa's 453 school districts have support personnel in science on either a full- or part-time basis. The 13 school districts employing support personnel in science are among the state's largest 18 school districts. In addition to these 13 districts, several districts employ a K-12 generalist.

Teacher Education  
and Certification

Iowa is one of the states that recognize the "approved program" approach to teacher education and certification. An Iowa teacher's certificate is issued to any person who has completed an approved baccalaureate--or graduate-degree teacher-education program, including supervised student teaching.

This means that an individual must complete and institution's approved program of preparation and be recommended by the institution for the type of certification sought in Iowa. A wide array of educational experiences between individuals is suggested with this approach to certification.

In Iowa there are 28 approved teacher preparation institutions. Three universities--Drake University, University of Iowa, and University of Northern Iowa--prepare nearly one-half of the teachers who are certified to teach science. Iowa State University is the fourth largest teacher preparation institution; approximately 10 per cent of the teachers are prepared at Iowa State University. Approximately 75 per cent of these teacher education graduates go directly into teaching upon graduation.

Classroom teachers in grades K-8 usually hold a general elementary certificate, whereas classroom teachers in grades 7-12 hold a general secondary certificate with approval in one or more of the following subject-matter areas: biology, chemistry, general science, physical science, physics, and physiology, or all sciences. The only basic requirement that is made by the college or university for all candidates of the general elementary certificate is that every candidate must have had a methods course and supervised student teaching. Although not required, it is strongly recommended by the State Department of Public Instruction that every candidate have a course in elementary science methods or a combination elementary science/mathematics methods course. Candidates for the secondary certificate are required to have at least a 30 semester hour major in one academic area with supporting work in related fields; for example, a 30 semester hour major in biology with supporting work, consisting of at least two courses, in chemistry. In addition, a methods course and supervised student teaching are required.

Approximately three per cent of all Iowa classroom teachers are teaching with temporary certificates. These certificates are issued for a variety of reasons. The most common reason today for issuing a temporary certificate is that the applicant has less than a baccalaureate degree.

### The Iowa Classroom Teacher

In general, the teachers in Iowa's public schools are at the level of the baccalaureate degree. There are, however, some interesting patterns evident in the various size groupings of school districts. All school districts, regardless of size, have approximately 74 per cent of their teachers at the baccalaureate level; however, it is only the larger school districts where a significant number of teachers (22.6 per cent) have achieved the master's degree level. The converse of this is also true; it is only in the smaller school districts where a significant number of teachers (23.5 per cent) have not obtained the baccalaureate degree.

In addition, it should be noted that 11.2 per cent (3,652 teachers) of all classroom teachers have not received a bachelor's degree. This percentage appears to be in direct conflict with the number of temporary certificates reported. However, prior to August 31, 1958, persons with less than a baccalaureate degree were issued pre-professional or standard elementary life certificates; these certificates are no longer issued and they account for the apparent discrepancy.

Data are available concerning the academic preparation of science teachers in grades 7-12. As might be predicted, these data closely parallel those data presented for all classroom teachers in the State. Fewer than one per cent of all secondary science teachers have not received the baccalaureate degree and fewer than one per cent have advanced beyond the master's degree level of education.

The total number of years of teaching experience does not appear to be a function of district size. Approximately one-third of all classroom teachers in Iowa public schools have fewer than five years of total teaching experience; approximately one-third of the classroom teachers have from five to 14 years of total teaching experience; and approximately one-third of all classroom teachers have more than 14 years of total teaching experience. In addition, 22.6 per cent of all classroom teachers

in the smallest districts have earned a master's degree while only 5.8 per cent of all classroom teachers in the smallest districts have earned a master's degree yet the largest districts and smallest districts have approximately the same percentage of classroom teachers in each experience bracket.

### Program of Instruction

The Code of Iowa requires that a minimum of four units of science shall be taught in grades 9-12 each year; 97.2 per cent of the high schools in Iowa meet the minimum requirement. The number of units of science instruction appears to be an inverse function of the size of the school district. Over 82 per cent of the districts in the smallest size class offer fewer than five units of science instruction per year, whereas over 86 per cent of the districts in the largest size class offer five or more units of science instruction per year.

The percentage of all students in grades 9-12 enrolled in science courses for any given school year has remained roughly constant. Stability in the science enrollment might be expected since the number of courses a student may enroll in is a function of the length of the school day. It is of interest to note the enrollment trends in selected science courses during this same 13 year period of time. While the biology and chemistry enrollments have remained fairly constant, the enrollment in physics has dropped and the enrollments in earth science and physical science have correspondingly increased.

### In-Service Education

According to Educational Standard 3.9, each school district is to have a continuous in-service program for teachers in effect. All school districts indicate that they comply with this standard; however, the amount of money budgeted for in-service education ranges from no monies budgeted in 12.6 per cent of the schools to over \$1000.00 budgeted in 24.6 per cent of the schools. Local school districts in areas where joint county units have been formed (Area V, IX and X) supplement their in-service budget with tax supported consultants in science. All districts in the state may utilize the limited services of the one state science consultant.

In addition to in-service education provided through the local school system, many teachers return to colleges and universities to continue

their educational pursuits. Of the 28 teacher training institutions in the state, eight offer graduate credit. It can be assumed that most teachers continue their work at these institutions, or similar out-of-state institutions, because of the structure of local salary schedules. Only four of these eight institutions (Drake University, Iowa State University, University of Iowa, and University of Northern Iowa) have professional science educators on their faculties and offer graduate credit in science education.

The results of Dr. Glass' statewide survey would seem to support the need for improving elementary and secondary education throughout the state of Iowa. More specifically, considerable emphasis should be placed upon formulating and implementing various teacher education improvement projects such as workshops and in-service institutes. Such instructional programs should help to meet the needs of those areas of the state that cannot financially support such projects.

In addition, the data provides some clues as to where significant educational problems seem to be couched. However, such problems could conceivably be brought to a clearer focus if and when a statewide Needs Assessment is implemented.

(Ed)

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## NATIONAL SCIENCE FOUNDATIONS NEWS

### NSF Expands Studies of National Science Computer Network

A National Science Computer Network that would link scientists, engineers, and educators at both small colleges and major universities, non-profit organizations, government, and industry, with advanced computer resources is being studied by the National Science Foundation.

A National Science Computer Network would aid the researchers throughout the country and strengthen the nation's research and educational programs by providing:

- high quality computer research facilities; and
- improved access to information and to national data banks.

It is expected that the network would also help eliminate costly duplication of equipment through more effective resource sharing.

Problems facing scientists studying the network are complex issues such as network management, integration of specialized resources and services, protection of data rights, servicing of common interest user groups, and network financing. A key consideration is the establishment of common or compatible computer languages.

NSF has been sponsoring research on a National Science Computer Network and is now expanding these efforts.

The details of the program are contained in a new publication, Expanded Research Relative to a National Science Computer Network, NSF 72-16, released August 20, 1972. NSF is seeking research proposals that deal with the concept, feasibility, and problems related to a national computer network for education, research, and science information services.

During the Fiscal Year 1973, NSF plans to make awards totaling approximately \$2 million on specific problems in utilizing a national computer network.

Research Proposals related to the computer network may be submitted at any time by academic institutions, and by for-profit and non-profit organizations. Because the current focus on the program is on concept, feasibility, and design studies the Foundation will not now consider proposals to implement the network.

The computer network program is being coordinated by the Office of Computing Activities (OCA). The program is a joint effort of OCA and the NSF Office of Science Information Service.

Program Information: For additional program information contact:

Office of Computing Activities  
National Science Foundation  
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