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A SURVEY OF ELEMENTARY SCIENCE IN IOWA

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Introduction

The purpose of this study was to determine the type of science education currently being taught to elementary students in Iowa. Areas investigated include the instructional materials being used, the time spent teaching science, and the extent to which environmental education is a part of science in Iowa schools.

A survey was conducted in the spring of 1980. The sample included one teacher at each grade level 1-6 for 300 randomly selected Iowa elementary schools, which represent approximately 25 percent of the elementary schools in Iowa. Dissemination of the instrument was done through science supervisors at the Area Education Agencies. Responses were received from 190 of the 300 selected schools representing a 63.3 percent return.

In an effort to assess the status of elementary school science in Iowa, the results of this study were compared with other studies found in the literature. Of particular value was a 1977 study sponsored by the National Science Foundation, directed by Iris Weiss, which conducted a major examination of science, mathematics, and social studies in response to concerns about the effectiveness of its programs. Other surveys included studies by Gullickson (1978), Andrew (1980), Heilighenthal (1980), Helgeson (1978), and Blackwood (1961-62).

Results

Table I indicates the percentage of Iowa classrooms using NSF sponsored science materials at each grade level.

Table I: Percentage of Classrooms Using ESS, SCIS, and S-APA in Selected Iowa Schools

Grade	0-999	District Size		All Schools	Most Used
		1,000-4,999	5,000 & Over		
1	24.08	34.70	43.59	33.10	SCIS
2	20.75	29.42	42.55	30.46	S-APA
3	18.46	33.93	43.48	30.54	ESS
4	18.58	33.33	48.99	31.76	ESS
5	20.97	35.71	46.00	33.11	ESS
6	29.62	41.18	43.18	37.12	ESS

The study also found that as district size increased the likelihood of using NSF sponsored materials in elementary science increased greatly. The overall percentage usage was 24.7% in schools of 0-999 students, 34.3% in schools of 1000-4,999 students, and 44.4% for school districts of over 5000 students. This is consistent with a study done by Weiss (1978:81, A-2) who found that school districts of 3000-12,000 students reported the highest level of usage of NSF materials. A positive note when considering the previous data is that larger schools are more likely to use activity-based science in Iowa, therefore, the percentage of students in Iowa using the NSF sponsored materials is considerably greater than the percentage of school districts using the materials.

Table II reflects a comparison of the use of ESS, SAPA, and SCIS programs in Iowa as compared to other studies found in the literature.

Table II: Use of ESS, SAPA, and SCIS Materials in Schools

	ESS	SAPA	SCIS
Weiss (1977) national	5 % (K-3) 9 % (4-6)	4 % (K-3) 9 % (4-6)	11 % (K-3) 12 % (4-6)
Gullickson (1974) midwest	14.6%	8 %	5.4%
Andrews (1980) New Hampshire	24 %	4 %	6 %
Anderson (1980) Iowa	13.2%	10.6%	8.6%
Heiligenthal (1980) Iowa	11.8% (K-3) 20 % (4-6)	16.5% (K-3) 10.6% (4-6)	14.8% (K-3) 10.6% (4-6)

The results of the study appear to indicate that the use of NSF activity-based programs in Iowa schools compares favorably with schools across the nation. The authors would like to note that ESS, which is the most widely used program in Iowa schools in grades 3-6, is often used in conjunction with other materials.

In identifying the type of school most likely to use a NSF activity-centered program, Weiss (1978:81) reported: "Schools in the Northeast are significantly more likely than schools in the South, North Central, or Western regions of the country to be using one or more of the federally-funded curriculum materials. Schools in small cities and suburban areas are more likely to use federally-funded curriculum materials than schools in urban areas. Medium-sized districts are more likely to use them than large districts. Schools in districts with larger percentages of low income families are less likely to use them. Schools in which the principal has participated in NSF activities are more likely to use them.

Table III provides a comprehensive listing of the science programs currently being used in Iowa Elementary Schools.

Weiss (1978:B-44) reported the top three textbooks in the 1977 National Survey to be: 1) Harcourt, Brace's *Concepts in Science* with 12 percent use for K-3 and 16 percent for 4-6, 2) Silver Burdett's *Science*:

Table III: Percentage Distrubutions of Science Materials Used in Selected Classrooms by District Size, Grades 1-6

	District Size				Total Number
	0-999	1,000- 4,999	5,000 & Over	All Schools	
Addison-Wesley <i>STEM</i>	4.47	7.42	9.09	6.77	62
American Book <i>Invest. Science</i>	2.79	1.41	0	1.53	14
Cambridge <i>Work-A-Text</i>	3.07	1.06	0	1.53	14
Ginn <i>Science</i>	3.07	2.12	0	1.86	17
<i>S-APA</i>	4.19	13.43	16.00	10.59	97
Harcourt, Brace <i>Concepts</i>	16.48	5.30	14.91	12.55	115
Harper-Row <i>Today's Basic Science</i>	1.40	1.06	0	.87	8
Heath <i>Science Series</i>	25.14	9.19	2.55	9.72	78
Holt <i>Elem. Science</i>	2.23	1.77	.36	1.53	14
Houghton Mifflin <i>MAPS</i>	2.23	1.77	4.73	2.84	26
<i>Science</i>	0	.35	1.82	.66	6
Laidlaw <i>Exploring Science</i>	14.53	7.42	2.18	9.06	79
<i>Modern Science</i>	1.12	0	0	.44	4
Lippincott <i>Elementary School Science</i>	1.12	.35	0	.55	5
Merrill <i>Accent on Science</i>	3.91	1.06	0	1.86	17
<i>Discovery in Science</i>	2.51	1.77	.36	1.64	15
McGraw Hill <i>ESS</i>	9.50	17.67	13.09	13.21	121
<i>Gateways to Science</i>	2.51	2.83	1.09	2.18	20
<i>People, Concepts, Processes</i>	.28	1.77	.36	.76	7
Rank McNally <i>Learning by Investigation</i>	4.47	.71	5.09	3.49	32
SCIS	8.10	3.18	15.27	8.62	80
Silver Burdett <i>S:UYE</i>	8.10	20.85	9.09	12.34	113
<i>SPIES</i>	.56	0	0	.22	2
Teacher Development <i>System Development</i>	7.54	8.13	4.73	6.88	63
	0	1.06	6.91	2.40	22
UNI <i>SCOPES</i>	1.40	0	0	.55	5

Understanding Your Environment with five percent for K-3 and ten percent for 4-6, and 3) Laidlaw's *Exploring Science* with five percent for K-3. In the Iowa study, when grade level and school size are combined, the order of use is: 1) Harcourt, Brace with 12.55 percent, 2) Silver Burdett with 12.34 percent, 3) Heath with 9.72 percent, and 4) Laidlaw with 9 percent. The percentages of use by Iowa schools are quite close to the percentages of the national survey.

Many schools use more than one program or have different programs throughout the grade levels. In the 190 responding schools, 75 or 39.47 percent used one program throughout all grade levels. The program most often used as a single program was Silver Burdett's *Science: Understanding Your Environment*, followed closely by Harcourt, Brace's *Concepts in Science*. Weiss (1978:89) reported that 46 percent in grades K-3 and 56 percent in grades 4-6 used a single textbook program. This is somewhat higher than the 25.26 percent for Iowa.

The percentages of Iowa schools making new science adoptions during the past five years (1975-80) included about 57 percent of the first grade classrooms, 59% of the second grade classrooms, 60% of the third grade classrooms, 56% of the fourth grade classrooms, 60% of the fifth grade classrooms, and 54% of the sixth grade classrooms. The percentage of new science adoptions between 1971 and 1975 ranged from 29% for third grade classrooms to 36% for sixth grade classrooms. Sixteen percent of the 190 schools responding indicated there had not been an adoption since 1965. The data appears to indicate that Iowa schools do slightly better than the nation as a whole in adopting new science series. Weiss (1978:94) listed 19% of the schools in grades K-3 and 24% of the schools in grades 4-6 had textbooks with copyright dates before 1971.

Table IV compares the number of minutes per week spent teaching science in Iowa with other studies found in the literature.

Table IV: Number of Minutes per Week Spent in Teaching Science in Elementary Schools*

	Grade Level					
	1	2	3	4	5	6
Blackwood (1961-2)	57	59	72	85	100	110
Andrew (1977-78)	103	101	118	141	182	193
Weiss (1977)	(-----85-----)			(-----140-----)		
Anderson (1979-80)	44	51	66	101	106	115

* (Blackwood, 1965:180, Andrew, 1980:105; Weiss, 1

It was found that the amount of time spent teaching science increases with grade level for all surveys. The data indicates that Iowa elementary school children receive considerably less instructional time in science than students in other states. Another item of concern is a tremendous variation reported by teachers in the amount of time spent teaching science. Over 15% of the teachers in grades 1 and 2 do not teach ten

hours of science per year and the majority teach less than 30 hours of science per year. The data indicates that approximately 10 percent of the teachers in grades 3 and 4, and 5 percent of the teachers in grades 4-6 do not teach ten hours of science per year.

Averages indicate schools from district enrollments of 0-999 spend the largest amount of time teaching science when comparing grades 4-6. Districts of 5,000 and more spend the largest amount of time when comparing grades 2-3.

The results of the survey indicate that the greatest number of Iowa teachers spend from 21-40% of their science time using "hands-on" instruction. Helgeson, et. al., (1978:81) indicated in K-3 seven percent of the teachers use manipulatives daily while in grades 4-6, eleven percent use manipulatives daily. The data from the survey indicates the percentage of Iowa teachers that spend from 81-100% of their science instruction with hands-on science by grade level is: grade 1, 12.8%, grade 2, 10.6%, grade 3, 10.2%, grade 4, 13.5%, grade 5, 12.3%, and grade 6, 12.2%. The respondents who indicated a high level of activity emphasis were essentially all users of SCIS, SAPA, or ESS. One textbook series, the Houghton-Mifflin MAPS program, reported significantly higher percentages of hands-on time than other textbook series.

Table V indicates the percent of classrooms teaching environmental education, the percentage of classrooms using outdoor experiences and the average time spent teaching environmental science in Iowa Elementary Schools.

Table V: Distribution Representing the Component of Science Associated Instructional Time Spent with Environmental Education in a Selected Sample of Iowa Elementary Schools

Grade	Percentage of Classrooms Teaching Environmental Education	Percentage of Classrooms Using Outdoor Experiences	Average Time Spent in Weeks	Average Time Spent in Hours
1	75.2	45.9	5.6	7.1
2	81.1	37.8	4.9	7.5
3	75.5	40.3	4.7	8.1
4	79.6	52.7	6.0	11.9
5	78.8	46.4	4.5	12.2
6	88.5	66.2	5.3	13.6

Between 75 and 89 percent of Iowa elementary classrooms include science as a part of the environmental education curriculum. The percentage of classrooms using outdoor field experiences as a part of their program varies between 37 and 66 percent. The amount of time devoted to environmental education increases by grade level from 7.1 hours in grade 1 to 13.6 hours in grade 6. The results of the survey indicate that Iowa students are getting exposed to environmental issues in the

elementary grades and many of them receive outdoor experiences at each grade level.

Conclusion

The following conclusions were reached as a result of the study:

1. ESS, SCIS, and SAPA do play an important role in elementary school science in Iowa. They are used by approximately one-third of the classrooms in grades 1-6.
2. About 40 percent of Iowa elementary schools use a single program throughout the grades. Of this percentage, approximately 15% are activity based and 25% are textbook based.
3. There is a great variation in the amount of time spent in teaching science in Iowa elementary schools. It appears that science is not considered a basic at the primary level in that over half of the Iowa primary teachers indicated they spend less than one hour per week teaching science. Overall, Iowa teachers spend less time teaching science than the national average.
4. Iowa, according to survey comparisons, allots more time to hands-on activities than the national average. This may be related to a higher level of utilization of NSF activity-based programs in Iowa.
5. Textbook users spend much less time on "hands-on" science than do users of NSF sponsored materials.
6. Environmental education is included in the elementary science programs in a majority of Iowa schools. Nearly half of the classrooms provide outdoor experiences for their students.

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