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WHAT'S HAPPENING IN ELEMENTARY SCHOOL SCIENCE

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Considerable confusion exists as to what is happening in science teaching in the elementary grades. In 1989, the author undertook a study to determine the amount of time currently spent teaching science, teacher attitudes toward science teaching and student attitudes toward science in elementary classrooms in Iowa.

After examining recent national studies, Robert Yager (1989) reported some alarming conclusions:

1. Student attitudes about science classes become more negative the longer a student is enrolled.
2. Student perceptions of their science teachers are more negative each year the student advances through the school program.
3. Students become less curious as they experience more science.

A continuing concern among science educators is the amount of time devoted to science instruction in the elementary grades and speculation that elementary teachers often turn off their students to future science learning. Speculation suggests this is a result of inadequate, perhaps inappropriate, teacher preparation and a general lack of interest in science as a teaching area. An additional concern is evidence of declining student interest and enthusiasm for science compared to other subjects in the curriculum.

The importance of the teacher dimension is well documented in science education literature. Taltan and Simpson (1987) reported: Student feelings about the emotional climate and physical environment of the classroom, activities within the science classroom and student interactions with their classmates have strong influences on student attitudes toward science throughout the school year.

In an assessment of student perceptions of their teachers, Yager (1983) reported that elementary teachers make science more exciting, make students feel more successful and encourage students to share ideas more often than their secondary counterparts. A study of 9-, 13- and 17- year-olds and adults indicated declining attitudes and interest as student age increased. In a follow up study, Yager (1989) said 68 percent of the students report that their science teachers make science exciting in the elementary grades; it falls to 56 percent at the junior high level and to 45 percent in senior high schools. The willingness of the teacher to admit to not knowing is even more dramatic. Forty-eight percent of the 9-year-old students reported that their teachers admit-

ted to not knowing. This declined to 23 percent of the 13-year-old students and down to 15 percent for 17-year-olds. However, in the same article, when comparing responses of students in exemplary centers of science, student attitudes remain fairly level with the most positive attitudes being expressed by 13-year-old students.

The Investigation

The author used two separate groups in collecting data for his recent study. The time allocation study included a review of previous studies and data collected from a survey conducted by Norton in 1987. The data is presented in Tables 1 and 2. The teacher attitude and student survey data were collected from the population of teachers and students of a single school district. This data is presented in Tables 3 and 4.

Table 1

Comparison of Number of Minutes per Week Spent in Teaching Science in Elementary Schools*

	Grade Level					
	1	2	3	4	5	6
Blackwood (1961-62)	57	59	72	85	100	110
Weiss (1977-78)	(----	85	---	(---	140	---
Anderson (1979-80)	44	51	66	101	106	115
Norton (1987)	65	73	95	110	148	156

*Blackwood (1965, p. 180) Weiss (1978, p.51) Anderson (1980, p. 54) Norton (1987)

The survey on time allocation represents a random sample of 302 schools from the 926 elementary schools listed in the 1987-88 *Iowa Educational Directory*. One teacher from each grade (levels K-6) of the sample population was mailed a questionnaire. Responses were received from 164 buildings, yielding a return of 54.3 percent.

Table 1 indicates the number of minutes per week teachers reported teaching science in four studies over the past thirty years. The data appears to indicate that more time is now being spent teaching

science than noted in the Blackwood (1962) or Anderson (1980) surveys. The data from a national survey by Weiss (1978) showed time allotments that nearly approximate the results from this survey. (The Blackwood and Weiss figures are from national surveys; the Anderson and Norton surveys are responses from elementary classroom teachers in Iowa.)

A New Hampshire survey conducted by Andrew (1980) showed that time spent on science varied a great deal from classroom to classroom. This is consistent with the Iowa data. Approximately 14 percent of the teachers in grades 1 and 2 reported teaching less than 1/2 hour of science per week. The distribution of results from this survey is shown in Table 2.

Table 2

Percentage Distribution of Iowa Classrooms in Which Science Is Taught for a Certain Number of Hours per Week

Grade	N	Hours Spent in Science Per Week				
		0	0-1/2	1/2-1 1/2	1 1/2-3	3+
1	150	1.33	12.67	67.33	18.00	0.66
2	158	1.27	12.66	56.33	27.22	2.53
3	147	0.00	6.80	35.37	53.74	4.08
4	148	0.00	4.73	14.19	77.03	4.05
5	136	0.00	1.47	9.56	44.85	44.12
6	86	1.16	1.16	4.65	40.70	52.33

The teacher and student survey data were collected from 120 K-6 classroom teachers with 2750 students in an Iowa school district with a community population of approximately 30,000. The teachers were generally well experienced. The district had limited teacher turnover during the past decade due to an approximate 30 percent decline in school enrollment. Many of the teachers had gone through the cycle of implementing an activity-based program (ESS) in the early 1970's followed by a textbook adoption (Merrill) in 1981. The school district has a K-6, 7-9, 10-12 structure. The primary organizational pattern in each of seven elementary schools is self-contained classrooms, although there is some shared instruction in the upper grades. The teacher survey included three questions and a forced ranking of subjects taught by the classroom teacher. The student survey used a

three-part Likert type scale. Primary grade students responded to happy-, neutral- and sad-faced diagrams for the ten subjects included in their educational program. Intermediate grade level students responded to the statements: better, about the same or less well.

Although few teachers prefer teaching science over other subject areas, they did not indicate a dislike for teaching science. The data in Table 3 is from a forced ranking of seven subjects assigned to the regular classroom teacher. Art, music and physical education are taught by specialists and, therefore, were not included in the survey.

Table 3

**Ranking of Subjects According to
How Well Teachers Enjoy Teaching Them**

Subject	Grade Level						Mean	Rank
	1st	2nd	3rd	4th	5th	6th		
Math	2.75	1.85	2.15	2.00	2.40	1.28	2.05	1
Reading	1.33	1.45	2.05	2.95	1.90	3.37	2.18	2
Writing	2.90	4.30	4.10	5.10	4.85	4.23	4.23	3
Science	4.70	4.15	4.80	3.95	4.15	4.38	4.35	4
English	4.70	4.70	3.90	4.15	4.60	4.53	4.45	5
Social Studies	6.20	6.40	6.05	3.10	4.20	4.62	5.10	6
Spelling	5.20	4.30	4.35	5.55	5.90	5.75	5.15	7

N = 108

Note: 1=best; 7=least

The data indicate teachers prefer to teach the basics--math, reading and writing. However, when comparing a ranking of mean scores, science ranks the highest of the remaining subjects. When asked, "Compared to other subject areas, I like teaching science . . ." the following teacher responses were received: better 7.7% (8); about the same 63.5% (66); less well 28.8% (30).

The results of the survey indicate that the teachers do not feel that their preparation in science is equivalent to that in other subject areas.

When asked, "Compared to other subjects, I feel my preparation in science is . . ." the following responses were received: better 3.8% (4); about the same 34.6% (36); less well 61.6% (64).

Teachers were asked to share perceptions as to how well their students liked science. When asked, "Compared to other subjects, I perceive that the students I teach like science . . ." the following teacher responses were received: better 52.9% (55); about the same 41.3% (43); less well 5.8% (6).

Table 4 indicates reactions from a sample of 1410 students in grades K-6. The data indicate that students like science better than most of the core subjects. The ranking indicates that physical education and art are the most liked with social studies and English being the least liked subjects in the curriculum. Science was ranked fifth; however, the composite scores of the subjects ranked 3-8 were extremely close.

Conclusions

The survey results appear to indicate that elementary teachers in Iowa are increasing the amount of instructional time for science. When compared to the survey conducted by Anderson in 1980, the time for science showed an increase at each grade level with the greatest increases in grades 5 and 6. This might be considered with optimism by science educators hopeful of increased attention to science in elementary classrooms.

Results from this survey indicate that elementary teachers in general are not excited about teaching science; however, a majority feel about the same toward teaching science as other areas in the curriculum. One may conclude that the lack of attention given to science may not be associated with negative attitudes toward teaching the subject. Other influences such as a perceived need to emphasize basic skills may be having a significant impact on the instructional time devoted to science in the elementary grades. Teacher preparation continues to be a major concern. The survey results indicate that over 60 percent of the sample feel less well prepared to teach science than other subjects they are expected to teach. This may be because science is a broad field with a rapidly expanding knowledge base, or because there is not a defined, recommended body of content and/or process skills which should be mastered by students at each grade level. In any case, there appears to be a need for continuing efforts to provide both pre-service and practicing teachers with opportunities for continuing education in the area of elementary school science.

The survey results indicate science fares well in terms of student interest both as perceived by teachers and by students. Although students do not rate it as high as art and physical education, it is among the most preferred of the academic core subjects. The data indicate

Table 4**Ranking of Subjects According to How Well Students Enjoy Taking Them**

Subject	Grade Level							Mean	Rank
	K	1st	2nd	3rd	4th	5th	6th		
P.E.	1.2	1.1	1.1	1.2	1.2	1.3	1.4	1.20	1
Art	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.36	2
Math	1.4	1.5	1.3	1.6	1.6	1.4	1.6	1.49	3
Creative Writing	1.3	1.4	1.4	1.5	1.4	1.9	1.6	1.50	4
Science	1.4	1.4	1.5	1.7	1.6	1.5	1.6	1.53	5
Cursive	---	1.5	1.4	1.2	1.5	1.8	1.9	1.55	6
Reading	1.4	1.7	1.4	1.5	1.7	1.7	1.6	1.57	7
Music	1.4	1.3	1.4	1.9	1.5	1.7	1.9	1.59	8
Social Studies	---	1.7	1.7	1.8	2.1	1.8	1.7	1.80	9
English	---	1.8	1.7	2.0	2.2	2.1	2.0	1.97	10
N	165	342	319	164	99	124	197		

N TOTAL = 1410

Note: 1= best; 3= least

that, comparatively, science maintains a stable ranking relative to other subjects in the curriculum. Only slight declines were shown in overall student attitude toward science when compared to other subjects as students progressed from kindergarten through grade six.

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