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A Study of Class Size in  
Iowa Public Schools  
1992-1993

Iowa Department of Education

March 30, 1993

# A STUDY OF CLASS SIZE IN IOWA PUBLIC SCHOOLS

## Executive Summary

Research on class size is often inconclusive and controversial. Part of the controversy stems from the variety of ways class size is measured or estimated. The most accurate measure of class size is based on the actual number of students in a typical classroom. The purpose of this study was to determine an accurate measure of class size in Iowa schools. In addition to precision, the results provide an opportunity to determine whether the student/teacher ratio, as reported by the Iowa Department of Education, may be used to estimate class size.

The study focused on classrooms in grades K-6 that were self contained and classrooms in grades 9-12 in core subject area courses required by state curriculum standards. An elementary classroom was considered self contained if students spent a major portion of the school day or most subjects with the same teacher. The secondary sample was selected from courses within eight curriculum areas: mathematics, science, English/language arts, social studies, health/physical education, fine arts, vocational education, and foreign language. Specific courses within each curriculum area were selected if course titles were likely to be consistent across school districts, if the courses represented the scope of the content within the subject area, and if the courses represented a range of academic levels within a subject area.

All public school building principals were asked to submit enrollment information by course (secondary), or teacher name or room number (elementary). Returns for both the elementary and secondary levels were sufficient to interpret the results as representative of school districts across the state. While breakdowns of average class sizes by district enrollment size categories may be interpreted with confidence at the elementary level, returns for some categories within the secondary level were just below minimum standards for confident interpretation. Therefore, analyses of secondary data by size category should be interpreted with caution.

Results of this investigation suggest that class sizes in Iowa schools vary with grade level, total district size, and curriculum area. Average class sizes increased with the size of the district and with successive grade levels in elementary grades (Table 1).

size.

Table 2. Average Student/Teacher Ratios by District Enrollment Size Category (Grades 1-6)

Grade	<250	250-399	400-599	600-999	1000-2499	2500-7499	7500+	State
1	12.1	15.3	15.2	16.6	16.8	19.4	17.5	17.0
2	12.2	16.0	15.6	16.8	17.4	19.8	17.8	17.4
3	11.6	15.5	15.8	17.5	17.7	20.2	18.3	17.8
4	12.8	16.5	16.3	17.6	18.1	21.0	19.2	18.3
5	12.6	15.1	16.9	17.3	17.7	19.8	19.2	18.0
6	11.5	14.8	16.9	17.4	17.9	19.5	18.3	17.6

## A STUDY OF CLASS SIZE IN IOWA PUBLIC SCHOOLS

Research on class size is often inconclusive and controversial. Part of the controversy stems from the variety of ways class size is measured or estimated<sup>1</sup>. Student to professional ratios are often used but are inaccurate because they include professional staff who may not teach; such as counselors and consultants. Average pupil teacher ratios are also not accurate because not all teachers have classroom responsibilities; such as speech pathologists, and special education teachers. The most accurate measure of class size is based on the actual number of students in a typical classroom. The purpose of this study was to determine an accurate measure of class size in Iowa schools. In addition to precision, the results provide an opportunity to determine whether the student/teacher ratio, as reported by the Iowa Department of Education, may be used to estimate class size.

### METHOD

#### Sample Design

This study focused on classrooms in grades K-6 that were self contained and classrooms in grades 9-12 in core subject area courses required by state curriculum standards. The elementary sample was drawn from the population of school districts that had grades K-6 (two districts sent their elementary grades 6 to another district via a whole grade sharing arrangement). All districts were assumed to have self contained elementary classrooms to provide the most conservative estimates. A classroom was considered self contained if students spent a major portion of the school day or most subjects with the same teacher.

The secondary sample was drawn from the population of districts that offered high school programs (364). Specific courses were selected from eight curriculum areas: mathematics, science, English/language arts, social studies, health/physical education, fine arts, vocational education, and foreign language. Specific courses were selected within each curriculum area on the basis of the following criteria:

- 1) the likelihood that course titles would be consistent across school districts to assure that comparisons of like courses were being made;
- 2) selected courses represented the scope of content within the subject area; and
- 3) courses represented a range of academic levels within a subject matter.

<sup>1</sup> Odden, A. (Summer, 1990). Class size and student achievement: Research based policy alternatives. Educational Evaluation and Policy Analysis, 12 (2), 213-227.

### Class Size by Grade

Average class sizes tended to increase slightly with each successive grade level (Table 2). The range of class sizes appeared to vary considerably within each grade level. Class sizes in approximately one half of the sample clustered within 6 students of the average class size.

Table 2. Distribution of Class Sizes by Grade Level

Grade	Number of Classrooms	Average	Median*	IQR**	Minimum	Maximum
K	1107	20.7	21	17-23	6	38
1	1124	21.0	21	18-23	4	33
2	1123	21.3	22	18-23	6	37
3	1056	22.3	23.5	19-24	7	33
4	1019	22.8	23	20-25	7	33
5	888	22.9	23	20-25	6	35
6	421	23.5	24	20-26	9	36

\* Class size at which 50% fell above and below. \*\*Range in which 50% of the class sizes fell.

### Class Size by Enrollment Category

Average class sizes tended to increase with successive grade levels in districts of all sizes (Table 3). The results also demonstrate that average class sizes for a given grade level tended to increase with the size of the school district. Notably smaller class sizes occurred consistently in districts with less than 250 total enrollment. Highest average class sizes tended to occur in districts with enrollments between 2500 and 7499 inclusive.

Table 3. Average Class Sizes by District Enrollment Size Category

Grade level	<250	250-399	400-599	600-999	1000-2499	2500-7499	7500+	State
K	13.8	20.4	18.9	20.1	20.6	22.5	21.8	20.7
1	15.0	19.8	19.4	20.5	20.9	23.0	21.9	21.0
2	14.8	19.7	19.3	20.6	22.3	23.1	21.9	21.3
3	14.8	20.5	19.6	22.0	23.0	24.4	23.1	22.3
4	16.1	21.0	20.8	22.6	23.0	24.8	23.7	22.8
5	17.6	20.3	21.1	22.7	23.4	25.1	23.7	22.9
6	16.3	22.3	20.9	23.5	25.1	25.3	25.5	23.5

Science

There was also considerable variation in the number of course offerings and the number of sections offered in science as reported by respondents. Average class sizes tended to increase with the size of the district (Table 6). The greatest variation in average class size across districts occurred in physics classes. No average class size exceeded 24 students. The smallest average class sizes tended to be in physics courses, the largest average class sizes occurred in biology classes.

Table 6. Average Class Sizes for Science Courses by District Enrollment Size Category

Science courses	<250	250-399	400-599	600-999	1000-2499	2500-7499	7500+	State
General science	9.7	12.5	17.7	18.3	20.4	23.0	14.7	19.4
Biology	16.3	14.9	17.0	19.1	21.1	23.5	23.9	20.6
Chemistry	10.1	13.3	14.3	15.5	17.9	21.6	23.1	17.9
Physics	5.8	8.4	10.4	12.5	14.7	20.7	23.7	15.4

English/Language Arts

Average class sizes for all courses in this area increased steadily between the smallest and the largest districts (Table 7). One average class size exceeded 25 students and about 25 percent of the average class sizes were 15 students or below. Averages for 9th and 10th grade English courses were similar across the state. There was greater variation in the averages across districts for composition and American literature.

Table 7. Average Class Sizes for English/Language Arts Courses by District Enrollment Size Category

Eng./L.A. Courses	<250	250-399	400-599	600-999	1000-2499	2500-7499	7500+	State
English grade 9	14.1	18.8	18.2	20.1	21.6	23.1	24.2	21.4
English grade 10	15.7	17.3	17.6	19.9	21.6	22.6	24.8	20.9
Comp.	6.6	13.3	13.5	17.5	18.1	20.6	22.9	18.4
American lit.	10.0	14.3	14.9	17.3	20.2	23.7	27.1	20.2

## Fine Arts

Courses selected for study in this area were sampled from visual arts (general art, design, drawing/painting, and photography), and performing arts (general music, band, and vocal music). While no pattern was evident in average class sizes across courses, there was a general tendency toward increased average class sizes with increased enrollments (Table 10). While three of the averages reported for visual arts were 20 students or more (11%), more than 75 percent were 15 students or less. As expected, average class sizes for performing arts were larger than courses in other curriculum areas. In band, averages increased steadily between districts with fewer than 250 students and districts with 2500-7499 students. Average class sizes in vocal music peaked in districts with 600-999 students then gradually decreased.

Table 10. Average Class Sizes for Fine Arts Courses  
by District Enrollment Size Category

Fine Arts Courses	<250	250-399	400-599	600-999	1000-2499	2500-7499	7500+	State
General art	6.3	8.8	10.3	11.2	13.7	19.4	17.1	12.7
Design	10.0	10.6	8.9	10.1	14.2	13.2	21.5	12.1
Drawing/painting	--	7.5	10.5	11.9	13.5	20.8	24.1	12.2
Photography	4.5	8.4	10.7	9.5	13.8	14.9	17.3	13.4
General music	--	--	6.3	14.0	2.9	18.9	28.0	14.6
Band	21.7	29.5	41.9	55.8	57.0	59.3	22.9	50.9
Vocal	25.3	35.6	42.3	52.6	48.3	46.7	39.4	45.9

## Foreign Language

Enrollments in French and Spanish classes were used to represent average class sizes for foreign language courses. The results indicate that average class sizes tended to decrease in upper level courses (Table 11). While only 2 of the course averages were greater than 25, approximately 51 percent were 15 or less. The results also indicate a general tendency for average class size to increase with the size of the school district.

## SUMMARY AND IMPLICATIONS

### Summary of Findings

The results of this investigation suggest that class sizes in Iowa schools vary with grade level, total district size, and curriculum area. Average class sizes increased with the size of the district and with successive grade levels in elementary grades. At the secondary level, class sizes tended to decrease in higher level courses in subjects such as mathematics, science, and foreign language. With the exception of band and vocal music, no average class size for the state exceeded 25 students. Among size categories, exceptions occurred in vocal music courses (where the average class size exceeded 25 students in each size category; and band (where the average class size exceeded 25 students in all but the largest and smallest districts). Exceptions also occurred consistently in the largest school districts. In this size category, average class sizes were greater than 25 in algebra (25.3), geometry (25.3), American literature (27.1), economics (25.3), American history (27.6), general physical education (31.6), general music (28.0), vocal music (39.4), Spanish I (26.9), and Spanish II (25.5) courses. Approximately 46 percent of the average class sizes for the grades and courses reported across district size categories were less than 15 students.

### Student/Teacher Ratio as an Estimate of Class Size

The student/teacher ratio reported by the Iowa Department of Education defines "student" as the head count of all students enrolled at a given building as of the third Friday in September. The number of "teachers" in the equation is based on the total full time equivalent (FTE) staff assigned to teaching responsibilities in each grade. It is determined by counting the number of full time, and the proportion of part time, staff assigned to particular responsibilities. In the annual reporting cycle, building officials are instructed to distribute the portion of FTE that represents teaching assignments across the grades served, by dividing the calculated FTE by the number of grades taught. The student/teacher ratio is determined by dividing the number of FTEs into the student head count for each grade.

Table 13 represents the 1992-93 average student/teacher ratios for the elementary grades examined in this study (kindergarten was omitted because of the variety of attendance alternatives available to school districts). Comparing these results to the results of the class size survey (Table 3) demonstrates that student/teacher ratios were lower than reported average class sizes at each grade level and across district size categories. The average difference between the class size and the student/teacher ratios was 4.59 students (Table 14). Because student/teacher ratios are not available by subject area, a similar comparison was not possible for secondary classes. However, these results indicate that