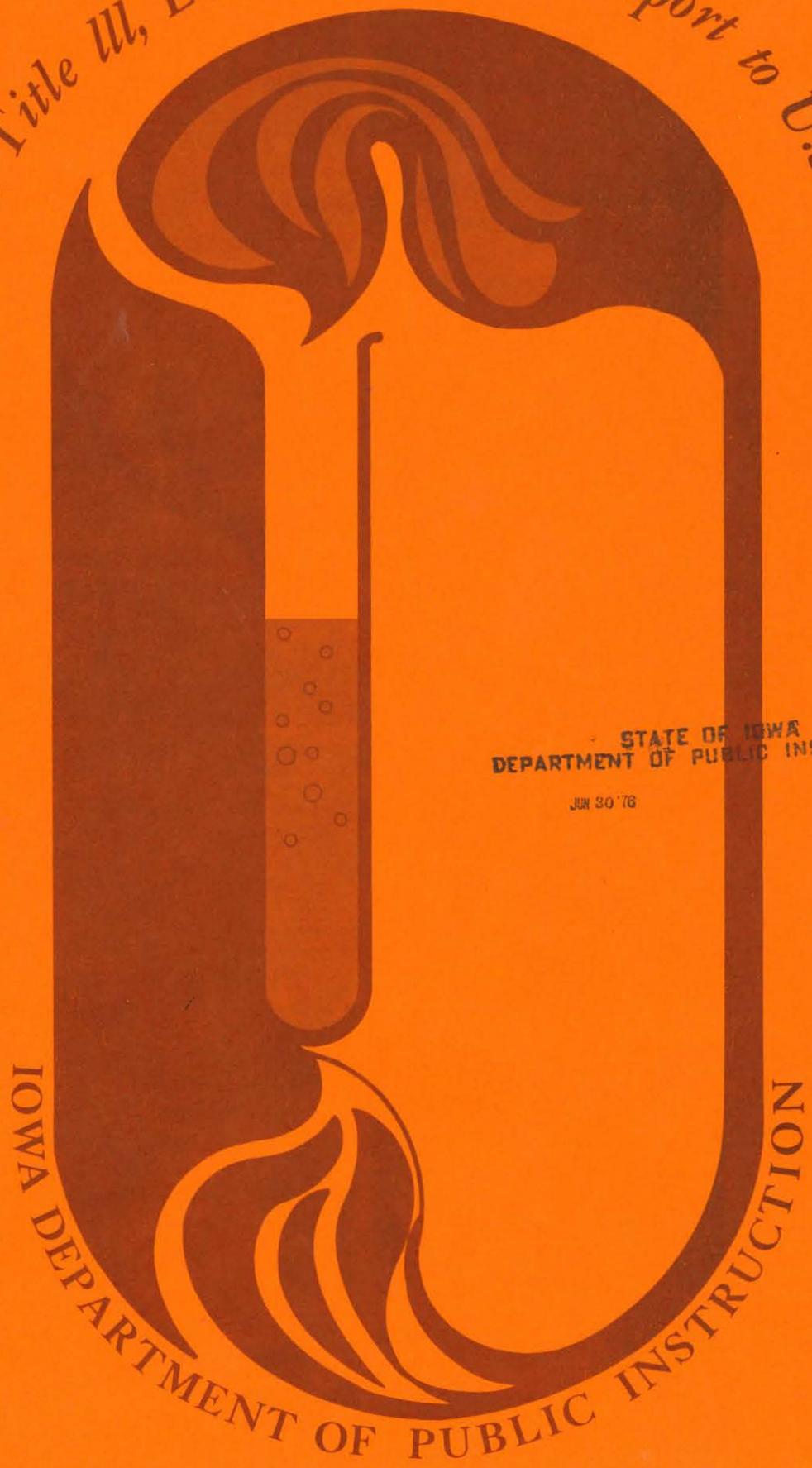


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*Iowa Title III, ESEA Assessment Report to U.S.O.E.*



STATE OF IOWA  
DEPARTMENT OF PUBLIC INSTRUCTION

JUN 30 '76

IOWA DEPARTMENT OF PUBLIC INSTRUCTION

PLANNING, RESEARCH, AND EVALUATION DIVISION

3200-48377-1/72

IOWA TITLE III, ESEA ASSESSMENT REPORT TO U.S.O.E.

Prepared by the  
Planning, Research, and Evaluation Division

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State of Iowa  
DEPARTMENT OF PUBLIC INSTRUCTION  
Des Moines, Iowa  
January, 1972

## Introduction

The following dialogue is intended to outline the major points of the Iowa Department of Public Instruction's efforts to assess a representative sample of public school pupils in grades four, seven, and twelve. Assessment activities were conducted during the 1970-71 school year in a total of 83 Iowa school districts. (See Appendix A.) The assessment was confined to the subject matter area of science and the affective areas of attitude toward school and self concept.

Funds for assessment activities were made available through federal assistance under Title III of the Elementary-Secondary Education Act of 1965. Such an assessment is required for a state's eligibility under Title III, ESEA.

Science exercises used in the assessment were items which had been released through the National Assessment of Educational Progress.<sup>1</sup> The two affective measures, attitude toward school (School Sentiment Index) and self concept (Self Appraisal Inventory), were prepared by the Instructional Objectives Exchange<sup>2</sup> for use by states in conducting assessments.

Public school involvement was secured on a voluntary basis and required a minimum of local school effort. Assessment proctors were trained by Department of Public Instruction personnel and were paid from federal funds. The proctors administered the three measures in schools throughout the state during March and April of 1971.

Data collected from assessment activities were processed by the Department of Public Instruction and Iowa State University.

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<sup>1</sup>NAEP was formed in an effort to provide a source of comprehensive, census-like data regarding the educational progress of Americans. It is now a major project of the Education Commission for the States. (ECS)

<sup>2</sup>Instructional Objectives Exchange (IOX) is a non-profit organization under the direction of W. James Popham of UCLA. IOX has been a leader in the development of criterion-referenced measures and has developed, under an eighteen-state compact, a series of criterion-referenced measures for use in conducting statewide assessments.

Techniques used to gather data were developed so that the status of public school pupils in specific assessment areas would reflect the status of pupils throughout the state. Therefore, information derived from the assessment cannot be interpreted as representative of a particular school district's status. Only as data from participating districts is combined can information concerning the total state be useful.

It is hoped that this report on pupil status in the categories of science, attitude toward school and self concept will provide some insight regarding the status of education throughout the state and perhaps also provide ideas for educational planning which could be useful in providing a more fruitful environment for education.

#### Definition of terms

Some common understanding of terminology used throughout this report is in order. The term assessment is defined as a technique used to gather information related to specific educational goals and objectives. An assessment is intended to reflect the present status of the learner in terms of stated goals and objectives which are being pursued.

An educational need is discovered after information gained from an assessment is compared to desired learner status. A need, then, is defined as the discrepancy between the present status of the learner and the desired goals and objectives established for the learner (assuming that the present status of the learner is less than the desired status inferred from the educational goals and objectives).

Reference to criterion-referenced measures as opposed to norm-referenced measures is also made within the report. The term criterion-referenced measure implies that assessment items used to determine the present status of

pupils with respect to certain goals and objectives are closely related to a criterion and items included within assessment measures are selected on this basis.

National performance level is a term which is arrived at through averaging percentages of responses to individual science items for pupils across the nation. In other words, the performance level for a given question represents the average of all pupil responses to that question.

When comparisons of Iowa pupils at a given grade level are made with the national performance level, it should be noted that national performance levels are based on age groups 9, 13, and 17, whereas the sample of Iowa pupils was drawn in terms of grade levels 4, 7, and 12. Although the vast majority of pupils at these three grade levels probably meet the criterion ages of the national performance, the validity of such comparisons must remain somewhat suspect.

#### Instrumentation

Instrumentation employed in the assessment can be categorized into three areas: self concept, attitude toward school, and science achievement.

Under an eighteen-state compact, the Instructional Objectives Exchange (IOX) was contracted to develop instruments which could be used to assess self concepts and attitudes toward school of groups of pupils.

The approach used by IOX to develop these measures was predominantly a criterion-referenced approach to measurement. Separate instruments were developed for intermediate (grades 3-8) and secondary (grades 9-12) pupils.

The intermediate measure, Self Appraisal Inventory Intermediate Level (Self Concept) consisted of eighty statements to which pupils responded either true or false. The inventory was composed of four separate subscales: general, family, peer group, and scholastic.

The secondary grade level measure, Self Appraisal Inventory Secondary Level (Self Concept), also consisted of eighty statements.

Pupils marked their responses to each statement according to the following scale:

a) strongly agree b) agree c) disagree d) strongly disagree

The subscale composition was identical to the intermediate level instrument.

Attitude toward school measures were also developed by the IOX. The approach used to develop these measures was similar to that used to develop self concept measures. Again, separate measures, one for the intermediate level and one for the secondary level, were developed. Subscales which composed these measures included learning, school social structure, teacher, peer group, and general.

The assessment measures from the National Assessment of Educational Progress were subjected to a reliability check to determine appropriateness of their use. Reliability coefficients obtained using the Cronbach Alpha technique are reported below for each of the three grade levels along with corresponding formula.

4th Grade Science Instrument

reliability coefficient

$$r = .848$$

7th Grade Science Instrument

reliability coefficient

$$r = .799$$

12th Grade Science Instrument

reliability coefficient

$$r = .847$$

Formula Applied

$$r_{kk} = \text{Coefficient Alpha (Cronbach } \alpha) = \frac{K\bar{r}_{ij}}{1-(K-1)\bar{r}_{ij}}$$

Where K = number of items in test

$\bar{r}_{ij}$  = Mean correlation among test items

## Administration of instruments

All questions, as well as responses, on the NAEP instrument were taped to standardize administration procedures and to accommodate different levels of reading ability. Instruments were then administered to pupils in groups of approximately twelve. Pupils responded by marking answers directly in their exercise booklets. This was done to reduce the possibility of transformation errors.

The four affective instruments, School Sentiment Index Intermediate Level, School Sentiment Index Secondary Level, Self Appraisal Inventory Intermediate Level, and Self Appraisal Inventory Secondary Level, were administered prior to the NAEP science exercises to prevent carryover of negative feelings which may have arisen from pupils' inability to respond to science items.

Directions for the affective measures were given on audio tape but items within the measures were read silently by pupils to promote a feeling of confidentiality.

A pilot study was conducted to identify problems in administration which might have resulted from use of the taped measures or from the format of the exercise booklets. Thirty pupils from a total of three grade levels, four, seven, and twelve, were assessed in three one-hour sessions. At the end of each exercise session, pupils were engaged in discussion to seek their reactions to such factors as pacing of the questions, clarity of instructions, marking of responses, and length of sessions.

In compiling pupil reactions from each of three discussion sessions and from auditing exercise booklets, no major problems related to the measures or methods used to administer the measures were noted.

During the actual assessment, assessment sessions were held outside pupils' regular classrooms and in the absence of classroom teachers and building administrators. Pupils responded anonymously to each of the three measures.

#### Sample design

The universe for this sample consisted of all full-time pupils enrolled in the public schools of Iowa in grades four, seven, and twelve. The universe excluded special education students and private school students attending public schools on a shared-time basis.

A stratified, multistage, cluster sample of pupils was selected in order to conduct the assessment. In designing the sample, three zones were delineated: an urban zone, a suburban zone, and the remainder of the state.

The urban zone consisted of school districts within the seven Iowa cities having a population of 50,000 or more. These were Cedar Rapids, Council Bluffs, Davenport, Des Moines, Dubuque, Sioux City, and Waterloo. Within this zone, each city was sampled independently. Thus, for sampling purposes, each constituted a separate stratum. The suburban zone consisted generally of the school districts located within the metropolitan areas associated with the seven cities in the urban zone except that only the western halves of Pottawattamie and Woodbury counties were included in the suburban zones for Council Bluffs and Sioux City. Within this zone, a sample of schools was selected. This entire zone constituted a single stratum.

The remainder of the state (Other) was divided into five geographical areas formed by combining adjacent Area Vocational School Districts. (See Appendix B)

According to annual data compiled by the Iowa State Department of Public Instruction, the total enrollment of black pupils in both public and non-public schools during the 1969-1970 school year was 10,196. A total of 8,706, or 84.4 percent of these pupils, were concentrated in the seven largest cities. Consequently, it was decided to limit the comparisons between black and non-black pupils to these cities. Comparisons would then be made between the special sample of black pupils and the sample of non-black pupils drawn from the same cities. Later, this plan was modified by dropping Dubuque and Council Bluffs from the special sample. Dubuque had almost no black pupils and Council Bluffs had very few. The sampling rates for the special sample of black pupils were set at each grade level to yield a total of approximately 100 pupils. These rates were one out of four, one out of five and five-tenths, and one out of seven for grades twelve, seven, and four, respectively.

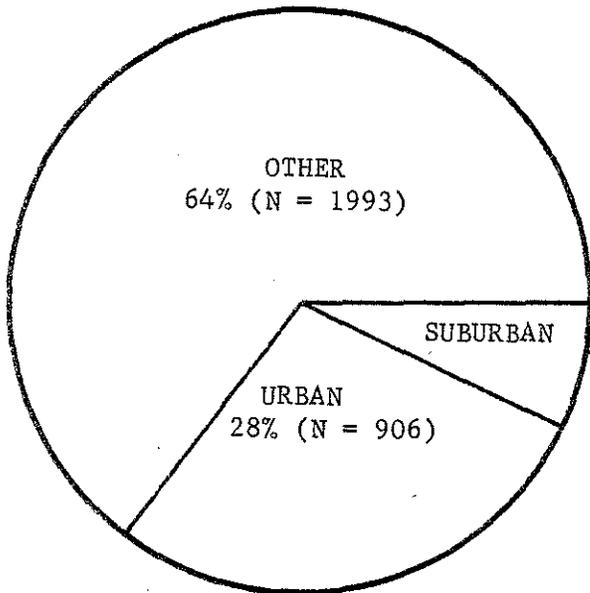
For the basic sample from the entire state, the sampling rates were set to yield a total of about 1,000 pupils in each grade level. This number represented an amalgam of the limits imposed by the resources available and the desire of the researchers to be able to make reliable comparisons among various subcategories defined by such characteristics as sex, educational level of parent, race, and grade level.

The rates for the basic sample were set at one out of 46, one out of 48, and one out of 49 in grades twelve, seven, and four, respectively. These rates were based on data from the 1969-1970 school year. The actual numbers of names drawn were 958, 1,099, and 1,105 for grades twelve, seven, and four, respectively. A pictorial description of the sample is presented in Figure 1.

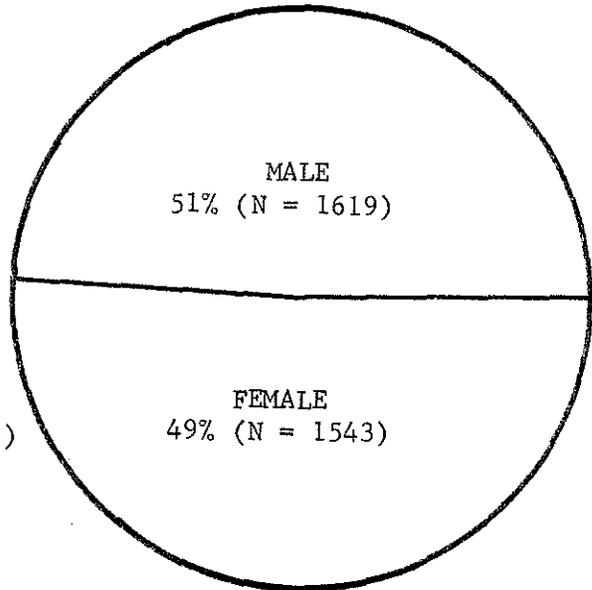
Within a stratum, the sample was selected in stages. The number of stages depended upon the stratum and the amount of information available. At the most, four stages were used. First, school districts were selected within

Figure 1.

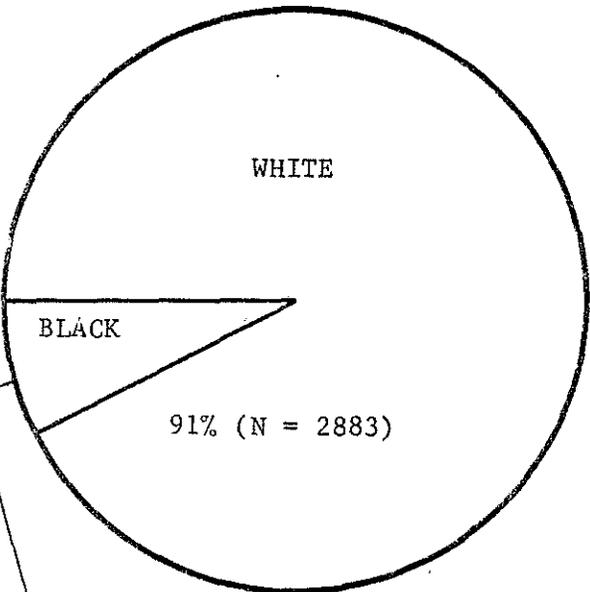
Sample Description



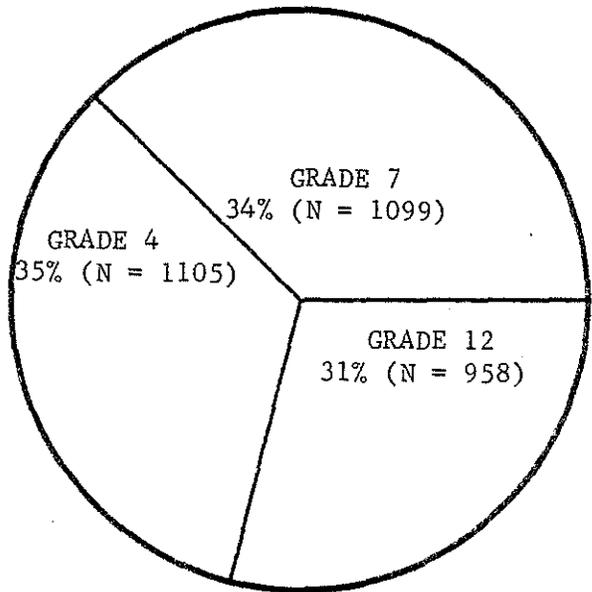
SIZE OF SCHOOL



SEX



RACE



GRADE LEVEL

9% (N = 279)

stratum (except in the seven largest districts where each district constituted a stratum). This was done by ordering the districts by size in terms of total 1969-1970 enrollment figures and selecting a sample in a systematic manner, thus assuring a representation of districts of different sizes. Within a sample school district, a particular building or attendance center was selected; within the sample building or attendance center, a particular section, class, or homeroom was drawn; and, finally, within the section, individual students were selected. At each stage down to the last one, selection was made with probability proportionate to size in terms of enrollment or estimated enrollment. At the final stage (pupils within class), selection was made at random with equal probability.

This procedure provided a sample with roughly equal numbers of pupils in each sample group yet with the probability of selection being the same for each pupil in the universe regardless of the size of a pupil's high school district, class, or homeroom. Pupils were selected in clusters not only to conserve field costs by reducing the number of school districts to be visited by assessment proctors, but also because the testing procedures were better suited to group administration.

The criterion earlier established by NAEP procedures called for limiting the size of groups to twelve. Since the group sizes could not be controlled completely while still maintaining uniform overall sampling rates, the expected group size was set at ten in anticipation that few groups would exceed twelve when the sample was drawn. Thus, in order to obtain 1,000 pupils, 100 groups were needed at each grade level. In grade twelve, five groups exceeded the criterion of twelve pupils--four containing thirteen each and one containing seventeen (the latter being in a school district having an unusually high twelfth grade enrollment relative to the total enrollment in the

district). In grades seven and four, no group exceeded thirteen pupils. Grade seven had four groups of thirteen each, and grade four had five groups of thirteen each.

Assessment proctors were provided with lists of the names of pupils comprising each sample group. Substitute names were also provided to help reduce attrition rates where pupils might be absent or otherwise unable to participate on the scheduled testing date. Generally, two male and two female names were provided for substitution purposes. When more than two pupils within a given sex were absent from assessment sessions, no further substitution was made.

Data from the Iowa Assessment were punched onto IBM cards, verified, and edited for valid responses by the Planning and Management Information Branch of the Department of Public Instruction. The actual data analysis was completed at the Iowa State University Statistical Laboratory.

#### Pupil performance in science

Science exercises released through National Assessment were administered to Iowa pupils as a part of the assessment program. Findings related to these exercises are presented below.

When Iowa pupils were compared with pupils nationwide on the science exercises at each of the three grade levels investigated, their performance, in general, was equal to or above the national performance level. (See Appendix C for complete item breakdown.)

There were four items in grade four out of a possible fifty-eight where Iowa pupils, on the average, performed below the national performance level. These are depicted below, along with the range of choices from which pupils were to select the correct response. (The correct response has been underlined.)

Jane wrapped the end of a piece of wire around the base of a flashlight bulb. When she touched the bottom of the bulb to the center of the top of a new battery, the bulb did not light. What should Jane do next to light the bulb?

Percentages		
<u>Iowa</u>	<u>National</u>	
15.0		a. Touch the end of the wire to the bulb.
1.4		b. Put the end of the wire in a drop of water.
16.3		c. Touch the bulb to the bottom of the battery.
52.7	61.0	d. Touch the end of the wire to the bottom of the battery.
14.3		e. I don't know.

Soon after a cold front has passed over St. Louis, one expects to find in St. Louis

Percentages		
<u>Iowa</u>	<u>National</u>	
30.6	34.0	a. clearing skies.
4.7		b. 100-mile-an-hour winds.
24.3		c. low atmospheric pressure.
19.9		d. the start of a three-day snow.
20.5		e. I don't know.

Do you think that the number thirteen (13) brings bad luck?

Percentages		
<u>Iowa</u>	<u>National</u>	
20.2		a. Yes.
70.5	74.0	b. No.
8.4		c. I don't know.

Big leaves usually give off more water than little leaves. Which of the following leaves gives off the most water?

Percentages		
<u>Iowa</u>	<u>National</u>	
88.6	89.0	a. 
1.3		b. 
4.0		c. 
2.6		d. 
3.3		e. I don't know.

In grade seven, Iowa pupils, on the average, performed lower than the national performance level on seven science exercises out of a possible forty-four. These seven exercises are shown below.

In order to make the beam balance, you should hang a 2-pound weight on the LEFT HAND SIDE at position

Percentage		
<u>Iowa</u>	<u>National</u>	
9.1		a. 1.
12.3		b. 2.
6.1		c. 3.
49.3	55.0	d. 4.
17.2		e. 5.
5.6		f. I don't know.

Most of the chemical energy of the gasoline in a car is not used to move the car but is changed into

Percentage		
<u>Iowa</u>	<u>National</u>	
19.5		a. electricity.
46.4	48.0	b. heat.
1.2		c. light.
9.6		d. magnetism.
2.6		e. sound.
20.8		f. I don't know.

Which of the following best describes the results of pasteurization of milk?

Percentage		
<u>Iowa</u>	<u>National</u>	
34.4		a. All bacteria are killed.
17.1		b. The milk is homogenized.
2.6		c. The taste of milk is improved.
38.3	40.0	d. Bacteria harmful to man are killed.
2.7		e. The milk is permanently kept from spoiling.
4.5		f. I don't know.

In terms of the theory of natural selection, what is the explanation of why giraffes have come to have such long necks?

Percentage		
<u>Iowa</u>	<u>National</u>	
6.8		a. Stretching to get food in high trees has made their necks longer.
1.6		b. There is something inside of giraffes which keeps making longer necks.
11.0		c. Giraffe food contained vitamins which caused vertabrae to lengthen.
24.3		d. Giraffe necks have gotten longer and longer as time has gone on, but nobody has any idea why this is.
<u>36.4</u>	38.0	e. Giraffes born with the longest necks have been able to stay alive when food was scarce and have passed this trait on to their offspring.
19.4		f. I don't know.

Why do we think that matter is made up of atoms?

Percentage		
<u>Iowa</u>	<u>National</u>	
38.2		a. We can see atoms with a microscope.
0.5		b. We can see atoms with our unaided eyes.
1.2		c. We can see atoms with a magnifying glass.
<u>33.8</u>	34.0	d. Matter behaves as if it were made up of atoms.
7.9		e. A famous wise man said many hundreds of years ago that matter is made of atoms.
18.2		f. I don't know.

Whenever scientists carefully measure any quantity many times, they expect that

Percentage		
<u>Iowa</u>	<u>National</u>	
18.9		a. all of the measurements will be exactly the same.
2.1		b. only two of the measurements will be exactly the same.
4.9		c. all but one of the measurements will be exactly the same.
<u>65.1</u>	69.0	d. most of the measurements will be close but not exactly the same.
9.0		e. I don't know.

Women can be successful scientists.

Percentage		
<u>Iowa</u>	<u>National</u>	
<u>93.2</u>	94.0	a. I believe this statement.
4.3		b. I don't believe this statement.
2.5		c. I don't know.

For twelfth grade, Iowa pupils, on the average, performed below the national performance level on only nine out of fifty science items. These nine are depicted below.

In terms of the theory of natural selection, what is the explanation of why giraffes have come to have such long necks?

Percentage		
<u>Iowa</u>	<u>National</u>	
12.1		a. Stretching to get food in high trees has made their necks longer.
1.9		b. There is something inside of giraffes which keeps making longer necks.
3.5		c. Giraffe food contained vitamins which caused the vertebrae to lengthen.
13.5		d. Giraffe necks have gotten longer and longer as time has gone on, but nobody has any idea why this is.
<u>55.0</u>	58.0	e. Giraffes born with the longest necks have been able to stay alive when food was scarce and have passed this trait on to their offspring.
13.9		f. I don't know.

Mercury can be enclosed in glass to make a thermometer because mercury

Percentage		
<u>Iowa</u>	<u>National</u>	
4.1		a. is a metal.
4.4		b. is more dense than glass.
10.0		c. conducts heat better than glass.
10.0		d. has a higher specific heat than glass.
<u>53.7</u>	56.0	e. expands more than glass when both are heated together.
17.4		f. I don't know.

A 5-pound rock is dropped from a cliff 500 feet high. The longer the rock falls, the greater is its

Percentage		
<u>Iowa</u>	<u>National</u>	
23.0		a. acceleration.
19.6		b. potential energy.
<u>44.7</u>	54.0	c. speed.
7.5		d. total energy.
2.0		e. volume.
3.2		f. I don't know.

If a person who is a light eater has a tendency to be overweight, it is most likely due to

Percentage		
<u>Iowa</u>	<u>National</u>	
0.2		a. too much exercise.
2.9		b. a carefully balanced diet.
19.3		c. a tendency toward nervousness.
14.4		d. an excessive dosage of vitamins.
<u>40.9</u>	49.0	e. highly efficient utilization of food by the body.
21.9		f. I don't know.

In each of five experiments, two objects were weighed four times each. Which experiment gives the strongest evidence that object I weighs more than object II?

Percentage			<u>Object I</u>	<u>Object II</u>
<u>Iowa</u>	<u>National</u>			
<u>78.3</u>	<u>81.0</u>	a. Experiment A	80 lb. 81 80 <u>82</u>	70 lb. 69 71 <u>70</u>
6.3		b. Experiment B	69 71 70 <u>70</u>	81 82 80 <u>80</u>
0.8		c. Experiment C	70 75 77 <u>80</u>	80 75 73 <u>70</u>
1.7		d. Experiment D	80 75 73 <u>70</u>	70 75 77 <u>80</u>
7.6		e. Experiment E	80 79 78 <u>77</u>	77 76 75 <u>74</u>
5.3		f. I don't know.		

Which of the following is a theory rather than a fact or an opinion about platinum?

Percentage		
<u>Iowa</u>	<u>National</u>	
7.9		a. Platinum is a metal.
5.2		b. Platinum is more dense than water.
10.3		c. Platinum is the most beautiful metal.
8.7		d. Wedding bands should be made of platinum.
<u>53.2</u>	59.0	e. Mesons account for the stability of the nuclei of platinum atoms.
14.5		f. I don't know.

A student made the following statement, "Some carbon atoms in the bread that I ate last night might have once been part of a dinosaur's body."

Which of the following is the best appraisal of the student's statement?  
This statement

Percentage		
<u>Iowa</u>	<u>National</u>	
3.6		a. contradicts the law of conservation of matter.
3.5		b. is ridiculous because dinosaurs lived so long ago.
<u>36.0</u>	40.0	c. could be true because atoms are rarely created or destroyed.
29.1		d. could be true only if the bread was grown in soil containing dinosaur fossils.
10.6		e. could not possibly be true because dinosaurs were animals but wheat is a plant.
17.2		f. I don't know.

A particular cell is shaped like a cube. If all its linear dimensions were doubled, its volume would increase

Percentage		
<u>Iowa</u>	<u>National</u>	
4.2		a. 3 times.
22.1		b. 4 times.
13.8		c. 6 times.
<u>30.6</u>	33.0	d. 8 times.
16.3		e. 16 times.
12.8		f. I don't know.

United States scientists are ahead of scientists in other countries in every field of research.

Percentage		
<u>Iowa</u>	<u>National</u>	
20.3		a. I believe this statement.
<u>67.7</u>	76.0	b. I don't believe this statement.
11.6		c. I don't know.

When pupils are categorized by classification variables other than grade levels, more specific information with regard to such characteristics as sex, race, size of school district, geographic region, and educational level of parents is revealed. This information is reported in Table 1.

Table 1 Distribution of Science items reported below the Average National Performance level by sex, race, size of school, and educational level of parent.

Characteristic	Grade level		
	4	7	12
Sex			
Boy	2	13	8
Girl	6	17	21
Race			
Black	40	39	34
Non-black	17	11	19
Size of school			
Urban	19	16	10
Suburban	3	12	16
Other	3	14	10
Educational level of parent			
Less than 8th grade	15	20	38
More than 8th grade but less than high school	19	16	29
High school graduate	5	16	22
Beyond high school	2	12	20
Total number items in assessment package	58	44	50

A consideration was also given to reporting NAEP science exercises in terms of items which were answered correctly by less than half of the pupils at a given grade level. The frequency of items missed is depicted for the characteristics sex, race, size of school district, educational level of parent, and geographic region in Table 2.

Table 2 Distribution of Science items reported below the 50th percentile by sex, race, size of school, and educational level of parent.

Characteristic	Grade level		
	4	7	12
Sex			
Boy	11	13	8
Girl	13	17	21
Race			
Black	25	27	34
Non-black	15	16	19
Size of School			
Urban	16	16	21
Suburban	11	12	21
Other	12	14	22
Educational level of parent			
Less than 8th grade	18	20	33
More than 8th grade but less than high school	18	16	29
High school graduate	12	16	22
Beyond high school	12	12	20
Total number items in assessment package	58	44	50

Science exercises were also examined in light of their classification as physical science or biological science items. Science exercises classified as biological were those items concerned with living or recently living organisms, their life processes and events or activities influencing life processes. Science exercises classified as physical included all items not classified as biological.

In considering only those items where less than 50 percent of Iowa pupils responding answered correctly, there were eleven such exercises in grade four out of a possible fifty-eight. Nine exercises were concerned with physical science, and two with biological science. There were thirteen exercises out of forty-four in grade seven. Six exercises were physical science

and seven were biological in nature. For grade twelve, twenty out of a total fifty exercises were answered correctly by less than half of the pupils responding to the exercises. Of these twenty, twelve were physical science items and eight were biological.

#### Fourth Grade

A comparison of science means for fourth grade pupils in Table 3 reflects statistically significant differences in four of the categories investigated. In the category sex, boys, on the average, had significantly higher mean scores than girls. A comparison of pupils by race indicated that non-black pupils, on the average, had significantly higher mean scores than black pupils. In terms of size of school, significant differences were found between urban and suburban and between urban and other. In both instances, pupils in schools classified as urban had, on the average, lower science mean scores.

For educational level of parent, statistically significant differences were found between the categories eighth grade but less than high school and high school graduate, and between eighth grade but less than high school and beyond high school, and also between high school graduate and beyond high school.

Science means for fourth grade pupils were also compared by geographic regions; however, no statistically significant differences were discovered.

Table 3 Comparison of NAEP Science Means for fourth grade pupils by sex, race, size of school, and educational level of parent.

Characteristic	Mean Score	Standard Error	t Value
Sex			
Boy	41.51	1.82	2.42*
Girl	39.73	1.47	
Race			
Black	31.71	3.95	4.27*
Non-black	38.34	2.60	
Size of school			
Urban	37.91	2.29	3.47*
Suburban	41.35	3.14	
Urban	37.91	2.29	4.81*
Other	41.54	1.08	
Educational level of parent			
8th grade but less than H.S.	37.19	1.79	6.76*
High school graduate	40.57	2.00	
8th grade but less than H.S.	37.19	1.79	8.92*
Beyond high school	41.92	1.27	
High school graduate	40.57	2.00	2.45*
Beyond high school	41.92	1.27	

\*significant at .05 level

#### Seventh Grade

In the four categories investigated for pupils in grade seven, three reflected statistically significant differences. (See Table 4.) In the category sex, boys, on the average, had significantly higher science means than girls. A comparison of pupils by race indicated that non-black pupils had significantly higher science means, on the average, than black pupils. For the category educational level of parent, significant differences were found between the classifications eighth grade but less than high school, and beyond high school; and between high school graduate, and beyond high

school. No significant differences were found to exist when pupils were grouped according to size of school.

Comparisons made among geographic regions indicated statistically significant differences between region one and three and between regions one and four. In both instances pupils in region one had lower science means, on the average, than pupils in the other district.

Table 4 Comparison of NAEP Science Means for seventh grade pupils by sex, race, and educational level of parent.

Characteristic	Mean Score	Standard Error	t Value
Sex			
Boy	28.85	.86	3.59*
Girl	27.50	1.22	
Race			
Black	20.03	2.94	6.95*
Non-black	27.43	2.39	
Educational level of parent			
8th grade but less than H.S.	26.65	1.79	2.87*
Beyond high school	26.69	1.27	
High school graduate	27.58	.59	3.92*
Beyond high school	29.69	1.27	

\*significant at .05 level

#### Twelfth Grade

Science means for twelfth grade pupils were also compared for the categories sex, race, district size, and educational level of parent. (See Table 5.) Of these classifications, statistically significant differences were found for pupils within all but the category district size.

Science means for boys were significantly greater, on the average, than science means for girls. When comparisons were made between black and non-black pupils, it was found that non-black pupils, on the average, had significantly higher science means.

Table 5 Comparison of NAEP Science Means for twelfth grade pupils by sex, race, and educational level of parent.

Characteristic	Mean Score	Standard Error	t Value
Sex			
Boy	28.72	1.17	9.52*
Girl	25.30	1.24	
Race			
Black	20.06	3.22	6.50*
Non-black	27.54	2.89	
Educational Level of Parent			
8th grade but less than h.s.	24.80	1.74	6.76*
Beyond high school	28.93	3.22	
High school graduate	26.14	1.52	3.75*
Beyond high school	28.93	3.22	

\*significant at .05

When pupils were classified by educational level of parent, significant differences were found between eighth grade but less than high school and beyond high school, and between high school graduate and beyond high school. In each instance pupils in the classification beyond high school had significantly higher science means.

No significant differences were found for the category district size.

Comparisons were made by geographic region also; however, no significant differences were discovered.

An additional aspect of the assessment in science involved comparing the performance of pupils in grade four and grade seven and in grade seven and grade twelve on identical items.

Grade four and grade seven pupils were compared on eight identical items. Individual performances were then averaged and are displayed in Table 6.

Eight identical items were also given to pupils in grades seven and twelve and again individual performances were averaged and compared. These comparisons appear in Table 7.

Table 6 Percent of correct responses on NAEP overlap items for grades four and seven.

Item number	Grade level	
	Grade 4	Grade 7
1	43.2	81.3
2	59.2	88.5
3	28.9	65.0
4	64.8	84.8
5	83.4	93.5
6	95.6	96.2
7	93.6	97.7
8	98.8	99.6

Table 7 Percent of correct responses on NAEP overlap items for grades seven and twelve.

Item number	Grade level	
	Grade 7	Grade 12
1	47.3	55.5
2	36.4	55.0
3	85.0	96.6
4	46.7	53.7
5	92.3	95.7
6	59.8	90.3
7	65.1	81.9
8	74.1	78.3

An inspection of both Tables 6 and 7 indicates, as expected, seventh grade pupils out-performed fourth grade pupils and twelfth grade pupils out-performed seventh grade pupils on all eight items.

Table 8 Summary table for Science achievement.

Characteristic	Grade level		
	4	7	12
Sex	$\bar{x}$	$\bar{x}$	$\bar{x}$
Boy	41.51	28.85	28.72
Girl	39.73	27.50	28.30
Race			
Black	31.71	20.03	20.06
Non-black	38.34	27.43	27.54
Size of school			
Urban	37.91	27.05	27.35
Suburban	41.35	28.67	26.93
Other	41.54	28.54	27.01
Educational level of parent			
Less than 8th grade	36.31	23.82	21.62
More than 8th grade but less than high school	37.19	26.65	24.80
High school graduate	40.57	27.58	26.14
Beyond high school	41.92	29.69	28.93
Geographic region*			
1 (Northeast)	41.70	27.21	27.14
2 (Northwest)	42.10	28.20	26.83
3 (Central)	42.60	28.73	27.53
4 (South)	39.90	29.08	27.17
5 (Southeast)	41.20	27.84	26.50

\*see Appendix B for further explanation

Note: Highest possible score  
 Grade 4 - 58  
 Grade 7 - 44  
 Grade 12 - 50

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## F O R E W O R D

This report concerning the 1971 Iowa Assessment is submitted pursuant to the responsibility of the Iowa Department of Public Instruction to conduct an annual assessment of the status of Iowa pupils. This report is a beginning. Assessment has been identified as an educational imperative in Iowa by the State Board of Public Instruction.

The Department believes that information gained through an ongoing assessment program will be useful to the U. S. Office of Education in determining critical educational needs.

We hope also that such annually updated information will prove quite useful to local education agencies. The Department of Public Instruction wishes to express its thanks to the sample school systems involved in the 1971 and 1972 Iowa Assessment activities. The Planning and Management Information Branch has dedicated much of its time and energy in working to improve education in Iowa through comprehensive and systematic planning and evaluation strategies.

PAUL F. JOHNSTON  
State Superintendent of Public Instruction

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## Attitude toward school

An additional phase of the assessment dealt with determining pupil attitude toward school. Attitude was defined as the degree of positive or negative feeling associated with school as measured by a given pupil's composite score on the School Sentiment Index measure.

Statistically significant differences in attitudes toward school for fourth grade pupils were found in each of the four categories investigated and are reflected in Table 9. Boys, on the average, were found to have less positive attitudes toward school than girls; black pupils, on the average, had less positive attitudes toward school than non-black pupils; pupils enrolled in schools classified as "other" had less positive attitudes toward school, on the average, than pupils enrolled in suburban schools; and, finally, pupils whose parents were high school graduates had less positive attitudes toward school, on the average, than pupils whose parents had education beyond high school.

Table 9 Comparison of mean attitudes toward school of fourth grade pupils by sex, race, size of school, and educational level of parent.

Characteristic	Mean Score	Standard Error	t Value
Sex			
Boy	54.36	1.82	3.36*
Girl	57.31	1.47	
Race			
Black	52.57	3.95	2.41*
Non-black	55.80	2.60	
Size of school			
Suburban	57.58	3.14	3.14*
Other	55.58	1.08	
Educational level of parent			
High school graduate	55.09	2.00	2.54*
More than high school	56.92	1.27	

\*significant at .05

Maximum score 75

It should be noted that, at each of the three grade levels investigated, boys, on the average, had attitudes toward school which were less positive than girls.

It is also of interest to note that attitudes toward school were less positive, on the average, for both boys and girls in grade seven than in grade four.

Since no comparisons between fourth and twelfth, or between seventh and twelfth, grade pupils could be made due to differences in instrumentation, it was not possible to determine what differences or similarities might exist between these grade levels in terms of attitude toward school.

## Self concept

The third phase of the assessment was directed toward assessing pupil self concept. Self concept was defined as the degree of positive or negative feeling associated with a pupil's perception of himself as measured by his composite score on the Self Appraisal Inventory.

For pupils in grade four, the only classification reflecting a significant difference was parent educational level. (See Table 13.) Pupils whose parents were high school graduates had less positive self concepts, on the average, than pupils whose parents had education beyond high school. No differences were found to exist when pupils were grouped according to sex, race, or size of school attended.

Table 13 Comparison of mean self concepts of fourth grade pupils by level of parent education.

Characteristic	Mean Score	Standard Error	t Value
Educational level of parent			
High school graduate	53.49	2.00	5.28*
More than high school	56.97	1.27	

\*significant at .05  
Maximum score 80

Of the four categories investigated, only size of school attended produced significant differences among seventh grade pupils. (See Table 14.) Within this category, pupils enrolled in schools classified as "other" had less positive self concepts, on the average, than did pupils enrolled in schools classified as urban. Significant differences were not present when pupils were grouped according to sex, race, and parent educational levels.

Comparisons of pupil self concepts were also made on the basis of geographic regions. Statistically significant differences for pupils in grade four were found to exist between region one and four, between region two and four, and between region five and four. (See Table 16.) In each instance, pupils in region four, on the average, possessed lower self concept means.

Table 16 Comparison of Self Appraisal Inventory Means for fourth grade pupils by geographic regions.

Geographic Region	Mean Score	Standard Error	t Value
1	55.28	3.20	4.26*
4	51.53	3.39	
2	54.90	2.55	3.20*
4	51.53	3.39	
5	56.39	3.90	3.82*
4	51.53	3.39	

\*significant at .05

For grade seven, no significant differences between geographic regions were found to exist.

In grade twelve, significant differences were found to exist between region one and four and between region two and four. In each instance, pupils in region four, on the average, were found to possess lower self concept means. (See Table 17.)

Table 17 Comparison of Self Appraisal Inventory Means for twelfth grade pupils by geographic regions.

Geographic Region	Mean Score	Standard Error	t Value
1	226.84	2.62	2.52*
4	222.66	6.39	
2	226.76	6.53	2.68*
4	222.66	6.39	

\*significant at .05

### Future Iowa assessment activity

The present view of assessment is one which rests upon the assumption that the probability of defining educational needs with high validity is much greater when done at the local school district level than when done at the state level. Therefore, our basic effort is seen as one which centers on developing methods and procedures which are adaptable to local school district needs. In this manner, each local district can eventually conduct its own assessment and thus identify educational needs unique to its particular district.

When each community has completed such a task, the SEA will then be able to indicate critical educational needs which appear to be common to various types of schools and sub-populations within the state. Until that time, however, any SEA attempt to delineate logically and defensibly the "critical" educational needs for the state as a whole is not feasible.

The role of the SEA then will become one of leadership and coordination of assessment activities enabling the state agency to provide a statewide picture of Iowa's educational growth and progress and to identify and define goals and needs common to Iowa schools.

### Dissemination of report

Salient points will be extrapolated from this report and appropriately fashioned into a pamphlet for dissemination to local education agencies, other agencies of state government, State Departments of Education, and other interested agencies, organizations and individuals by Title III, ESEA personnel. Through this technique, as well as through other involvement strategies planned or being planned, LEA's will be involved in determining appropriate courses of action to be taken as a result of assessment findings.

APPENDIX A

Iowa Schools Involved in 1970-71 Assessment

Iowa Schools Involved in Assessment  
1970-1971

Urban (7)

1. Des Moines
2. Cedar Rapids
3. Davenport
4. Waterloo
5. Sioux City
6. Council Bluffs
7. Dubuque

Suburban (10)

8. Cedar Falls
9. West Des Moines
10. Urbandale
11. Southeast Polk
12. Linn-Mar
13. College Community
14. Saydel
15. Mt. Vernon
16. Lawton-Bronson
17. Bondurant

Stratum 1 (13)

18. Mason City
19. Charles City
20. West Delaware
21. Independence
22. New Hampton
23. Forest City
24. Central Clayton
25. Postville
26. Grundy Center
27. South Winneshiek
28. Guttenberg
29. Garnavillo
30. Corwith-Wesley

Stratum 2 (15)

31. Fort Dodge
32. Le Mars
33. Spencer
34. Denison
35. Algona
36. Emmetsburg
37. Central Lyon
38. Maple Valley
39. Alta
40. Kingsley-Pierson
41. Northeast Hamilton
42. Everly

43. Gilmore City-Bradgate
44. Cedar Valley
45. Sioux Rapids

Stratum 3 (13)

46. Marshalltown Community
47. Ames Community
48. Newton Community
49. Indianola Community
50. Knoxville Community
51. Winterset Community
52. West Marshall Community
53. Roland-Story Community
54. Ackley-Geneva Community
55. Dallas Community
56. Stuart Community
57. Panora-Linden Community
58. Garwin Community

Stratum 4 (12)

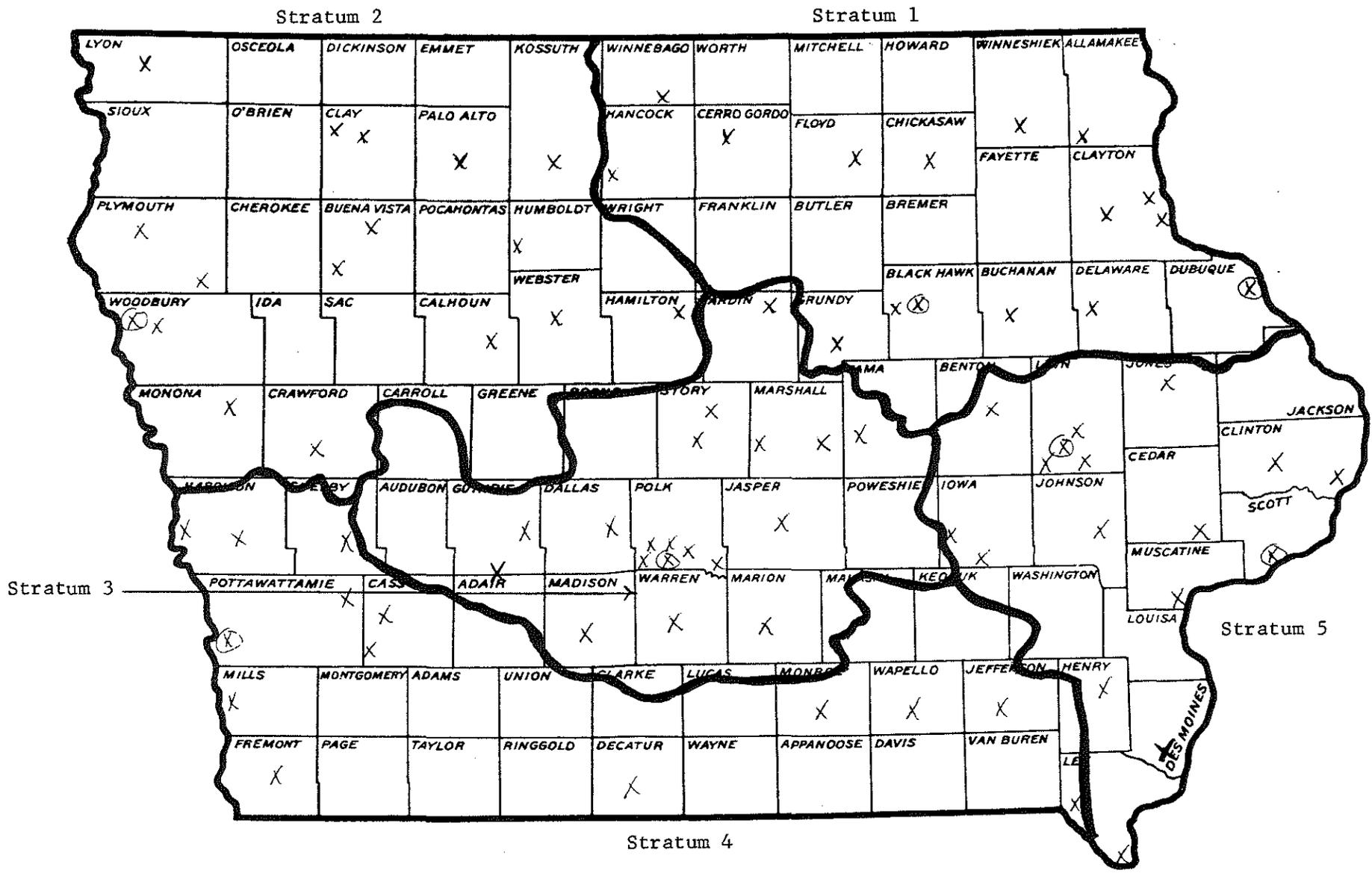
59. Ottumwa Community
60. Fairfield Community
61. Atlantic Community
62. Harlan Community
63. Albia Community
64. Glenwood Community
65. Griswold Community
66. Central Decatur Community
67. Woodbine Community
68. West Harrison Community
69. Sidney Community
70. Walnut Community

Stratum 5 (14)

71. Iowa City Community
72. Burlington Community
73. Clinton Community
74. Clinton Community
75. Fort Madison
76. Keokuk Community
77. Central Clinton
78. Vinton Community
79. Monticello Community
80. Central Lee Community
81. Durant Community
82. English Valleys
83. Winfield-Mt. Union
84. Lost Nation

APPENDIX B

Five Geographic Regions



Five Geographic Regions

Appendix B

APPENDIX C

Iowa Performance in Science Compared to the  
Average National Performance Across All Items

Iowa Performance in Science Compared to the Average National Performance Across All Items  
(Grade 4)

Item number	National Average	Iowa Average	Iowa Average Sex		Iowa Average Race*1		Iowa Average Size of School*2			Iowa Average Educational Level of Parent*3			
			M	F	B	NB	1	2	3	1	2	3	4
1	92	98.8	98.9	98.8	95.5	99.1	98.9	99.0	98.8	100.0	98.8	98.8	98.8
2	92	96.8	98.8	94.6	86.6	96.9	96.2	99.0	96.7	84.4	95.1	98.1	97.6
3	91	93.6	92.4	95.0	92.9	92.9	92.9	95.8	93.6	76.1	90.1	94.0	94.7
4	89	95.8	95.3	96.2	69.6	93.3	91.8	97.9	96.9	98.0	89.7	96.6	96.9
5	88	98.0	97.9	98.2	87.5	97.3	96.7	96.9	98.7	91.7	92.3	99.3	98.2
6	87	95.6	95.5	95.7	91.1	96.0	95.7	94.8	95.7	91.7	91.1	96.4	96.8
7	87	92.3	93.6	90.9	72.3	92.9	91.5	96.9	92.0	83.4	87.8	94.7	92.8
8	85	93.2	94.1	92.2	91.1	93.3	93.2	92.7	93.3	85.4	85.9	93.1	94.9
9	84	94.1	95.2	92.9	89.3	91.1	91.0	96.9	94.8	92.7	87.6	93.3	95.4
10	81	91.8	92.0	91.5	86.6	89.7	89.5	89.6	92.9	100.0	86.2	92.7	92.2
11	80	84.4	87.3	81.3	82.1	77.2	77.6	85.4	86.8	69.8	78.7	86.1	84.4
12	83	93.0	94.9	90.9	76.8	92.4	91.4	90.6	93.9	90.7	89.9	93.8	94.4
13	79	95.0	97.5	92.3	85.7	94.2	93.6	91.7	96.0	84.4	92.3	95.0	96.3
14	79	82.0	84.5	79.3	79.5	76.3	76.5	85.4	83.5	92.7	83.8	79.7	83.5
15	77	79.7	77.6	82.1	60.7	75.9	74.9	80.2	81.4	76.1	70.2	79.3	83.7
16	75	89.5	93.2	85.4	79.5	85.7	85.3	89.6	90.9	70.8	87.1	89.9	89.9
17	52	75.2	74.5	76.0	56.3	68.3	67.5	80.2	77.2	76.1	62.0	75.2	80.1
18	73	87.9	88.3	87.4	81.3	80.8	80.8	95.8	89.3	75.0	79.8	85.4	90.9
19	70	80.1	81.2	78.8	62.5	79.0	77.9	86.5	79.9	60.4	75.9	81.7	83.0
20	69	79.4	83.9	74.5	59.8	79.9	78.6	90.6	78.1	68.8	76.5	76.4	83.6
21	62	86.4	89.8	82.8	57.1	76.8	75.5	93.8	89.3	67.7	79.2	87.3	89.0
22	61	52.7	55.3	49.9	58.9	49.1	49.7	51.0	54.0	61.5	50.3	52.2	53.7
23	59	62.1	63.1	61.0	53.6	55.4	55.2	59.4	64.9	54.2	55.1	62.7	63.8
24	58	75.2	79.3	70.6	53.6	64.7	64.0	79.2	78.6	78.1	66.3	75.4	77.4

\*1) B - black NB - non-black

\*2) 1 = urban 2 = suburban 3 = other

\*3) 1 = less than 8th grade

2 = more than 8th grade but less than high school

3 = high school graduate

4 = beyond high school

## Grade 4 (Cont.)

Item number	National Average	Iowa Average	Iowa Average Sex		Iowa Average Race*1		Iowa Average Size of School*2			Iowa Average Educational Level of Parent*3			
			M	F	B	NB	1	2	3	1	2	3	4
49	38	43.2	44.6	41.6	12.5	35.7	34.2	47.9	45.7	43.8	36.8	40.8	48.0
50	22	28.9	28.5	29.2	17.9	32.1	31.2	24.0	28.7	21.9	25.3	25.8	34.1
51	22	40.0	41.6	38.2	12.5	29.9	28.8	38.5	44.2	21.9	26.0	39.6	44.7
52	51	56.5	59.2	53.6	40.2	50.0	49.4	54.2	59.4	44.8	43.8	56.3	59.7
53	70	71.9	70.4	73.6	50.0	67.0	65.9	74.0	73.8	52.1	69.8	69.9	73.0
54	83	86.7	86.2	87.3	58.0	84.8	83.1	84.4	88.4	74.0	85.7	89.3	87.6
55	74	70.5	72.5	68.3	60.7	70.5	69.9	79.2	69.5	60.4	63.2	69.9	72.1
56	89	88.6	89.2	88.0	70.5	85.3	84.3	89.6	90.0	74.0	89.0	88.7	89.4
57	45	57.6	59.0	56.2	31.3	54.5	52.9	57.3	59.4	38.5	43.5	63.6	57.8
58	36	37.2	41.1	33.0	20.5	30.4	29.7	39.6	39.6	44.8	37.0	35.6	39.5

\*1) B - black NB - non-black

\*2) 1 = urban 2 = suburban 3 = other

\*3) 1 = less than 8th grade

2 = more than 8th grade but less than high school

3 = high school graduate

4 = beyond high school

## Grade 7 (cont.)

Item number	National Average	Iowa Average	Iowa Average Sex		Iowa Average Race*1		Iowa Average Size of School*2			Iowa Average Educational Level of Parent*3			
			M	F	B	NB	1	2	3	1	2	3	4
25	32	32.6	31.1	34.1	29.0	32.2	32.0	28.0	33.4	13.6	20.6	31.5	37.0
26	27	33.5	35.9	31.0	21.0	30.0	29.6	33.3	34.9	25.8	32.3	34.9	33.6
27	26	29.2	31.2	27.2	20.0	22.7	22.6	25.8	32.1	13.6	31.0	28.3	31.3
28	26	34.2	37.9	30.3	14.0	27.5	26.8	23.7	38.3	36.4	28.8	32.6	38.2
29	92	93.5	93.7	93.4	90.0	91.0	90.9	94.6	94.4	87.9	94.5	92.7	94.7
30	83	85.2	84.9	85.6	74.0	84.1	83.6	93.5	84.7	62.1	88.5	83.0	88.4
31	81	84.8	81.5	88.2	52.0	87.6	85.7	90.3	83.7	75.8	81.3	82.9	88.7
32	75	82.5	83.9	81.0	64.0	77.3	76.6	80.6	84.8	72.7	80.5	82.7	83.5
33	79	85.0	85.0	84.9	59.0	88.0	86.5	84.9	84.4	84.8	79.3	81.1	91.8
34	71	83.2	83.3	83.0	42.0	79.4	77.5	83.9	85.1	86.4	76.8	82.1	86.9
35	62	74.1	71.6	76.7	37.0	73.8	71.9	72.0	75.2	48.5	67.0	72.9	79.6
36	61	66.9	67.6	66.2	36.0	60.5	59.3	66.7	69.7	36.4	62.5	67.6	69.4
37	73	81.3	81.7	80.9	49.0	82.0	80.3	87.1	80.8	74.2	77.8	79.4	85.2
38	69	65.1	61.9	68.3	50.0	63.9	63.2	66.7	65.5	36.4	58.8	65.7	67.1
39	36	43.7	49.7	37.5	23.0	46.8	45.6	41.9	43.2	74.2	33.0	43.1	47.7
40	27	21.8	23.1	20.5	15.0	15.5	15.4	29.0	23.2	0.0	17.6	19.4	26.6
41	56	65.0	64.8	65.2	41.0	61.8	60.7	65.6	66.4	74.2	56.6	64.8	67.5
42	94	93.2	89.5	97.1	88.0	94.0	93.7	92.5	93.2	74.2	89.9	93.7	93.7
43	91	94.2	94.6	93.8	82.0	92.7	92.2	94.6	94.9	75.8	93.7	93.1	96.5
44	8	12.5	15.6	9.4	13.0	12.9	12.9	8.6	12.9	37.9	14.6	9.4	16.0

\*1) B - black NB - non-black

\*2) 1 = urban 2 = suburban 3 = other

\*3) 1 = less than 8th grade

2 = more than 8th grade but less than high school

3 = high school graduate

4 = beyond high school

## Grade 12 (Cont.)

Item number	National Average	Iowa Average	Iowa Average Sex		Iowa Average Race*1		Iowa Average Size of School*2			Iowa Average Educational Level of Parent*3			
			M	F	B	NB	1	2	3	1	2	3	4
26	36	45.7	53.0	38.0	23.9	50.0	49.0	50.7	44.2	28.4	36.4	42.1	53.0
27	35	43.3	52.9	33.3	20.9	50.0	48.9	39.7	42.2	49.6	40.5	40.7	46.9
28	34	35.2	35.3	35.0	32.8	33.5	33.5	39.7	35.1	22.0	23.4	34.3	39.9
29	32	41.1	42.3	40.0	14.9	42.4	41.3	43.8	40.8	28.4	31.2	37.0	49.1
30	29	34.3	25.9	43.2	43.3	32.9	33.3	37.0	34.3	21.3	35.7	34.7	34.0
31	25	25.1	38.1	11.5	13.4	21.2	20.9	21.9	26.6	14.2	24.3	27.7	22.7
32	21	31.1	38.9	22.9	11.9	31.2	30.4	20.5	32.5	7.8	29.3	28.4	35.6
33	18	23.7	27.5	19.7	17.9	25.9	25.6	20.5	23.5	49.6	24.7	20.4	26.2
34	17	19.5	21.5	17.3	7.5	20.6	20.1	27.4	18.4	14.2	13.1	14.4	27.3
35	9	14.7	15.6	13.7	10.4	11.8	11.7	9.6	16.1	7.1	16.4	13.6	15.7
36	6	11.3	11.1	11.5	4.5	10.6	10.4	13.7	11.3	7.1	9.1	9.6	14.1
37	3	5.1	8.6	1.4	6.0	5.3	5.3	8.2	4.6	0.0	2.2	4.8	6.3
38	3	4.1	6.3	1.8	1.5	5.3	5.1	2.7	4.0	0.0	5.0	3.3	5.0
39	81	78.3	77.1	79.6	44.8	81.2	79.8	79.5	77.7	43.3	77.8	76.6	81.7
40	68	81.4	85.4	77.3	50.7	81.2	80.0	75.3	82.5	64.5	73.8	78.8	87.3
41	59	53.2	52.2	54.3	29.9	55.9	54.9	53.4	52.7	36.2	34.4	51.2	61.3
42	40	36.0	40.8	31.0	28.4	41.8	41.2	39.7	34.2	7.1	27.6	32.2	43.9
43	33	30.6	36.5	24.3	14.9	38.2	37.3	27.4	29.1	21.3	24.4	27.0	36.6
44	18	29.0	33.0	24.7	10.4	29.4	28.7	28.8	29.1	14.9	27.2	26.3	33.0
45	92	96.6	96.4	96.9	83.6	98.8	98.2	95.9	96.3	92.9	96.6	95.3	98.3
46	72	81.9	84.0	79.6	59.7	83.5	82.6	76.7	82.2	78.0	81.8	77.7	86.8
47	29	36.4	36.0	37.0	26.9	31.2	31.0	30.1	38.6	43.3	31.5	31.9	42.8
48	81	75.0	74.0	76.0	61.2	70.6	70.2	79.5	75.7	71.6	62.8	72.1	81.8
49	76	67.7	68.6	66.9	52.2	69.4	68.7	65.8	67.7	64.5	64.8	60.5	77.1
50	17	9.2	13.9	4.4	13.4	14.1	14.1	9.6	7.9	0.0	10.1	7.0	11.9

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