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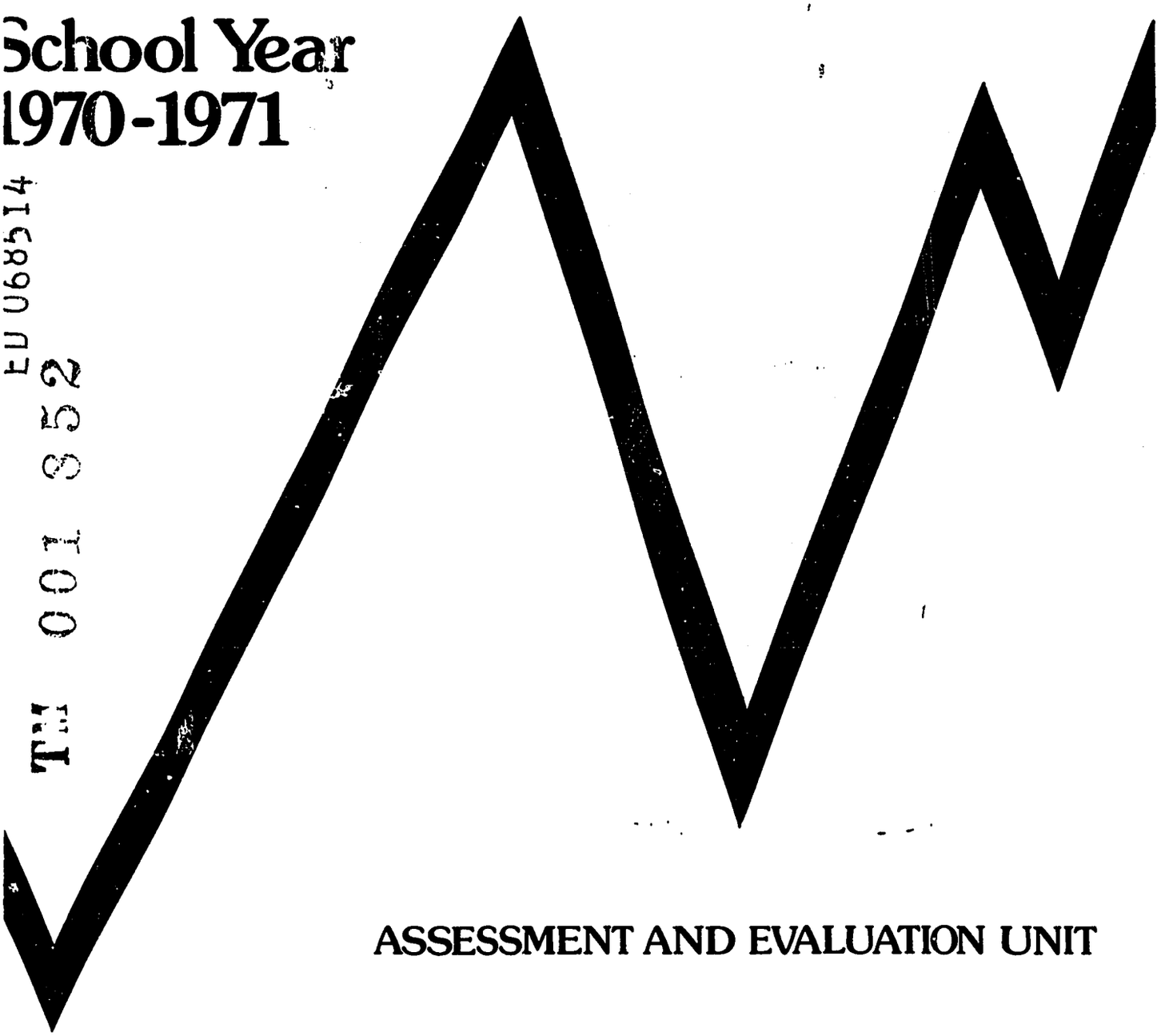
ABSTRACT

The needs of students in the public schools of Colorado are reviewed in a report that contains two types of information: (1) descriptions of some educational outcomes commonly desired in Colorado, as found in statements of goals and objectives; and (2) descriptions of student performance on the assessment inventory given in the spring of 1971. Results of pupil performance on assessment exercises are given for language skills, learner self-concept, social knowledge and skills, health information, and music appreciation. There are instances throughout where students have acquired certain skills, knowledge, and attitudes, and some instances where they have not. The statewide findings should be interpreted by local district personnel in terms of specific objectives for their school programs. (LH)

AN ASSESSMENT OF LEARNER NEEDS IN COLORADO

School Year 1970-1971



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Denver, Colorado

AN ASSESSMENT OF LEARNER NEEDS IN COLORADO

School Year 1970-1971

Prepared by John W. Helper

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FOREWORD

This report has been prepared in accordance with the Elementary and Secondary Act of 1965, Title III, guidelines and is addressed to all who wish to know and understand the needs of students in the public schools of Colorado. It contains information of two types:

1. Descriptions of some educational outcomes commonly desired in Colorado, as found in statements of goals and objectives;

2. Descriptions of student performance on the assessment inventory given in the Spring of 1971.

Throughout this report, the reader will find some instances where students have acquired certain skills, knowledge, and attitudes and some instances where they have not. These statewide findings should be interpreted by local district personnel in terms of specific objectives for their school programs. Each local district can decide for itself the appropriateness of the needs identified in the report and the degree to which their existing programs should be modified.

Donald D. Woodington

Donald D. Woodington
Commissioner of Education

ACKNOWLEDGEMENTS

Successful completion of this Assessment of Learner Needs in Colorado was made possible by cooperative working relationships of the Department of Education with other agencies and individuals.

- Personnel from the University of Colorado's Laboratory of Educational Research edited assessment exercises and wrote "Working Papers." Dr. Gene V. Glass of the Laboratory supervised this work and also designed the sampling and analysis plans.

- Personnel from Pacific Educational Evaluation Systems (PEES), Dr. Robert W. Heath, Director, consulted on computer programming for the facilities available to the Colorado Department of Education.

- The State of Colorado's Automated Data Processing Service Center wrote the specifications and computer programs to analyze the 300,000+ student responses on assessment exercises, upon which this report is based.

- The Interstate Service Center supplied exercises to assess affective learnings, as described in several objectives provided by the Colorado Department of Education.

- Personnel from the Colorado Music Educators Association created pools of exercises from which the music forms were constructed.

Most importantly, educators and school children in Colorado cooperated to make the effort worthwhile.

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I. INTRODUCTION

Consistent with guidelines promulgated by the Elementary and Secondary Education Act of 1965 (Title III), this Assessment:

1. Identified some outcomes commonly desired from Colorado schools.
2. Determined the extent to which students in Colorado have obtained certain of these outcomes.
3. Reported the findings and offered conclusions regarding learner achievements and needs in Colorado.

The nature of the Assessment and organization of this report are described briefly below. (Details are in the Appendix.)

Nature of the Assessment

The Assessment sought answers to the question, "Have students in Colorado acquired capabilities which will enable them to enjoy the benefits described by Educational Goals for Colorado Citizens*?". Assessment processes included: (1) restating the Goals into performance objectives, (2) creating objectives-referenced exercises, (3) sampling, and (4) analyzing student responses.

Restating the goals. In 1969, a Task Force on Assessment and Evaluation first analyzed Goals for Education in Colorado** into specific, year-end objectives which described student performance capabilities in several curricular areas, and then submitted these objectives for professional judgement.

Creating exercises. Consultants retained by the Colorado Department of Education created exercises by which students could demonstrate capabilities specified in the commonly-desired performance objectives. Staff members

*Adopted by the Colorado State Board of Education in February, 1971.
**Adopted by the Colorado State Board of Education in 1962.

revised and supplemented these exercises on the basis of field tests in the Spring of 1970 before the field work in the Spring of 1971.

Sampling. Random assignment of assessment forms to a randomly-selected sample of students provided performance indicators for all students in Colorado in Grades 3, 6, 9, and 12, and students in certain population groups, i.e., low income, minority, rural, etc. Exercises were sampled from these exercise pools: health, language arts, learner self-concept, mathematics, music, science and social studies.

Analysis. Percentages of students making each response on the assessment exercises were listed for each of the 600+ exercises administered in 1971. Consistent with common practice, a 70% performance level was used as a "bench-mark" by which to judge students' capabilities. (Exceptions to this "bench-mark" are noted in Part III).

Organizing the data. Exercises, along with the student performance data, were grouped under corresponding objectives. Objectives and exercises were then grouped by goal area. The data were displayed as follows:

GOAL #1

Objective 1.1	Objective 1.2	Objective 1.3	Objective 1.4	Objective 1.5
Item 1.1.1	Item 1.2.1	Item 1.3.1	Item 1.4.1	Item 1.5.1
Item 1.1.2	Item 1.2.2	Item 1.3.2	Item 1.4.2	Item 1.5.2
Item 1.1.3	Item 1.2.3	Item 1.3.3		Item 1.5.3
Item 1.1.4	Item 1.2.4	Item 1.3.4		Item 1.5.4
Item 1.1.5	Item 1.2.5			Item 1.5.5
	Item 1.2.6			Item 1.5.6
	Item 1.2.7			

Data regarding each of the six major Educational Goals for Colorado Citizens were similarly displayed. From these displays, this report was written, submitted for professional criticism, and revised for publication.

Organization of This Report

Four parts comprise this report:

Part I: An introduction--describing the nature of the assessment and the organization of the report.

Part II: Conclusions--bringing together many bits of information regarding achievements and needs of learners in Colorado.

Part III: Typical results--illustrating (1) what outcomes are commonly desired in Colorado, (2) student performance in regard to these desired outcomes, and (3) judgments as to the adequacy of student performance.

Part IV: Appendix--giving the rationale of the Assessment, technical information, and methodology.

II. CONCLUSIONS:

OUTCOMES DESIRED AND OUTCOMES ACQUIRED

Comparing goals and objectives (outcomes desired) with student performance (outcomes acquired) revealed certain learner achievements and certain learner needs in Colorado. Conclusions reached from these comparisons are offered below. Specific examples and detailed analyses are contained in Part III of this report.

Techniques of Learning

Stated first in Educational Goals for Colorado Citizens* is . . . "each student in the State has the opportunity to acquire:

> - the TECHNIQUES OF LEARNING which make discovery of knowledge and wisdom a functional, exciting, and lifelong process."

Objectives judged to be important by Colorado educators and which called for certain techniques of learning were found in the areas of language arts, science, social studies and mathematics. Student

*Adopted by the Colorado State Board of Education in 1971

performance on exercises relating to these objectives showed that some objectives have been achieved by most (more than 70%) of the students in Colorado, while other objectives have not been achieved by many (more than 30%) of the students.

The conclusions that follow are presented as answers to the question "have students acquired techniques of learning which make the discovery of knowledge and wisdom a functional, exciting, and lifelong process?"

Most (at least 70%) of students in Colorado appeared to be able -

- to extract pieces of information from a table of contents and from statistical tables by Grade 3;
- to select appropriate words to fit the context of simple sentences and to select appropriate sentences to fit the context of a paragraph by Grade 3;
- to identify the topic sentence of a paragraph by Grade 6;
- to identify appropriate uses of a dictionary and encyclopedia by Grade 6;
- to predict the probable results from measuring the same thing several times by Grade 9;
- to recognize verbs of sentences by Grade 12;
- to distinguish fact from opinion in a letter to the editor of a newspaper by Grade 12;

Many (more than 30%) of the students in Colorado appeared to be unable to identify or recognize -

- relative size of certain standard measures by Grade 3;
- the mathematical procedures needed in certain practical problems at all grade levels;
- the use of imagery in a literary passage by Grade 9;
- the correct order in which certain historical events occurred by Grade 12;
- a logically-correct sentence to complete a syllogism by Grade 12;
- certain structural elements of mathematics by Grade 12;
- subjects of sentences by Grade 12;

- analogies and hypotheses by Grade 12
- scientific explanations for many natural phenomena by Grade 12;
- geographic features, distances, and alternative routes on a road map by Grade 12;

Needs for certain "techniques of learning" were noted especially among learners from low-income, bi-lingual, low-education, and ethnic minority families. (See Part III of this report.)

Skills of Doing

Stated second in Educational Goals for Colorado Citizens is . . . "each student in the State has the opportunity to acquire:

> - the SKILLS OF DOING (computation, reading, intellectual, artistic, or physical performance) which produce satisfying participation in worthwhile human activities."

Objectives judged to be important by Colorado educators and which described specific "skills of doing which produce satisfying participation in worthwhile human activities" were found in the areas of mathematics, language arts, social studies, and music. Student performance revealed that most (over 70%) of the students in Colorado could:

- do simple computations of adding, subtracting, multiplying, and dividing by Grade 6;
- select words or phrases which are grammatically correct at all levels; (some exceptions to this are noted in Part III.)
- predict probable effect of certain natural changes on a particular environment by Grade 9;
- choose socially beneficial solutions to certain problems in human relations by Grade 9;
- distinguish certain musical terms from non-musical terms by Grade 9;
- select grammatically correct responses appropriate to ordinary conversation at Grades 9 and 12;
- choose active musical participation over passive listening or non-participation by Grade 12;

- estimate mathematical probability by Grade 12;

Many (over 30%) of the students in Colorado could not -

- compute prices, time-rate-distance, make change when given ordinary problem situations at all levels;
- determine length by use of indirect measurement by Grade 6;
- do simple computations with decimals and fractions by Grade 12;

Needs for certain "skills of doing" were found most prevalent among certain pupil populations, notably those pupils from low-income families. (See Part III of this report.)

Confidence of Knowing

Stated third in Educational Goals for Colorado Citizens is . . . "each student in the State has the opportunity to acquire:

- the CONFIDENCE OF KNOWING what is useful, relevant and meaningful to him."

Objectives in the areas of social studies, learner self-concept, and music appeared to be related to "the confidence if knowing." Student performance on exercises demonstrating such learning is described below.

Most (over 70%) of students in Colorado can -

- select the styles of music which they enjoy and do not enjoy;

Many (over 30%) of students in Colorado -

- among certain population groups (See Part III) choose learnings "outside of school" to be those "most important for me to learn.";

As this goal calls for considerable judgment regarding use, meaning, and relevance, the reader is encouraged to inspect the findings discussed in Part III to form his own conclusions as to whether students in Colorado have acquired "the Confidence of Knowing."

Satisfaction of Earning

Stated fourth in Educational Goals for Colorado Citizens is . . . "each student in the State has the opportunity to acquire:

- the SATISFACTION OF EARNING a contributing and rewarding place in the economic system."

Most informative regarding this goal were student opinions of their own ability to learn to do tasks often associated with the world of work. Most (over 70%) reported they could already -

- write a business letter by Grade 12;
- make a long-distance phone call by Grade 12;

and either could already or could learn to

- run a cash register in a supermarket by Grade 12;
- learn to speak enough German to work in a store in Germany within two years.

More comprehensive facts regarding "Satisfaction of Earning" were collected in Colorado's 1970 Assessment. These results are reported in Assessing Educational Outcomes in Colorado (1970), available through the ERIC Retrieval System #ED 050 153.

Capability of Being

Stated fifth in Educational Goals for Colorado Citizens is . . . "each student in the State has the opportunity to acquire:

- the CAPABILITY OF BEING a worthy person in his relationships to others and with himself."

Objectives in the areas of social studies and learner self-concept appeared to contain descriptions of student capabilities relative to this goal. Most students (over 70%) reported themselves to be -

- "above average" at learning things in school at all levels;
- "most like" students who are capable of learning at Grades 6 and 9;

- capable of learning reasonably demanding non-academic tasks at Grades 6, 9, and 12;

Results from social-studies exercises indicated that -

- while eventually a majority (75% in Grade 12) of students in Colorado can identify a reason for school rules, performance levels are much lower in Grades 3 and 6;
- most students (over 70%) demonstrated knowledge of various aspects of government including the rights of children under the United States Constitution by Grade 3;
- many students (more than 30%) could not distinguish between the Declaration of Independence and the United States Constitution by Grade 12 as documents which secure their personal rights and freedom;

Notable exceptions to these rather high performance rates were found among certain pupil populations. Typical findings included these facts:

- girls reported less confidence than boys in their ability to learn fairly demanding academic tasks;
- Chicano students and students from low-income families rated themselves lower on their ability to learn new things;
- less boys than girls reported they thought they were learning useful things in school;

Further information on "Capability of Being" is contained in Part III of this report.

Joy of Feeling

Stated sixth in Educational Goals for Colorado Citizens is . . . "each student in the State has the opportunity to acquire:

> - the JOY OF FEELING a sense of accomplishment, of contributing to the welfare of others, of having physical and mental well-being, of establishing satisfying friendships.

Objectives in the areas of health and learner self-concept appeared to be important in "having physical and mental well-being."

Most (over 70%) of students in Colorado could -

- identify single foods more nutritious than others by Grade 3;

- identify the dangers of smoking by Grade 3;
- identify a necessary precaution with prescribed drugs by Grade 6;
- identify a basic cause of obesity by Grade 9;
- identify some personal and social effects of drug addiction by Grade 12;
- predict they can learn to do reasonably demanding academic and non-academic tasks within several years;

Many students in Colorado (over 30%) could not demonstrate knowledge of -

- a benefit of a relaxed atmosphere at mealtime by Grade 3;
- the importance of regular visits to the dentist by Grade 6;
- the cause of obesity by Grade 9;
- characteristics of mental illness by Grade 9;
- common medical uses for certain drugs by Grade 12;
- what is the most balanced among several menus by Grade 12;
- a benefit of vigorous physical exercise by Grade 12;

Critical Needs

Certain critical needs were identified by (1) considering the importance of a particular skill, knowledge, or attitude in achieving a desired goal and (2) the numbers of students lacking such learnings.

Educational Goals for Colorado Citizens.

> Students in Colorado, in large majorities, could do simple computations of addition, subtraction, multiplication and division. The need is for applying these skills to practical, everyday problems. Lacks in skills of application and understanding would appear to jeopardize the students' chances to enjoy "satisfying participation in worthwhile human activities" as described in a statewide Goal for education in Colorado.
>
> If students are to "make the discovery of knowledge and wisdom an exciting, functional, and lifelong process,"

they need to strengthen certain skills in logical thinking, scientific processes, and measurement. Without such skills, the world may appear to these students to be more confusing and unhospitable than it actually is.

Students' opinion of their own ability to learn appeared to be more related to their minority or economic status rather than their actual capabilities. Here, a need for self-understanding, especially among certain pupil populations, was indicated.

Finally, certain pupil populations, especially those from families with low incomes, have far more than their share of difficulty with assessment exercises. The needs described in the above paragraphs are compounded when children have several needs instead of just one or two. Analysis of these needs is contained in Part III, which presents an item-by-item discussion of assessment results.

The remainder of the report contains detailed information from which the reader may draw conclusions of his own regarding learner needs in Colorado. Cooperative consideration of this information may lead to increasing congruence of "outcomes desired" and "outcomes acquired" in the schools of Colorado.

III. RESULTS:
PUPIL PERFORMANCE ON ASSESSMENT EXERCISES

Results of the Assessment are listed here to permit comparisons of two kinds: (1) comparisons of student performance (outcomes acquired) with goals and objectives (outcomes desired), and (2) comparisons of the performance of certain pupil population groups with the average for all students in Colorado.

Student performance data indicated either general (a) achievement of desired skills, knowledge or attitudes, or (b) non-achievement. When achievement was in evidence, a statement to that effect was made and marked with a (+) sign. When non-achievement was in evidence, a statement to that effect was made and marked with a (-) sign. The reader may note that the percentages on certain exercises don't always add up to 100%; this is due to rounding or to student non-responses.

A. LEARNING SKILLS

The first two Educational Goals for Colorado Citizens describe long-range outcomes commonly desired in Colorado:

Each student has the opportunity to acquire:

> the TECHNIQUES OF LEARNING which make discovery of knowledge and wisdom a functional, exciting, and lifelong process.
>
> the SKILLS OF DOING (computation, reading, intellectual, artistic, or physical performance) which produce satisfying participation in worthwhile human activities.

More specific descriptions of such learning skills were found in year-end curricular objectives which had been judged to be important by Colorado educators. Skills commonly taught in language arts, mathematics, and science appeared to be desirable to aid students to learn and to use what they have learned.

Language Arts - Grades 3 and 6

Using contextual clues in reading, distinguishing fact from opinion, using sources of information, and identifying correct grammar were skills found among commonly-desired objectives in elementary language arts. Student performance on exercises calling for these skills is discussed below.

Using contextual clues. Students in third grade were given two reading exercises calling for them to identify words to fit the context of simple sentences. Students identifying the correct word demonstrated not only their knowledge of individual words, but a more general comprehension of the meaning of the sentences.

Bring me the _____ from the shelf, please.		1971
a) house	a) o	2%
b) book	* b) o	93%
c) door	c) o	3%
d) dust	d) o	2%
Park the _____ by the street.		
		1971
a) star	a) o	1%
b) bench	b) o	2%
c) car	* c) o	94%
d) light	d) o	3%

(+) The high rate of correct response on these items (93%) and 94%) indicates that Colorado students in third grade can, in fact, use contextual clues in reading simple sentences.

Selecting a sentence consistent with the context of a paragraph was called for in other exercises such as this one:

How does this story probably end? Tommy ate his lunch. He went to the store. He looked at some toys and books. Then he went to the gas station. There, he _____.		1971
a) played football.	a) o	7%
b) put air in his bike tires.	* b) o	89%
c) sang songs	c) o	3%

(+) Results on this and two similar exercises indicate that the students in Grade 3 in Colorado can read with sufficient comprehension to identify a logical ending to a simple paragraph.

Students' ability to put disorganized statements into historical sequence was demonstrated in this item.

Read these sentences and answer the question below.

a. Sammy ate the candy bar.
b. Sammy bought his favorite kind of candy bar.
c. Sammy found a dime on the sidewalk.
d. Sammy went into a nearby candy store.

If you wanted these sentences to tell a story, which sentence would come first?

		1971
a) sentence "a"	a) o	9%
b) sentence "b"	b) o	6%
c) sentence "c"	* c) o	75%
d) sentence "d"	d) o	7%

(+) A clear majority of the students were able to identify the sentence which would come first in the story.

Distinguishing fact from opinion. The ability to tell whether a statement is factual or an expression of someone's opinion was demonstrated in this exercise.

The Johnson family moved into a house with 6 bedrooms and each of the other 2 families moved into houses with only 3 bedrooms.

		1971
a) fact	* a) o	46%
b) opinion	b) o	49%
(nonresponse)		6%

The Johnsons live in the nicest of the 3 houses.

		1971
a) fact	a) o	46%
b) opinion	* b) o	51%
(nonresponse)		4%

(-) The data for all exercises calling for the ability to distinguish fact and opinion indicate a correct-response percentage that can be accounted for almost entirely by chance guessing.

Using information sources. Several exercises called for the students to identify and use certain sources of information to find answers to questions.

To find out what a word means, children may		1971
a) look it up in the dictionary	* a) o	69%
b) look it up in an encyclopedia	b) o	10%
c) look at the word very hard	c) o	8%
d) skip it	d) o	8%
(nonrespondents)		5%

(-) Twenty-one percent of the students in Grade 3 not choosing either "dictionary" or "encyclopedia," would seem to indicate lacks in students' ability to identify information sources.

(-) Other exercises showed that the two-step reasoning required to locate information from a book's table of contents is not attained by Colorado children in Grade 3. On a task calling for first using a list of illustrations to find the page number of a certain picture, then looking on the table of contents to see which chapter contains that page, most students can only guess at the correct answer. Similar results were obtained in the 1970 assessment in Colorado.

Selecting correct usage. Skills identified as important to "produce satisfying participation in worthwhile human activities" included the capability of selecting grammatically correct word forms. Typical exercises and student performance were as follows:

Joe and Sharon are now _____ to the playground fence in a race!

			1971
a)	run	a) o	5%
b)	running	* b) o	91%
c)	runned	c) o	2%
d)	ranned	d) o	2%

They have _____ other races before this one.

			1971
a)	runned	a) o	8%
b)	ranned	b) o	5%
c)	ran	c) o	75%
d)	run	* d) o	12%

(+) and (-) More students in Grade 3 were able to identify correct present-tense verbs than those in past-perfect tense. Other results on Grade 3 grammar exercises were similarly mixed.

Several identical exercises given at both Grades 3 and 6 assessed students' ability to identify correct plurals and possessives:

If this toy belongs to James, we can say, "This toy is _____."

			1971	
			G6	G3
a)	James'	* a) o	42%	30%
b)	Jameses	b) o	6%	17%
c)	Jamese's	c) o	12%	48%
d)	Jame's	d) o	40%	6%

When you have more than one penny, you may have several _____.

			1971	
			G6	G3
a)	pennys	a) o	20%	29%
b)	penny's	b) o	8%	17%
c)	pennies	* c) o	69%	48%
d)	pennie's	d) o	3%	6%

(-) Although more students in Grade 6 than in Grade 3 made correct answers, many students finish elementary programs without competence to identify correct forms of plurals and possessives.

On other exercises, the students in Grade 6 performed as follows:

(+) 83% chose "I don't doubt that" over "I don't doubt but that" and "can hardly run" over "can't hardly run."

(+) 76% could identify topic sentences in two different paragraphs.

(-) Only 50% (the chance guessing rate) chose "different from" over "different than," a result obtained also from students in Grade 9.

(-) Less than two-thirds could identify the subjects and verbs of sentences, the tense (past, present, or future) of a verb.

Language Arts - Grades 9 and 12

Student performance on certain tasks of analysis and distinguishing correct from incorrect usage indicated the extent to which some of these "techniques of learning" and "skills of doing" were being acquired in Colorado schools.

Distinguishing between correct and incorrect usage was required to successfully complete these exercises:

Mark the one sentence which sounds the better of each pair below:		
a) Regardless of the price, I'll take it.	a) o	82%
b) Irregardless of the price, I'll take it.	b) o	17%
a) They met my wife and I at the door.	a) o	54%
b) They met my wife and me at the door.	b) o	40%
a) While the days are hot, the nights are chill y.	a) o	9%
b) Although the days are hot, the nights chilly.	b) o	85%
a) He gave a speech along the lines of good citizenship.	a) o	16%
b) He gave a speech about good citizenship.	b) o	78%

(+) Except for the common error in selecting "my wife and I" in the second exercise above, consistently more than 70% of the students in Grade 12 can distinguish between correct and incorrect usage.

Selecting correct but appropriate replies to grammatically incorrect questions was the problem posed by these exercises:

The next two questions are about what you would most likely do in certain situations.

a. The situation:

You are at a job interview. During the summer you will need this job very badly as you will have to help out with expenses at home. If you get this job, you will have to drive the company truck and the owner must get partial insurance for you. During the interview he says, "I hope you ain't got any traffic tickets.

What reply would you most likely give?

			1971 G12	1971 G9
a)	"No, I ain't got any tickets."	a) o	1%	2%
b)	"I have received no traffic tickets."	b) o	29%	33%
c)	"No, I haven't."	* c) o	63%	65%
d)	"No, I ain't."	d) o	1%	

b. The situation:

You and two of your friends are talking to a man who has come to your school to get volunteers for a hospital service project he is organizing. When he asks one of your friends to join, the friend says, "I don't got no time for that stuff."

When he asks the second friend, the reply is, "I don't got no time either."

Finally he asks you. What reply would you most likely give?

			1971 G12	1971 G9
a)	"I don't got no time either."	a) o	2%	2%
b)	"I'm sorry, but I don't have the time."	* b) o	78%	76%
c)	"Sorry, but I ain't got the time."	c) o	2%	5%
d)	"I would most assuredly like to assist your worthy cause, but other commitments prevent my affiliation at this time."	d) o	12%	16%

(+) Most students selected grammatically correct responses to grammatically incorrect questions. Slightly over 10% of the students chose responses which were grammatically correct but generally too fancy for the ordinary situation presented.

Analyzing English composition. An identical exercise, calling for skills of analyses was given to students in Grades 9 and 12 as follows:

Read the following letter and answer questions about it.

To the Editor:

(a) Something must be done to reduce the carnage and slaughter on the highways in Colorado. (b) The yearly death toll has risen from 433 in 1960 to 687 in 1970. (c) I would like to see drivers with six violations on their record be removed from the road for good; after all, six fouls remove a pro player from the basketball court. (d) If the accident-prone drivers were removed from the road, the yearly death rate would probably go down on Colorado highways.

Results obtained indicated that:

(+) 85% of ninth-grade and 91% of twelfth-grade students can find the statement of fact in the letter above.

(-) Only half of the students for either grade could identify the hypothesis, the analogy, and the author's likely purpose in the letter above.

Other exercises not reproduced here indicated that:

(+) Students in Grade 9 (74%) generally can identify verbs of sentences.

(-) Students in Grade 9 generally cannot identify subjects of sentences.

(-) Slight over half (55%) of the students in Grade 12 can select as different a sentence beginning with an independent clause from others beginning with a dependent clause.

(-) Less than half of the students in Grade 12 can recognize poetic imagery.

Language Arts - Pupil Population Groups

Performance of various pupil population groups was compared with statewide performance generally on all language arts items. The (-) indicates that the population group scored below the state average, the (+) indicates that the population group scored above the state average.

TABLE 1

AVERAGE PERCENT CORRECT ON LANGUAGE ARTS EXERCISES:
POPULATION GROUPS COMPARED TO STATE AVERAGE
1971 SCHOOL YEAR

		Grades			
		3	6	9	12
Sex:	Boys	-0.8	-1.0	-2.3	-2.0
	Girls	+1.5	+1.2	+2.6	+1.4
Ethnicity:	Black	-3.5	-1.6	-7.4	-9.6
	Chicano	-7.8	-5.8	-8.5	-5.0
	Bilingual	-10.3	-4.5	-8.4	-7.0
Father's Education:					
	Grade School	-8.2	-6.7	-4.4	-2.0
	High School	+1.8	+0.2	+0.9	+0.4
	College	+6.6	+4.9	+3.5	+2.7
Family Income:					
	Less than $4500	-7.9	-6.7	-2.2	-3.4
	$4500-$9000	+0.7	+0.2	-1.2	+0.7
	More than $9000	+4.6	+3.4	+2.6	+2.1
Community:	Rural	+1.2	+0.5	+1.7	+0.8
	Res/Ind/Com	-3.3	-1.8	-3.2	-4.9
	Residential	+0.1	+0.3	+0.5	+1.4

Some tasks which appeared especially difficult for the low-performing population groups were as follows:

Boys - using table of contents (Grade 3)

Blacks - distinguishing fact and opinion (Grades 3 and 12)
putting events into sequence (Grade 3)
identifying subject of a sentence (Grade 9)
word association (Grade 9)

Chicanos - drawing conclusions (Grade 3)
using table of contents (Grade 3)
word association (Grade 9)

Bilingual - reading skills (all levels)

Low income - analysis of English composition (Grade 12)

Residential/commercial/industrial community - distinguishing sentence structure (Grade 12)

Low Education - identifying factual statements (Grade 12)

Mathematics - Grades 3 and 6

"Techniques of learning" and "skills of doing" were also found to be described in some detail in year-end curricular objectives judged to be important by mathematics teachers in Colorado. These skills included not only simple computation, but also the application of rules, recognition of structural elements and other tasks requiring conceptual understanding of mathematics. Student performance on certain of these tasks is discussed below:

Adding, subtracting, multiplying, and dividing. Student performance on simple computations was found to be as follows among students in Grades 3 and 6.

TABLE 2
MATH PERFORMANCE IN GRADES 3 AND 6

Third Grade	Correct	Sixth Grade	Correct
Multiply 3 digits by 1 digit	77%	Multiply 3-digits by 3 digits	83%
Add two 3-digits	89%	Add five 3-digits	72%
Subtract one 3-digits from another 3-digits	60%	Subtract one 4-digits from another 4-digits	77%
Multiply 3-digits by 1 digit	59%	Multiply 3-digits by 2 digits	83%
Divide 2-digits by 1-digit	70%	Divide 6-digits by 1-digit	80%

(+) As should be expected, there appears to be growth between Grades 3 and 6, with greater percentages of students doing more complex problems in Grade 6 than Grade 3. Multiplication appears to be a noteworthy growth area, however. . .

(-) Between 15% and 25% of students in Colorado appear to finish Grade 6 without certain basic computational skills. Mistakes, possibly due to carelessness, appeared most prevalent in the addition and subtraction problems.

Identifying standard measures. On exercises calling for demonstration of understanding of certain measures, these findings were obtained for students in Grade 3:

(+) 85% indicated correctly that a year is longer than a day, week, or month.

(-) Only 61% indicated correctly that a quart is smaller than a gallon, but larger than a cup and pint.

(-) Only 31% could estimate the distance across Colorado in this exercise:

Which choice best names the distance across the state of Colorado?		1971
a) four miles	a) o	4%
b) forty miles	b) o	13%
*c) four hundred miles	* c) o	31%
d) four thousand miles	d) o	52%

Among students in Grade 6:

(-) Less than half of the students could distinguish between cubic and square measures for describing the amount of air in a room.

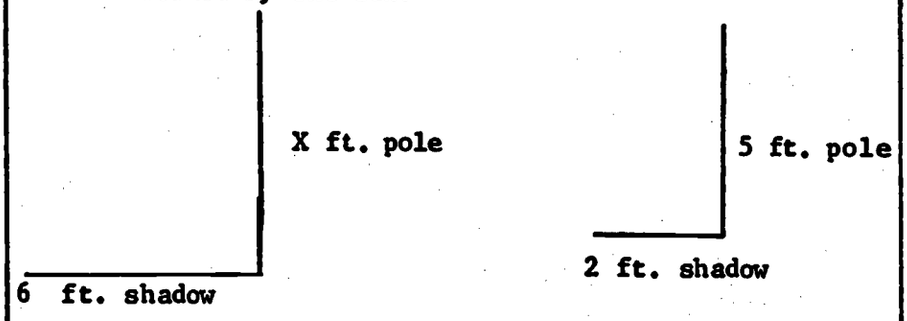
Computing time, rate, and distance. This exercise, given to students in Grade 6, called for students first to find the number of miles driven and then dividing by the number of gallons of gasoline used to find the gas mileage of a car:

A man drove 60 miles per hour for 4 hours and used 12 gallons of gas. How many miles did he drive on 1 gallon of gas?		1971
a) 20	* a) o	27%
b) 15	b) o	22%
c) 5	c) o	32%
d) 3	d) o	18%

(-) In this and similar exercises, Colorado students in Grade 6 responded correctly at about the rate of chance guessing.

Skills of indirect measurement were assessed with this exercise:

The two figures below represent two poles and their shadows formed by the sun:



How tall is the pole on the left?

			1971	1970
a)	12 ft.	a) o	53%	
b)	13 ft.	b) o	19%	
c)	15 ft.	* c) o	23%	27%
d)	20 ft.	d) o	5%	

(-) Students in Grade 6 in Colorado were unable to use concepts of mathematical proportions in indirect measurement in the above problem.

Finding information from a statistical table. Students in Grade 3 were asked two questions, answers to which could be found or computed from a table.

The table below shows how many students were in class for each day of a week.

	Mon	Tues	Wed	Thurs	Fri
Boys	15	13	10	14	11
Girls	14	12	15	13	12

On what day were the fewest boys in class?

			1971
a)	Monday	a) o	11%
b)	Tuesday	b) o	6%
c)	Wednesday	* c) o	65%
d)	Thursday	d) o	3%
e)	Friday	e) o	13%

On what day were the fewest students in class?		
a) Monday	a) o	8%
b) Tuesday	b) o	9%
c) Wednesday	c) o	31%
d) Thursday	d) o	4%
e) Friday	* e) o	44%

(-) Approximately one-third of students in Grade 3 could not find the lowest number for "boys" in the table and then see which day that lowest number was under.

(-) Over half of the students could not find the total attendance for each day and identify the day with the lowest total.

Selecting appropriate procedures. On the following exercise. . .

To solve the problem 34 + ☐ = 93 correctly, you can:		1971	1970
a) subtract 34 from 93	* a) o	36%	39%
b) add 34 to 93	b) o	36%	
c) subtract 93 from 34	c) o	26%	

(-) Students in Grade 3 show a lack of understanding that addition and subtraction are inverse (or opposite) operations.

On different exercises . . .

(-) About half of the students in Grade 6 could identify the procedure to find the average height of a basketball team.

(-) Only slightly more than half (57%) of Colorado students in Grade 6 indicated that multiplication, rather than addition, subtraction, or division, was the way to find the area of a truck bed when the length and width are known. Similar numbers of students in Grade 6 could correctly identify the two-step procedure for finding the average height of a basketball team.

Computing prices, making change. Exercises calling for skills with money obtained these results:

(-) Third-grade students performed at a level barely better than chance in identifying the price of 6 pens at a price of 2 for 25¢.

(-) Most students in Grade 6 could not identify the combination of coins which represents the change from a $3.95 (plus 19 cents tax) purchase with a five-dollar bill.

Applying concepts of positive and negative numbers.

(-) Most Colorado students in Grade 6 could not identify the number of degrees of temperature change between 20° above to 5° below zero. Many students incorrectly identified 15° as the correct answer.

Mathematics - Grades 9 and 12

Solving common problems, computations with fractions and decimals, identifying number relationships, identifying faulty logic, and identifying structural properties of mathematical systems were skills judged important by Colorado educators. The extent to which students in Grades 9 and 12 have acquired these skills is indicated in the assessment results discussed in this section.

Solving common problems. Identical or similar exercises given in both Grade 9 and Grade 12 demonstrated various skills in solving problems.

Computing-	9th	12th
Prices of ham*	41% correct	68% correct
Car speed	42% "	61% "
Cost of installment buying*	78% "	58% "
Return on investment	55% "	68% "

*Different exercises for Grades 9 and 12.

(-) Although there were more students in Grade 12 than in Grade 9 who made correct responses, it appeared that between 30% and 40% of Colorado students finished Grade 12 without being able to solve these problems of a practical nature.

Results on two exercises given only in Grade 9 obtained the following:

A pipe can empty a 175 gal. tank in 7 min. At what rate (gal./min.) does the pipe empty the tank?

		G9
a) 25 gal. per min.	*a) o	85%
b) 168 gal. per min.	b) o	7%
c) 183 gal. per min.	c) o	3%
d) 1225 gal. per min.	d) o	3%

A machine sorts 600 cards in one minute. How many cards does it sort per second?

		1971
a) 10	*a) o	74%
b) 3600	b) o	5%
c) 660	c) o	2%
d) 60	d) o	19%

(+) Sizeable majorities of students in Grade 9 could find these rates of flow and card sorting. The second exercise, calling for knowledge that there are 60 seconds per minute, appeared more difficult.

Identifying number relationships. Ninth-grade students' capability to indicate what happens to an element in an equation when a different element is changed was assessed by two items.

What happens to y in the following equation when x increases?

$$\frac{1}{x}(4) + 3 = y$$

		1971
a) y decreases	* a) o	35%
b) y increases	b) o	45%
c) y stays the same	c) o	18%

What happens to □ in the number sentence △ + □ = 7 when △ gets larger?

		1971
a) □ gets smaller	*a) o	51%
b) □ gets larger	b) o	13%
c) □ stays the same	c) o	26%
d) none of these	d) o	9%

(-) The majority of students in Grade 9 did not appear to have the requisite understanding of number relationships to determine the effect of change in one element on another element.

Identifying structural properties. Similar exercises given to students in Grades 9 and 12 yielded these results:

Grade 9:

Select the property that is illustrated in the following equation 4x(x3) = (4x8)x3		1971	1970
a) associativity	* a) o	40%	51%
b) commutativity	b) o	24%	
c) distributivity	c) o	24%	
d) identity element	d) o	5%	
e) inverse element	e) o	5%	

Grade 12:

$a \times \frac{1}{a} = 1$		1971	1970
a) associativity	a) o	10%	
b) commutativity	b) o	9%	
c) distributivity	c) o	13%	
d) identity element	d) o	27%	
e) inverse element	*e) o	38%	50%

(-) Considerably lower performances in 1971 than 1970 (not found in other areas) were evident on identifying structural properties of mathematical equations. Rates of correct response dropped from approximately 50% to 40%.

Computation with fractions and decimals. Simple computational skills requiring no application to a common problem were assessed by such exercises as this:

.42 ÷ .0007 =		1971	1970
a) 6	a) o	12%	
b) 60	b) o	13%	
c) 600	* c) o	62%	60%
d) 6,000	d) o	7%	

(-) While this performance by Colorado students in Grade 12 represents an improvement over performance of students in Grade 9, over one-third of students graduating from high school in Colorado appeared to have difficulty in computations with decimals.

(-) Similarly, over one-third of Colorado students in Grade 12 were unable to identify the correct answer to 5/8 ÷ 1/3 = ?

Identifying true and faulty logic. Students in Grade 12 performed as follows on this exercise:

If it is a car, then it has four wheels. It has four wheels. Therefore		1971
a) it is a car	a) o	23%
b) it is not a car	b) o	4%
c) no conclusion	* c) o	72%

Another problem was as follows: "If it rains, then it will turn cold. It is raining." Sixty-seven percent concluded "it will turn cold." On another item, 50% responded with "I might have a square" when given "All squares are rectangles. I have a rectangle. Therefore--." When given "If 'p and q' is false, then:", 46% recognized "either p or q is false" as the right answer.

(-) The results suggest that approximately one-half of the students in Colorado graduate from high school without developed abilities in logical thinking.

Computing probability. Students in Grades 9 and 12 demonstrated skills in computing probability in exercises such as this:

If a 6-sided die is rolled, what is the probability of getting a 2?		G9	G12
a) 1/6	* a) o	54%	74%
b) 2/6	b) o	27%	15%
c) 4/6	c) o	9%	3%
d) 1/2	d) o	9%	5%

(+) An increase of 20% between Grades 9 and 12 shows considerable improvement and a fair mastery of this concept by Grade 12.

Mathematics - Pupil Population Groups

Performance of various pupil population groups was compared with statewide performances generally on all mathematics items.

TABLE 3

AVERAGE PERCENT CORRECT ON MATHEMATICS EXERCISES: POPULATION GROUPS COMPARED WITH STATE AVERAGE

		Grades			
		3	6	9	12
Sex:	Boys	0.0	-0.3	+2.3	+0.8
	Girls	-0.1	+0.9	-1.8	-1.1
Ethnicity:	Black	-8.4	-9.3	-14.7	-23.6
	Chicano	-8.6	-8.2	-14.6	-16.3
	Bilingual	-8.0	-5.7	-14.5	-11.6
Father's Education:					
	Grade School	-8.6	-7.3	-5.9	-5.9
	High School	+0.6	-0.3	-2.0	+2.0
	College	+4.3	+8.6	+9.2	+2.9
Family Income:					
	Less than $4500	-3.7	0.0	-6.2	-7.0
	$4500-$9000	+0.3	-0.1	+0.7	+1.9
	More than $9000	+5.4	+6.0	+9.1	+6.4
Community:	Rural	+2.1	+3.1	+2.9	-0.7
	Res/Ind/Com	-7.3	-3.6	-4.8	-3.1
	Residential	+5.0	+0.1	+1.1	+1.9

Some tasks appeared particularly difficult for low-performing groups:

Girls

Computing time, rate, and distance (Grade 9)
Computing probability (Grades 9 and 12)

Blacks

Finding information from a table (Grade 3)
Adding 5 three-digit numbers (Grade 6)
Computing cost of installment buying (Grade 9)
Computing probability (Grade 9)
Subtracting decimals (Grade 12)
Computing probability (Grade 12)

Chicano

Identifying measures of quantity (Grade 3)
Identifying appropriate procedures (Grade 6)
Computing probability (Grade 9)
Multiplying fractions (Grade 9)
Identifying faulty logic (Grade 12)
Identifying structural properties (Grade 12)

Bilingual

Identifying measures of quantity (Grade 3)
Making change (Grade 3)
Adding positive and negative numbers (Grade 6)
Computing probability (Grade 9)
Identifying structural properties (Grade 9)
Identifying faulty logic (Grade 12)
Computing rates (Grade 12)

Low Family Education

Identifying measures of quantity (Grade 3)
Finding information from a table (Grade 3)
Selecting correct procedure (Grade 6)
Computing costs of installment buying (Grade 9)
Computing probability (Grade 12)
Identifying structural properties (Grade 12)

Low Income

Simple division (Grade 3)
Selecting correct procedure (Grade 6)
Computing probability (Grade 9)
Identifying faulty logic (Grade 12)

Residential/Commercial/Industrial

Finding information from a table (Grade 3)
Selecting correct procedure (Grade 6)
Computing rate (Grade 9)
Identifying faulty logic (Grade 12)

Science - Grades 3 and 6

Scientific knowledge and scientific procedures enable students at all levels of development to "make the discovery of knowledge and wisdom

a functional, exciting, and lifelong process." Understanding of natural phenomena, a systematic way to find things out, dealing effectively with the environment - all of these capabilities may be classified as learning skills. The extent to which students in Colorado have acquired some of these skills is reported from findings from the statewide assessment.

Demonstrating scientific curiosity. Students demonstrated their scientific curiosity and their knowledge on how to conduct an experiment in several exercises.

Mary combed her hair with her plastic comb. Then she held the comb above some pieces of Kleenex on the table and the Kleenex jumped up and stuck on the comb. Her friends who watched said the following things. Which thing is the most scientific:

			1971	
			G6	G3
a)	"I do not believe what I saw."	a) o	5%	14%
b)	"It's magic and can't be explained."	b) o	6%	17%
c)	"The Kleenex wanted to jump up to the comb."	c) o	4%	12%
d)	"I can't explain it, but there must be a reason why the Kleenex pieces jumped up to the comb."	*d) o	84%	55%

(+) Most students in Colorado, by the time they reached Grade 6, indicated correctly that there are scientific explanations for natural phenomena. Relatively few chose responses indicating belief in magic or general disbelief.

Understanding the requirements of a scientific experiment was demonstrated by Colorado students in these exercises:

Someone said that if you mix salt and sugar with water and let the mixture stand you get salt-water taffy -- a kind of candy. Which of the following could be the best way for you to test this idea?

		1971 G6	1971 G3
a)	take a vote among your friends a) o	2%	7%
b)	buy some salt-water taffy and see if it has salt in it. b) o	8%	18%
c)	find out if salt and sugar have the same chemical in them c) o	9%	15%
d)	grind up some salt-water taffy to see if d) o	4%	
e)	try to mix salt, sugar, and water, let stand, and see what happens *e) o	77%	58%

Tom wanted to find out whether plants can grow better in the dark or in the light. He put a pot with 6 radish seeds in a dark room and a pot with 6 bean seeds on the window sill.

radish seeds in the dark

bean seeds in the light

He added the same amount of water to both pots. The bean seeds grew better than the radish seeds, so Tom said his plants grew best in the light.

To be able to say this, he should have

		1971 G6	1971 G3
a)	watered both pots more a) o	6%	15%
b)	watered the radish seeds more b) o	13%	16%
c)	put the same kinds of seeds in both pots *c) o	73%	43%
d)	grown the seeds in water instead of soil d) o	8%	22%

(+) Despite the complexities of these exercises, majorities could identify the correct scientific procedure for the experiments described above. However, the 25% of the students in Grade 6 answering incorrectly represented some 10,000 young Coloradoans.

Other exercises by which students demonstrated capabilities to engage in scientific processes were as follows:

(-) Six-grade students generally could not identify what a scientific theory does (explains why some thins act as they do).

(-) Third-grade students attributed "bad luck" to breaking a mirror (24%), walking under a ladder (16.1%), letting a black cat cross your path (28.0%) rather than to none of these (27.1%).

(-) Only two-thirds of Colorado students in Grade 6 could identify mathematics as being more useful in scientific research than music, magic, marketing, or manufacturing.

Explaining natural events. Students were given several exercises in which they could demonstrate their scientific knowledge in identifying reasons for certain natural phenomena. For example, students in Grade 6 responded as follows to this exercise:

A fossil of an ocean fish was found in a rock outcrop on a mountain. This probably means that

			1971
a)	fish once lived on the mountain	a) o	7%
b)	the relative humidity was once very high	b) o	10%
c)	the mountain was raised up after the fish died	*c) o	30%
d)	the fish used to be amphibians like toads and frogs	d) o	8%
e)	the fossil fish was probably carried to the mountain by a great flood	e) o	44%

(-) Generally, students in Colorado have not, by Grade 6, gained the understanding of the pre-historic formation of the continents.

On other exercises, results indicated that

(+) Most Colorado students in Grade 3 could correctly identify the reason for day and night. (The earth turns.)

(+) Most students in Grade 3 indicated correctly that babies come from their mother's body rather than the stork, the hospital, or the doctor.

(+) A majority (87%) of students in Grade 6 correctly indicated that the earth needs plants for human survival.

(-) Over half (58% of Colorado students in Grade 6 correctly identified erosion as a reason for some rocks being smooth.

(-) About half (53%) of students in Grade 6 identified the purpose of a scientific theory as explaining natural events, or behavior.

Prevalence of superstition was assessed by this exercise:

Which one of the following will cause you to have bad luck?	1971 G6	1971 G3
a) breaking a mirror	a) o 8%	24%
b) walking under a ladder	b) o 5%	16%
c) letting a black cat cross your path	c) o 5%	28%
d) none of these	*d) o 80%	27%

(+) Between Grades 3 and 6, approximately half of the students in Colorado seemed to learn that superstition provides little or no explanation for "bad luck."

Other scientific knowledge and skills.

(-) Less than half (45%) of students in Grade 3 could identify how a tree, a worm, and a flower growing in a pot were similar. (They are all alive.)

(-) Few students (less than one-third) in Grade 6 were able to identify the position of a block of wood floating in fresh water as compared to a block of wood floating in salt water (law of displacement).

(-) One in three (one-third) of Colorado students in Grade 6 could identify "housefly" as a carrier of disease.

(+) 76% of students in Grade 6 could identify Einstein as the scientist in a list with other famous men.

(+) A majority of students in Grade 6 (over 80%) could identify baking soda as useful for putting out a fire in the kitchen.

Science Grades 9 and 12

By completion of junior and senior high school, students should be able to use scientific processes and information to understand the world in which they find themselves. Assessment results indicated to what extent that this goal has been achieved.

Identifying processes and procedures. Students demonstrated their knowledge of one aspect of scientific measurement in this exercise:

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

		1971 G12	1971 G9
a) all of the measurements will be exactly the same	a) o	13%	9%
b) only two of the measurements will be exactly the same	b) o	6%	8%
c) all but one of the measurements will be exactly the same	c) o	6%	8%
d) most of the measurements will be close but not exactly the same *	d) o	73%	73%

(+) and (-) While nearly three-fourths of students in Grade 12 demonstrated their knowledge of the probable outcome of repeated measurements, this represented no superiority over students completing Grade 9.

Students' understanding of the use of a scientific model was assessed in this exercise:

What special meaning does the word "model" have when used in scientific terms like "the atomic model"?

		1971 G12	1971 G9
a) a structure made of plastic which you can look at to see what an atom would look like if it was big enough to see	a) o	40%	40%
b) a theory of how atoms are made which tries to explain why atoms act like they do *	b) o	30%	24%
c) a small scale copy of an atom	c) o	17%	23%
d) an idea of what the original atom looked like before all other atoms were made	d) o	6%	9%

(-) Few students could identify the purpose of a scientific model.

An ability to generalize from a table of information was assessed in this exercise:

A doctor kept records of heart-beat rates of people when they were resting. He made the table below.

Heart-beat Rates

Person	Beats in a minute
Baby boys	85
7-yr. old girls	80
7-yr. old boys	80
10-yr. old boys	77
mothers	72

The table shows that			1971		
			G-12	G-9	G-6
a) boys' hearts beat faster than girls'	a)	o	4%	5%	10%
b) girls' hearts beat faster than boys'	b)	o	2%	3%	5%
c) older people's hearts beat faster than younger people's	c)	o	4%	3%	8%
d) younger people's hearts beat faster than older people's.	*d)	o	88%	86%	76%

(+) Most students by Grade 12 could check various statements against the information given and then decide which statement was supportable.

Explaining natural phenomena. On exercises calling for scientific explanations of why certain things are the way they are, the following results were obtained:

(+) Nearly two-thirds of students in Grade 9 correctly identified the molecular explanation of the difference between solids, liquids, and gasses among untrue or partially true explanations.

(-) Few students (less than one-third) in Grade 9 could find the temperature of the water after mixing 2 pints of 20°C and 1 pint of 80°C. (40°C)

(-) Approximately half of the students in Grade 12 could identify the statement demonstrating the Law of Conservation in explaining how a candle's flame heats a pan of water.

(-) At least half of the students finishing Grade 12 could not identify correct explanations for:

- Why giraffes have long necks (natural selection)
- Why a fossil of a fish could be found on a mountain top (undersea volcanoes in prehistoric times)
- Why some rocks are smooth and some aren't (erosion)
- Why plants are needed on earth (to manufacture oxygen)
- Why milk is pasteurized (to kill harmful bacteria)

- How marble was formed (heat and pressure)
- Why continents haven't been washed into the sea (earth forces push land up at about the same rate as erosion)
- Why mercury and glass is used in a thermometer (mercury expands more than glass when heated)
- Why a sodium substance will turn yellow when heated (increased electron energy is given off as yellow light).

Several exercises assessed student understanding of certain ecological relationships:

In a particular meadow there are many rabbits that eat the grass. There are also many hawks that eat the rabbits. Last year a disease broke out among the rabbits and a great number of them died. Which of the following probably then occurred?

			1971 G12	1971 G9
a)	the grass died and the hawk population decreased	a) o	5%	10%
b)	the grass died and the hawk population increased	b) o	3%	5%
c)	the grass grew taller and the hawk population decreased	* c) o	78%	58%
d)	the grass grew taller and the hawk population increased	d) o	4%	4%
e)	neither the grass nor the hawks were affected by the death of the rabbits	e) o	9%	22%

Which of the following would LEAST upset the balance of animal and plant life in a small area?

			1971
a)	burning a forest	a) o	3%
b)	draining a swamp	b) o	3%
c)	constructing a dam	c) o	4%
d)	broadcasting radio waves	* d) o	87%
e)	killing all hawks, owls, and vultures in the area	e) o	2%

(+) Understanding certain ecological relationships seemed to be prevalent among Colorado students in Grade 12.

Science - Pupil Population Groups

TABLE 4

AVERAGE PERCENT CORRECT IN SCIENCE:
POPULATION GROUPS COMPARED WITH STATE AVERAGE*

		Grades			
		3	6	9	12
Sex:	Boys	-2.2	+0.4	+3.7	+3.3
	Girls	+2.7	0.0	-2.9	-3.5
Ethnicity:	Black	-11.7	-17.6	-13.2	-12.0
	Chicano	-6.2	-8.3	-7.4	-19.0
	Bilingual	-12.9	-11.0	-12.3	-19.7
Father's Education:					
	Grade School	-14.0	-15.6	-4.2	-4.6
	High School	+9.6	+0.8	-0.5	-0.3
	College	+10.1	+8.3	+4.6	+7.3
Family Income:					
	Less than $4500	-12.2	12.0	-4.2	-10.1
	$4500-$9000	+1.3	-1.7	+4.3	0.0
	More than $9000	+5.7	+6.3	+6.2	+6.5
Community:	Rural	-1.0	+1.5	+4.3	+1.7
	Res/Ind/Com	-5.0	-2.9	-5.5	-7.7
	Residential	+1.4	+0.1	+0.4	+1.5

*See following page for example.

B. LEARNER SELF-CONCEPT

Educational Goals for Colorado Citizens, adopted by the State Board in 1971, includes this desired outcome from Colorado schools:

> each student has the opportunity to acquire: the capability of being a worthy person in his relationships with others and with himself.

Performance objectives, also adopted by the Board and designed to enable students to attain long-range goals, included:

TABLE 5

THIRD-GRADE STUDENTS PERFORMANCE ON TWO TYPICAL SCIENCE EXERCISES

		G3	Boys	Girls	Blacks	Chicano	Parents' Educational Level			Type of district		
							GS	HS	College	Rural	Res/Comm	Res.
a. Our sun is a												
a) planet	a) o	25%	25%	23%	29%	30%	27%	22%	23%	27%	22%	24%
b) satellite	b) o	12%	11%	14%	11%	11%	15%	13%	6%	11%	16%	12%
c) solar system	c) o	15%	13%	17%	14%	21%	22%	15%	11%	14%	18%	15%
d) star	* d) o	48%	51%	46%	46%	38%	35%	50%	61%	47%	44%	49%
b. Which one of the following things often found in the kitchen could be used to put out fires?												
a) cooking oil	a) o	15%	14%	16%	18%	17%	29%	16%	12%	12%	13%	17%
b) baking soda	* b) o	47%	50%	44%	36%	42%	41%	47%	51%	49%	44%	48%
c) alcohol	c) o	26%	24%	28%	29%	30%	19%	25%	29%	26%	31%	24%
d) charcoal	d) o	10%	9%	11%	18%	11%	11%	10%	5%	10%	10%	10%

All students shall show evidence of a self-concept which recognizes their individual strengths and weaknesses . . .

The intent of the Board is clear - along with knowledge and skills, students should acquire positive attitudes as well. Such an intent is consistent with findings from educational research which indicate that cognitive (knowledge and skills) learning and affective (attitudes) learning go hand in hand; achievement of one enhances the achievement of the other.

The University of Colorado's Laboratory of Educational Research designed assessment forms by which students could report their views of themselves as learners. Specifically, personnel at the Laboratory prepared four performance-type objectives, which described what students would do to indicate whether or not they had achieved a self-concept as a learner. The objectives specified these outcomes in terms of student performance:

- The pupil will select such self-descriptors as "a good learner" from a list of descriptive statements.
- The pupil will predict that he can learn reasonably demanding academic work if he makes the effort to learn.
- The pupil will identify himself with pupils who are capable of learning.
- The pupil will express the opinion that he is capable of learning a number of moderately demanding non-academic skills (e.g., routine banking, long-distance calls) in the world outside of school.

The Learner Self-Concept form was given at the same time as the other form on the same sampling basis in Grades 3, 6, 9, and 12. Results are reported below, first the statewide results and then by pupil-population groups.

Describing Self as Capable

An identical question asked at all four grade levels obtained these responses:

How good are you at learning things in school?		1971			
		G12	G9	G6	G3
a) among the worst	a) o	0	1%	1%	3%
b) poor	b) o	0	1%	1%	3%
c) below average	c) o	2%	5%	6%	5%
d) average	d) o	37%	46%	47%	16%
e) above average	e) o	23%	19%	13%	9%
f) good	f) o	24%	22%	21%	42%
g) among the best	g) o	11%	6%	11%	18%

(+) Large and increasing numbers of students reported themselves to be average or above in their ability to learn things at school.

(+) Increasing numbers of students between Grades 3 and 12 saw themselves as average, with no students reporting themselves as "poor" or "among the worst" by Grade 12.

(-) Among students at all levels, those from families with incomes under $4500 reported themselves as "good" rather than "among the best."

(+) or (-) Persistently through Grade 9, between 7% and 10% reported themselves to be "below average." What happened to these students between Grades 9 and 12? Did they improve their self-concepts or did they drop out?

(-) Among Chicano pupils in Grade 9, 60% reported themselves as "average" as compared with 46% of all pupils (Chicanos included). Only 25% of Chicano pupils in Grade 9 rated themselves "above average."

(-) Students from low-education families also tended to rate themselves lower as learners at all levels.

A question which did not, as was done in the above question, ask students to compare themselves with others was given to students in Grades 3 and 6 with these results:

Are you like this?	1971 G6 Yes	G6 No	G3 Yes	G3 No
a) a good learner	73%	19%	70%	12%
b) a poor learner	11%	79%	13%	65%

(-) Considerably more students in Grade 6 rated themselves as "poor learners" on this question than "below average" on the question discussed first in this section.

(-) Rather high rates of non-response on this question may indicate either the question was confusing or that the students were reluctant to report whether or not they think they are "good learners."

(-) As in the question before this one, students in Grade 3 from lower-income families tended to rate themselves lower:

	% Choosing "poor learners"
Low income	25%
Middle income	12%
High income	7%

(-) More girls than boys chose the "good learner" designation at both Grades 3 and 6.

Predicting academic success. Several questions presented students with fairly complex learning tasks and then asked students to make predictions about their ever being able to learn them. For example, this question received these responses from students in Grade 3:

Look at the writing in the box, but don't read it carefully.

> "Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty and dedicated to the proposition that all men are created equal. Now we are engaged in a great Civil War, testing whether that nation or any nation so conceived and so dedicated can long endure."

How old will you be before you can read and understand what's written in the box?

		1971
a) 9 years old	a) o	31%
b) 11 years old	b) o	32%
c) 13 years old	c) o	14%
d) 15 years old	d) o	7%
e) 17 years old	e) o	9%
f) I don't think I'll ever be able to understand it	f) o	5%

(+) Large numbers of third-grade students (95%) predicted that eventually they will be able to understand the first paragraph of Lincoln's Gettyburgh Address.

(-) When faced with a particular learning task, girls tended to be slightly less confident than boys in their eventual understanding of this passage.

(-) Students from low income families tended to give more variable responses with higher percentages than the total population choosing, (a) "9 years old" and (b) "I don't think I'll ever be able to understand it."

Students in Grades 6, 9, and 12 predicted their eventual capability to solve a rather complex mathematical equation in this exercise:

Problem

$$\cos^2 x - 2 \cos x + 1 = 0$$

Find all values of x for which the above equation is true.

Do you think that you ever could learn enough math to correctly solve the above problem?

		1971	
		G9	G6
a) yes	a) o	54%	40%
b) no	b) o	13%	8%
c) uncertain	c) o	28%	49%
d) I already know how to solve it.	d) o	5%	3%

(+) There was less uncertainty at Grade 9 than at Grade 6 as to whether students believed that they would ever be able to solve the above math problem.

(-) At Grade 9, girls tended to be slightly less confident than boys, a tendency which increased at Grade 12. Also at Grade 12, 31% of the boys and 21% of the girls reported they already knew how to solve the equation.

In a question about learning German, the following results were obtained from students in Grade 9:

If you went to live in Germany, how long do you think it would take you to learn to speak German well enough to work in a department store?

		1971
a)	less than 2 months	a) o 1%
b)	2 months	b) o 5%
c)	6 months	c) o 14%
d)	a year	d) o 32%
e)	2 years	e) o 30%
f)	4 years	f) o 11%
g)	more than 4 years	g) o 6%

(+) The tendency of Chicano pupils to express a slightly less confident assessment of themselves was not evident on this particular question.

(-) The 17% who predicted "4 years" or "never" appeared to be unrealisticly high.

Identifying with capable learners. Students were given descriptions of four boys' learning ability and asked to identify the boy "most like" himself. Identical items given at both sixth-grade and ninth-grade produced these results:

John learned all of his lessons with ease. He hardly studied at all, but still he learned everything and passed all of the tests with top grades.
Bob worked hard to learn his lessons. When he didn't understand things right away, he would think hard and pretty soon he would know how to do the lesson.
Jim tried hard to learn. But no matter how hard he tried, he couldn't seem to understand well enough to pass the teacher's test.
Tom gave up trying to learn a long time ago. He used to try, but now he knows it is just no use trying to learn all that stuff in those books.

Which boy is most like you?

		1971	
		G9	G6
a)	John	a) o13%	15%
b)	Bob	b) o56%	61%
c)	Jim	c) o17%	13%
d)	Tom	d) o 3%	4%
e)	None of them	e) o11%	8%

(-) While a majority of the students (76% in Grade 6 and 69% in Grade 9) chose students as most capable of learning, at least approximately one-fifth (between 8,000 and 10,000) students at each grade level chose non-learners as "most like" themselves.

(-) Little change or growth was noted between Grade 6 and Grade 9; students' self-confidence seemed pretty well set, possibly to their detriment.

(-) Most apparent were relationships between level of father's education and choosing non-learners "Jim" and "Tom" as "most like" the students.

Father's Education	% Choosing "Jim"
Less than Grade School	37%
Finished Grade School	31%
Finished High School	16%
Finished College	8%

(Differences between boys and girls were not appreciable on this question).

Predicting non-academic success. Students were asked whether or not they could ever learn to do certain non-academic tasks. Results were as follows:

Which of the following things do you think you could learn to do someday, IF YOU WANTED TO?

To type on a typewriter		1971 G12	1971 G6
a) Yes, I probably could learn to, if I wanted to	a) o	87%	89%
b) I'm not sure if I could	b) o	1%	9%
c) No, I probably couldn't learn to, even if I wanted to	c) o	1%	2%
d) I can already	d) o	10%	

To speak French		1971 G12	1971 G6
a) Yes, I probably could learn to, if I wanted to	a) o	65%	62%
b) I'm not sure if I could	b) o	12%	30%
c) No, I probably couldn't learn to, even if I wanted to	c) o	5%	7%
d) I can already	d) o	15%	

To work a cash register in a supermarket		1971 G12	1971 G6
a) Yes, I probably could learn to, if I wanted to	a) o	65%	89%
b) I'm not sure if I could	b) o	1%	8%
c) No, I probably couldn't learn to, even if I wanted to	c) o	1%	3%
d) I can already	d) o	32%	

To make a long-distance phone call		1971 G12	1971 G6
a) Yes, I probably could learn to, if I wanted to	a) o	8.3%	94%
b) I'm not sure if I could	b) o	0%	5%
c) No, I probably couldn't learn to, even if I wanted to	c) o	0%	1%
d) I can already	d) o	90%	

To write a business letter		1971 G12	1971 G6
a) Yes, I probably could learn to, if I wanted to	a) o	17%	81%
b) I'm not sure if I could	b) o	1%	16%
c) No, I probably couldn't learn to, even if I wanted to	c) o	0%	2%
d) I can already	d) o	80%	

(+) As would be hoped, there is less uncertainty and more confidence in learning certain non-academic tasks in Grade 12 than in Grade 6.

Opinions of school activities, as reported by students in Grade 12, were indicated in this question.

Check the <u>one</u> response which <u>best</u> describes your attitude toward learning in school:			1971
a) I am learning a great deal in my classes which will be useful to me after graduation.	9.	a) o	37%
b) I do not care very much about learning in my classes as long as I can earn a passing grade.		b) o	3%
c) I could learn things from my classes if I wanted to but the most important things for me to learn are outside of school.		c) o	10%

			1971
d)	I like being in school even though I am not a very good learner.	d) o	4%
e)	School is a waste of time for me; I can hardly wait until graduation so that I won't have to learn any more	e) o	1%
f)	I am not learning very much in school; I can hardly wait to get to college so I can take some interesting courses.	f) o	10%
g)	None of the above is a good description of my attitude.	g) o	32%

(-) Forty-two percent (42%) of the girls as compared with 31% of the boys chose "a" regarding the usefulness of things learned in school.

(-) More rural than urban students chose the option "the most important things for me to learn are outside of school."

The high (32%) rate of selecting option "g" prevents any conclusions regarding student opinion statewide from this exercise.

C. SOCIAL KNOWLEDGES AND SKILLS

Each of the Educational Goals for Colorado Citizens has a social dimension. For example, the "Techniques of Learning" implies students' learning from a social situation as well as alone; the "Skills of Doing" include participation in social events; the "Capability of Being" involves relationships with others, and so on.

More particularly a Performance Objective, adopted by the State Board concurrently with the goals, states as follows:

For the student:

> All students shall acquire levels of knowledge of home, community, nation, and world which enable them to function in a manner appropriate to their age and environment.

and for the student in relation to society:

> All students shall demonstrate a knowledge of and appreciation for a democratic form of government.

The outcomes mentioned and implied in these goals and objectives describe students who have acquired considerable social knowledges and skills. Knowledge (if not approval) of social conventions, social organization, interpersonal competence, and a sense of history are commonly deemed important in Colorado and are encompassed by the goals and objectives stated above.

Assessment exercises were gathered from a variety of sources:

> National Assessment of Educational Progress (a project of the Education Commission of the States) - Citizenship
>
> Instructional Objectives Exchange (a project of ESEA Title III at the University of California at Los Angeles) - history, civics and geography
>
> Standardized Tests of Social Studies - ideas of items assessing various knowledges and skills in the social studies

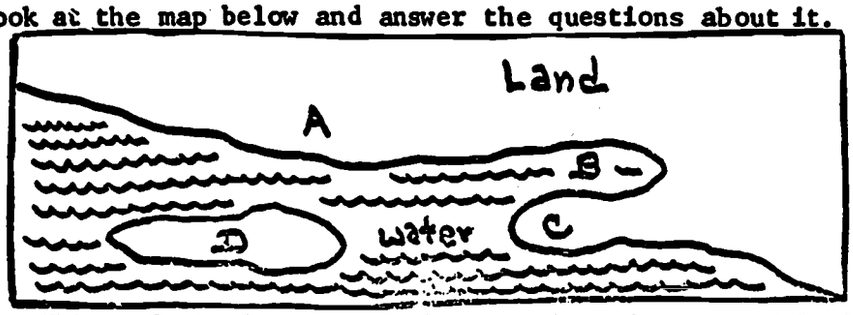
Student performance on these exercises was analyzed according to "Social Studies for Colorado Schools" a compendium of objectives collected and classified by consultants at the Colorado Department of Education in 1969 to be consistent with statewide educational goals as adopted by the State Board of Education.

Map Reading

At both the elementary and secondary levels students were given a portion of a map and then asked to find certain information from it.

Grades 3 and 6. On an identical exercise given at both the 3rd and 6th grade levels, students performed as follows:

Look at the map below and answer the questions about it.



Which of the letters on the map above is on an island?

		1971 G3	1971 G6
a)	"A"	o 31%	12%
b)	"B"	o 3%	1%
c)	"C"	o 3%	1%
* d)	"D"	o 56%	84%

Which of the letters on the map is on a peninsula?

		1971 G3	1971 G6
a)	"A"	o 19%	9%
b)	"B"	o 25%	22%
* c)	"C"	o 34%	64%
d)	"D"	o 19%	5%

Which of the letters on the map above is on a gulf or bay?

		1971 G3	1971 G6
a)	"A"	o 19%	5%
* b)	"B"	o 34%	67%
c)	"C"	o 32%	26%
d)	"D"	o 12%	2%

(+) Most (84%) of the students in Grade 6 could identify an island on a small map. Only slightly more than half of students in Grade 3 could do this. This indicated improvement in this skill among students in their upper elementary years in Colorado schools.

(-) Although considerably more students in Grade 6 than in Grade 3 could identify a "peninsula," and a "bay," approximately one-third of the students still could not do this upon completion of Grade 6.

Grades 9 and 12. On a portion of a road map (not reproduced here), students correctly found information at the following rates:

Task:	% Correct G9	G12
Finding the number of roads crossing another	92%	94%
Computing number of miles between towns	45%	40%
Identifying correct directions from one town to another	44%	56%

(-) While students in Grades 9 and 12 could count the number of roads crossing another, the tasks of computing miles between towns and identifying correct directions appeared very difficult for the students.

Demonstrating Knowledge of Social Organization

Students demonstrated, via assessment exercises, their knowledge of certain facts of social organization. Included were exercises touching on, (a) reasons for certain laws and social institutions, (b) political processes, and (c) miscellaneous facts of common knowledge.

Reasons for laws. An identical exercise was given in Grades 3, 6, and 12 with these results:

The main reason there are school rules is

		1971 G3	G6	G12
a)	to keep pupils from misbehaving	a) o 35%	36%	9%
b)	to make pupils acts like adults want them to act	b) o 20%	16%	11%
c)	to protect the rights of all	* c) o 32%	45%	75%
d)	to make the teachers happy	d) o 1%	2%	4%

(-) While eventually a majority (75% in Grade 12) of Colorado students can identify the main reason for school rules, performance levels are much lower in Grades 3 and 6.

The general purpose of Child Labor Laws is

		1971 G9	G12
a)	to get jobs for needy children	a) o 14%	6%
b)	to get teenagers to do some work	b) o 6%	2%
c)	to protect children from hazardous or harmful experiences	* c) o 68%	87%
d)	to protect employers from unqualified workers	d) o 10%	4%

(+) A sizeable majority (87%) of Colorado students, by high school graduation time, could identify the purpose of Child Labor Laws.

(-) Sizeable numbers of students in Grade 9, many of them employed or employable, probably did not know their rights and responsibilities under Child Labor legislation.

Organization of government. A few exercises touched on facts of governmental organization.

The capital of the United States is		1971 G3
a) New York	a) o	5%
b) Denver	b) o	17%
c) Washington, D.C.	* c) o	74%
d) Colorado Springs	d) o	2%

(+) Ability to identify the capital of the United States is indicated by approximately three-fourths of students in Grade 3.

The Congress of theUnited States is made up of two parts. One is the House of Representatives. What is the other?		G12
a) Assembly	a)o	1%
b) Electoral College	b) o	0
c) Senate	* c) o	95%
d) State Department	d) o	0
e) Supreme Court	e) o	4%

When might a state have more Senators than it has Representatives?		G12
a) when it has a small area	a) o	5%
b) when it has a large area	b) o	10%
c) when it has a small population	* c) o	50%
d) when it has a large population	d) o	34%

(+) Knowledge of the electoral college among Colorado students in Grade 12 appeared to approach the 100% level.

(-) Few students in Grade 12 have enough background knowledge to identify when a state might have more Senators than Representatives.

The United States Constitution serves to protect children as well as grown-ups.		1971	
		G3	G6
a) true	* a) o	76%	90%
b) false	b) o	23%	9%

(+) Majorities of students in Colorado, by Grade 6, could identify a purpose of the Constitution regarding children as well as grown-ups.

Other questions about the United States Constitution included the following:

Free speech, free worship, and free press are promised to all American citizens in		1971
		G6
a) the Declaration of Independence	a) 0	42%
b) the United States Constitution	* b) o	44%
c) neither of the above	c) o	14%

The Fourteenth Amendment to the United States Constitution limits state police actions		G12
a) to standards of equal protection and due process	* a) o	57%
b) usually in time of national emergency	b) o	8%
c) only in cases of racial equality	c) o	7%
d) none of the above	d) o	26%

(-) Students in Colorado generally could not (a) distinguish between the Declaration of Independence and the Constitution in Grade 6, or (b) identify the control of state actions by the Constitution in Grade 12.

Legal processes. Elections, negotiations, and settling disagreements by legal means were processes which students were called upon to identify in the assessment exercises.

How did Governor Love get to be Governor?

		1971 G3	1971 G6
a) he was elected	* a) o	67%	90%
b) he was hired	b) o	7%	1%
c) he was appointed	c) o	12%	6%
d) his father was Governor	d) o	13%	2%

(+) By Grade 6, most students could identify how the Governor became Governor.

What is the political party of President Nixon?

		1971 G3	1971 G6
a) Democrat	a) o	28%	28%
b) Republican	* b) o	37%	58%
c) Independent	c) o	24%	9%
d) Other	d) o	9%	5%

What is the political party of Governor Love?

		1971 G6
a) Republican	* a) o	55%
b) Democrat	b) o	28%
c) Independent	c) o	11%
d) Other	d) o	6%

(-) Most students in Grade 6 could not identify the political party of the President or the Governor currently in office.

On other exercises dealing with legal processes, students performed as follows:

(-) Approximately half of the students in Grade 12 could identify why workers organize into labor unions (To bargain with employers).

(+) Approximately three-fourths of students in Grade 9 identified the right of appeal in a disputed ruling by a District Court.

(-) Virtually no child in Grade 6 could identify his right to attend school without paying tuition.

(+) Most students identified why it is good to have at least two candidates for an office (So people can have a choice).

The appropriate legal process to settle a possible disagreement was in question on this exercise:

Before very long, men may go from Earth to Mars in rockets. Both the United States and Russia may be planning to send men to Mars. Whoever gets to Mars first may say that Mars belongs to their country and that other countries can't send people there. Before this happens, What do you think the governments of our country and Russia should do about it?		G9
a) Have a race and the winner would own Mars	a) o	2%
b) Right to Mars should be settled in advance by international agreement	*b) o	73%
c) Fight over it and the winner gets the biggest share	c) o	1%
d) I don't know	d) o	23%

(+) Students in Grade 9, in large numbers, chose a legal solution to the problem of the ownership of Mars. Also, some 23% admitted, "I don't know" to this complex and relatively new problem.

Identifying Appropriate Social Processes

Students in Grade 9 were given descriptions of various social situations and then asked "What would you do?"

You belong to a club. A person of another race wants to join your club. Some of the other club members are doubtful about admitting that person because of his race. You		G9
a) don't want any problems so you make up an excuse to tell the person.	a) o	2%
b) suggest that all members get to know the individual, and then decide on club membership	b) o	* 80%
c) leave the club if the person were admitted	c) o	2%
d) none of the above	d) o	15%

(+) Only 4% of these students chose unsocial or devious solutions to the problem regarding matters of interracial relations.

On other situations given students in Grade 9:

(+) Over two-thirds chose to ask the reason for a particular ruling on student dress rather than either refusing to comply or letting the issue drop.

(-) Only half of the students in Grade 9 would take the opportunity to travel to another city and live with another family for a month.

(-) Less than half of the students in Grade 9 would accept a nomination to class office if a friend also wants the office.

Historical Perspective

Exercises which asked students to identify a period of time or to put events into sequence were also included in this section.

How long has the United States of America been a nation?

		1971	
		G3	G6
a) 100 years	a) o	16%	14%
b) 200 years	* b) o	14%	36%
c) 400 years	c) o	26%	30%
d) 1500 years	d) o	43%	20%

(-) Although there appears to be increased awareness of the age of the United States between Grades 3 and 6, over two-thirds of the students in Grade 6 still guessed wrong on this exercise. By Grade 12, only 70% could identify the approximate age of the United States.

In what chronological order did the following events occur?
King John signed the Magna Carta in England
Plato wrote his Republic in Greece.
Hammurabi set down written law in Babylonia
John Hancock signed the Declaration of Independence in America

		1971		
		G6	G9	G12
a) King John, Plato, John Hancock, Hammurabi	a) o	16%	8%	2%
b) Plato, Hammaurabi, King John, John Hancock	b) o	23%	23%	21%
c) Hammurabi, Plato, King John, John Hancock	*c) o	33%	52%	69%
d) none of the above	d) o	26%	13%	5%

(+) By Grade 12, a considerable but not impressive number of students could put these historical events into their order of occurrence.

Performance on All Exercises by Pupil Population Groups

Performance of several pupil population groups was compared to performance of all students on social knowledges and skills items. The (-)

indicates the population group scored below the state average; the (+) indicates the population group scored above the state average. Response patterns found in mathematics, science, health, and language arts appeared also in the social studies exercises. The minority students,

TABLE 6

AVERAGE PERCENT CORRECT ON SOCIAL STUDIES EXERCISES: PUPIL POPULATION GROUPS COMPARED WITH STATE AVERAGE

		Grades			
		3	6	9	12
Sex:	Boys	+0.7	+1.7	+1.6	+2.2
	Girls	-0.5	-1.4	-1.7	-1.6
Ethnicity:	Black	-11.5	-4.2	-12.7	-16.3
	Chicano	-7.8	-7.7	-9.8	-5.6
	Bilingual	-7.0	-9.7	-11.2	-7.8
Father's Education:					
	Grade School	-7.3	-7.3	-5.6	-1.7
	High School	0.0	-0.1	+0.2	+0.3
	College	+6.4	+3.9	+4.7	+2.5
Family Income:					
	Less than $4500	-6.1	-5.6	-11.2	-7.2
	$4500-$9000	+0.6	-0.3	+2.5	0.0
	More than $9000	+4.2	+5.7	+7.8	+3.6
Community:	Rural	-3.7	+0.5	+1.8	+2.4
	Res/Ind/Com	-4.4	-2.2	-1.3	-2.8
	Residential	+0.9	0.0	-0.6	+0.3

students from low-income and low-education families, and from industrial communities scored consistently lower.

D. HEALTH INFORMATION

Educational Goals for Colorado Citizens, as adopted by the Colorado State Board of Education, calls for opportunities for each student to acquire:

> the CONFIDENCE OF KNOWING what is useful, relevant and meaningful for him.

And more specifically related to students' health and physical well being, Performance Objectives (adopted concurrently with the Educational Goals) specify that

> All students shall demonstrate continuing physical development appropriate to their individual strengths and weaknesses.

Still more specifically, objectives judged to be important by educators in Colorado describe student behaviors which indicate that students have, in fact, acquired health information important to physical development and well-being. These objectives, among other things, specify that students should have information useful:

- to identify healthful eating habits;
- to distinguish between practices beneficial and harmful to physical strength and health;
- to recognize harmful and beneficial uses of drugs;
- to demonstrate knowledge of disease and mental illness;
- to identify important dental care practices;

Exercises in which students demonstrated whether or not such information has been acquired were given to students in Grades 3, 6, 9, and 12 on a statewide sample. Performance of students on these exercises is discussed below.

Grade Three

Children in these young, formative years make daily choices which bear on their present and future well-being. Their responses on various exercises calling for health information is one indication of the type of choices they would make in various situations.

Identifying healthful eating habits. Students in Grade 3 selected nutritious meals as follows:

Which of the following snacks would be best for you?

		1971
a) cake and potato chips	a) o	6%
b) cake and 7-Up	b) o	11%
c) candy bar	c) o	4%
d) milk and cookies	* d) o	78%

Jimmy eats only a good cereal for breakfast, lunch and supper. Bobby eats fruit, meat, bread and vegetables every day. Who will grow up to be healthier?

		1971
a) Jimmy	a) o	14%
b) Bobby	* b) o	84%

(+) Given choices among foods and eating habits, substantial majorities of students in Grade 3 could identify the most nutritious.

(-) Ability to select the most nutritious meal (first exercise above) appeared to be related to the income level of the student's family:

Gross Yearly Income of Pupils' Family	Percent Answering Item b Correctly
Under $4,500	63%
Between $4,500 & $9,000	78%
Over $9,000	85%

Actually eating the food once it was selected was touched upon in exercises such as these:

It is a good idea to wash your food down with water so that you don't have to chew so much.

		1971	1970
a) true	a) o	34%	29%
b) false	* b) o	65%	71%

If a person gets very mad or excited while he is eating, he might get sick to his stomach.

		1971	1970
a) true	* a) o	70%	69%
b) false	b) o	29%	31%

(+) Majorities of students in Grade 3 appeared to be knowledgeable about the importance of chewing food and a relaxed atmosphere at mealtime.

Recognizing physically beneficial practices. An exercise calling for students to recognize the beneficial effects of vigorous physical exercise received the following responses from students in Grade 3.

Billy played hard every day and was tired every night before bed. Jimmy sat quietly in his house all day and never got tired. Who probably will be healthier when he grows up?		1971	1970
a) Billy	* a) o	75%	75%
b) Jimmy	b) o	25%	25%

(+) Majorities of students in Grade 3 could identify the more active of two children as the one most likely to be healthier when he grows up.

Recognizing harmful effects of smoking. Early information on smoking was assessed by this item:

People who smoke cigarettes all their lives will be just as healthy as people who never smoke cigarettes.		1971
a) true	a) o	12%
b) false	* b) o	86%

(+) Students 8 and 9 years old appeared to know that cigarettes are harmful to peoples' health.

Identifying practices of dental care. Tooth-brushing and visiting a dentist were the subjects of these two exercises:

People don't need to go to a dentist unless they have a bad toothache.		1971
a) true	a) o	36%
b) false	* b) o	62%

Betty eats lots of candy and does not brush her teeth. Sally does not eat candy and she brushes her teeth at night and in the morning. Who may get cavities and have fillings in her teeth?		1971
a) Betty	* a) o	81%
b) Sally	b) o	18%

(-) Importance of seeing a dentist was not in evidence among students in Grade 3, especially those from lower-income families:

Family Income	% Correct
Under $4500	50%
$4500-$9000	65%
Over $9000	80%

Recognizing correct uses of drugs. Knowledge about drugs and their uses or effects was assessed in exercises such as these:

Some drugs can be taken as medicine if		1971
a) the doctor says to take them.	* a) o	67%
b) you feel sick and need them.	b) o	8%
c) you want to take them.	c) o	7%
d) people should never take them.	d) o	16%

Taking drugs		1971
a) makes you happy.	a) o	4%
b) can be a habit.	*b) o	74%
c) both (a) and (b) are true	c) o	17%

Mrs. Jones was sick. She went to the doctor; he gave her some pills that made her well. Mrs. Smith felt sick. Mrs. Jones let Mrs. Smith borrow her pills. Did Mrs. Jones do the right thing?

		1971
a) yes	a) o	27%
b) no	* b) o	72%

Will all pills make you feel good when you take them?

		1971	1970
a) yes	a) o	22%	25%
b) no	* b) o	77%	75%

(+) Certain minimal precautions associated with the use of drugs and medicines seemed to have been learned by a majority of pupils by the end of third grade.

(+) Students in Grade 3 exhibited a fairly high rate of trust in professional expertise with the use of drugs.

(-) A significantly large percentage of pupils considered sharing of prescribed medicines the "right thing" to do.

(-) Apparently, large numbers of students in Grade 3 incorrectly thought that all pills will make them feel good.

Grade Six

Students in Grade 6, hopefully, will show more knowledge of health practices important to their physical and mental well being. Assessment results are informative as to whether this was the case in Colorado.

Identifying healthful eating habits. As in Grade 3, students were asked to identify among several choices the most nutritious meals and healthful eating habits.

Drinking coffee makes a person healthier.

		1971	
		G6	G3
a) true	a) o	5%	22%
b) false	* b) o	95%	76%

(+) Misconceptions about coffee held in Grade 3 appeared to be overcome by Grade 6 in Colorado.

Which one of the fdlowing lunches represents the most balanced diet?		1971	1970
a) hamburger, potato chips, cookies,and pop	a) o	3%	
b) hamburger, carrots, pickles, and tomato juice	b) o	41%	
c) ham sandwich, french fries, and a milk shake	c) o	4%	
d) ham sandwich, potato salad, an orange green beans, and a milk shake	* d) o	53%	58%

(-) Consistently, students in Grade 6 could not identify the combination of food most healthful among several choices. Again, performance of students from low-income families was considerably lower on an exercise dealing with nutrition.

Two exercises asked students to demonstrate knowledge of diet in connection with being fat:

Most people are fat because		1971
a) they're born that way; it runs in their family.	a) o	15%
b) they eat more calories than they burn up by work or exercise.	* b) o	52%
c) they eat the wrong kinds of foods	c) o	33%

Which of the following contains the most fat?		1971
a) apples	a) o	2%
b) potatoes	b) o	31%
c) fish	c) o	7%
d) cream	* d) o	61%

(-) Approximately half of the students in Grade 6 attributed being fat to the simple practice of eating more calories than are used. The 15% selecting the hereditary explanation might well believe that being fat is beyond a person's control. The one-third selecting a dietary explanation apparently had only partial knowledge. These misconceptions appeared among girls more than boys though in low-income more than high-income groups.

(-) Almost one-third of Colorado students in Grade 6 indicated incorrectly that potatoes contain more fat than cream.

Recognizing physically beneficial practices. Exercises dealing with physical fitness obtained these results:

What is the best thing to do to have healthy lungs and heart?

		1971	1970
a) sleep and rest	a) o	12%	
b) eat the right food	b) o	13%	
c) get lots of exercise	* c) o	73%	66%
d) take a bath every day	d) o	2%	

It is not good for your body to run and play so hard that you get tired and out of breath.

		1971	1970
a) true	a) o	48%	54%
b) false	* b) o	52%	46%

(-) Students in Grade 6 appeared to be somewhat uncertain or misinformed about the benefits of physical exercise. While 73% rated "lots of exercise" as most important for healthy lungs and heart, only 52% (no better than random guessing) recognized that getting tired and out of breath was not bad for you.

(-) On an item not reproduced here, half of the students in Grade 6 demonstrated the misconception that face-washing was sufficient to prevent acne or facial blemishes among youth.

Demonstrating knowledge of disease and mental illness. On items not reproduced here, of the students in Grade 6

(+) 88% correctly identified immunization as the best way to keep from getting polio, measles, small-pox.

(+) 71% diagnosed a mole that was growing in size and changing color as a possible sign of cancer.

(+) 72% chose "germ control" as the explanation of why many foods require refrigeration.

Recognizing dangers of smoking and drugs. Comparisons between 1970 and 71 and Grade 3 and Grade 6 were made on this exercise:

People who smoke cigarettes all their lives will be just as healthy as people who never smoke cigarettes.

		1971		1970
		G6	G3	G6
a) true	a) o	4%	12%	3%
b) false	* b) o	96%	86%	97%

(+) Knowledge of the dangers of smoking appeared to be prevalent among children between the ages of 9 and 12.

Growth-rate in students' knowledge of drugs may be observed on these exercises:

Some drugs can be taken as medicine if

		1971 G6	1971 G3
a) the doctor says to take them	* a) o	89%	67%
b) you feel sick and need them	b) o	6%	8%
c) you want to take them	c) o	2%	7%
d) people should never take them	d) o	3%	16%

Mrs. Jones was sick. She went to the doctor; he gave her some pills that made her well. Mrs. Smith felt sick. Mrs. Jones let Mrs. Smith borrow her pills. Did Mrs. Jones do the right thing?

		1971 G6	1971 G3	1970 G6
a) yes	a) o	5%	27%	5%
b) no	* b) o	95%	72%	95%

(+) By Grade 6, students appeared to be increasingly knowledgeable about use and misuse of drugs.

(-) A tendency for poor, urban, and ethnic minority students to indicate that people should never take drugs was noted in the assessment results.

Grade Nine

During the years of rapid change and growth, students' knowledge about factors influencing their health would seem crucial to attaining the goal stated at the outset of this section.

Identifying healthful eating habits. Students were asked to identify healthful foods separately and in combination:

Which one of the following drinks does not make a person healthier?

		1971	1970
a) milk	a) o	2%	
b) orange juice	b) o	1%	
c) chocolate milk	c) o	14%	
d) tea	* d) o	82%	82%

Which one of the following breakfasts is best for your health?

		1971
a) cereal, donut, coffee	a) o	1%
b) cereal, eggs, toast, tea	b) o	16%
c) cereal, orange, bacon, milk	* c) o	66%
d) cereal, pancakes, toast, milk	d) o	16%

(+) Large majorities of students in Grade 9 could identify tea among a list of other drinks as one that does not make a person healthier.

(-) Almost one-third of the students in Grade 9 could not identify the most nutritious breakfast menu among four alternatives.

On other items,

(-) Students in Grade 9, like those in Grade 6, could not (a) identify a food with the most fat content, or (b) correctly attribute being fat to eating more calories than are used.

Demonstrating knowledge of physical fitness, growth, and development. Students in Grade 9 responded to several exercises in this area as follows:

If a child will eat only the right kinds of food, he will not have pimples.

		1971		1970
		G9	G6	
a) true	a) o	18%	44%	16%
b) false	* b) o	82%	56%	84%

(+) Considerably more students in Grade 9 (82%) than in Grade 6 (56%) correctly indicated that pimples may be caused by factors other than diet.

Other items produced these results:

(+) 96% recognized as false the statement that girls can become pregnant before age 18.

(+) 88% identified immunization as the best way to prevent communicable diseases.

(-) Many (46%) students in Grade 9 incorrectly indicated that there is immunization against tuberculosis.

(-) Many (54%) consider, even at Grade 9, "much physical work" as harmful to the body:

Which one of the following is not harmful to your body?		1971	1971 Boys	1971 Girls
a) heavy smoking of cigarettes	a) o	1%	2%	1%
b) much physical work	* b) o	43%	53%	33%
c) heavy drinking of water	c) o	2%	3%	1%
d) consuming many more calories than you need	d) o	1%	1%	0
e) all of the above are harmful to the body	e) o	54%	42%	65%

Recognizing dangers of drugs. Results indicated that

(+) Large majorities of students recognized that

- drugs may be taken on a doctor's prescription
- glue sniffing can do bodily damage
- heroin is the most dangerous of several drugs

Grade Twelve

Exercises given at lower grades along with exercises assessing knowledge of certain drugs comprised the form completed by students in Grade 12.

Nutrition and weight control. Selecting nutritious meals and identifying reasons for being fat were asked of students in these exercises:

Most fat people are fat because		1971 G12	1971 G9	1971 G6	1970 G12	1970 G9
a) They're born that way; it runs in their family.	a) o	5%	9%	15%		
b) they eat more calories than they burn up by work or exercise	*b) o	75%	68%	52%	72%	73%
c) they eat the wrong kinds of foods	c) o	18%	21%	33%		

Which one of the following breakfasts is best for your health?		1971 G12	1971 G9
a) cereal, donut, coffee	a) o	1%	1%
b) cereal, eggs, toast, tea	b) o	18%	16%
c) cereal, oranges, bacon, milk	c) o	71%	66%
d) cereal, pancakes, toast, milk	d) o	8%	16%

(-) Although steady progress was made from Grade 6 through Grade 12 in dispelling misconceptions surrounding obesity, by the time Colorado pupils finished high school, only two-thirds could indicate (without guessing) that being fat is caused by imbalance of input of calories and output of energy.

(+) The inheritance explanation of obesity was almost gone by Grade 12.

(+) A majority, but not an impressive one, could identify the one most nutritious breakfast among four choices.

Demonstrating knowledge of physical growth and development. Comparison of Grade 12 with Grade 9 results were made on these exercises:

If a child will eat only the right kinds of food, he will not have pimples.		1971 G12	1971 G9
a) True	a) o	12%	18%
b) False	* b) o	86%	82%

Girls cannot become pregnant and have a baby until they are over 18 years old.

		G6	G9
a) True	a) o	1%	3%
b) False	* b) o	98%	96%

Which one of the following is not harmful to your body?

		1971	Boys	Girls
a) heavy smoking of cigarettes	a) o	1%	2%	0
b) much physical work	* b) o	38%	46%	31%
c) heavy drinking of beer	c) o	0	1%	0
d) consuming many more calories than you need	d) o	2%	3%	1%
e) all of the above are harmful to your body	e) o	56%	45%	64%

(-) The majority of pupils at Grade 12 continued to believe that much physical work is harmful to the body.

(-) Many students in Grade 12 and in Grade 9 indicated incorrectly that a good diet is sufficient to prevent pimples.

Disease prevention. Results of various public information programs may be estimated from the results on these items:

Many kinds of cancer can be cured if they are discovered early and treated.

		1971	1970
a) true	* a) o	91%	94%
b) false	b) o	9%	6%

Being in the sun too long for many years can make your skin dry and wrinkled and can even cause skin cancer.

		1971	Boys	Girls
a) true	* a) o	78%	70%	85%
b) false	b) o	21%	29%	14%

(+) The possible harm of over-exposure to sun and the benefits of early detection were recognized in relation to cancer by majorities of students in Grade 9.

Other exercises indicated:

(+) Immunization was considered by twelfth-grade students as the best protection against certain communicable diseases.

(-) The misconception that there is immunization (shots) for tuberculosis persisted among Colorado students in Grades 9 and 12.

Knowledge of mental illness. Comparisons among grade levels were made on these items:

Most mental illness is inherited; a person is born with a mental problem and it comes out when he is older.

		1971		1970	
		G12	G9	G12	G9
a) true	a) o	15%	27%	20%	26%
b) false	* b) o	82%	71%	78%	72%

Most people who are mentally ill are very dangerous people and should be kept locked up.

		1971			
		G12	G9	G6	G3
a) true	a) o	20%	18%	35%	38%
b) false	* b) o	80%	82%	64%	60%

(-) Approximately one in five students graduating from Colorado high schools (a) attributed mental illness to heredity, and (b) indicated most mentally ill people are dangerous. Little improvement was noted between Grades 9 and 12 on this latter misconception.

Drug information. Exercises calling for knowledge of legal/illegal, harmful/beneficial or habitual uses of drugs obtained these results for students in Grade 12:

One of the earliest known and still most useful drugs for relief of extreme pain is called

		1971
a) methadone	a) o	17%
b) amphetamine	b) o	10%
c) opium	* c) o	22%
d) none of these	d) o	49%

A drug frequently used in dieting and weight control is

			1971
a)	amphetamine	* a) o	30%
b)	paregoric	b) o	15%
c)	caffeine	c) o	13%
d)	none of these	d) o	39%

A very valuable drug used for control of epilepsy, high blood pressure and insomnia is called

			1971
a)	codein	a) o	2%
b)	phenobarbital	* b) o	63%
c)	meperdine	c) o	11%
d)	none of these	d) o	22%

A drug which may be purchased in many states without prescription providing it meets the federal standard as an exempt narcotic is called

			1971
a)	hashish	a) o	2%
b)	codeine	* b) o	63%
c)	morphine	c) o	11%
d)	none of these	d) o	22%

Habitual use of drugs can lead to

			1971
a)	personal unhappiness	a) o	7%
b)	community disorganization	b) o	1%
c)	financial loss	c) o	2%
d)	all of these	* d) o	82%
e)	none of these	e) o	5%

(-) Medical and legal information called for by these items was not conspicuously high among students in Grade 12. Chance guessing probably accounted for most correct answers that amphetamine was useful in weight control.

(+) General knowledge of possible consequences of taking drugs habitually was generally prevalent in graduating seniors in Colorado high schools.

Pupil Population Groups. Performance of certain pupil population groups was compared to performance of the total state population at Grades 3, 6, 9, and 12. The (-) indicates the population group scored below the state average, the (+) indicates the population group scored above the state average.

Table 7

AVERAGE PERCENT CORRECT ON HEALTH EXERCISES:
POPULATION GROUPS COMPARED TO STATE AVERAGE

		Grade 3	6	9	12
Sex:	Boys	-2.7	-0.1	-2.1	-1.4
	Girls	+3.0	+0.2	+2.0	+1.1
Ethnicity:	Black	-2.4	-7.6	-6.7	-2.4
	Chicano	-9.3	-5.3	-3.8	-6.4
	Bilingual	-6.8	-7.2	-5.2	-11.3
Father's Education:					
	Grade School	-3.6	-3.8	-1.5	+1.2
	High School	-1.6	+0.2	+0.9	+1.5
	College	+5.4	+2.2	+3.0	+0.7
Family Income:					
	Less than $4500	-4.3	-6.1	-2.3	-4.0
	$4500-$9000	-1.2	-0.3	+2.5	+1.8
	More than $9,000	+6.7	+3.4	+0.8	+1.9
Community:	Rural	+0.5	+2.8	+0.7	+2.0
	Res/Ind/Comm	-5.3	-1.9	-1.0	-3.6
	Residential	+0.8	-0.3	+0.2	+0.8

Familiar effects were noted: Boys generally scored lower than the state average as did students from minority, low-education and low-income families as well as students living in Residential/Industrial/Commercial areas. Further analysis may reveal in more detail what specific exercises were the most difficult for the various pupil population groups.

E. APPRECIATING MUSIC

Educational Goals for Colorado Citizens describes as desirable those opportunities for students to acquire

- skills of doing - including artistic performance
- confidence of knowing - including what is personally relevant
- a joy of feeling - including physical and mental well-being

Performance objectives, also adopted by the State Board specify that

> All students shall, according to their ability and interest, enjoy a variety of experiences in the cultural arts (including music)

Consistent with these goals and objectives and those objectives judged to be important by music teachers in Colorado schools, assessment exercises were constructed. Personnel from the Colorado Music Teachers Association advised in the exercise development. The music exercises were administered in May 1971 concurrently with the exercises in the six other areas. Results are summarized below in terms of three common objectives:

1. Valuing music as self expression
2. Liking music of various types and styles
3. Valuing music for itself

Valuing Music as Self Expression

Students demonstrated their interest in participating in musical activities by responding to various questions.

Grade Three. Three questions were asked in Grade 3 about instrumental music:

Would you be willing to save part of your allowance to buy a musical instrument, if someone would teach you to play it?		
a) yes	a) o	67%
b) no	b) o	16%
c) I'm not sure	c) o	17%
Would you practice 30 minutes every day in order to learn to play a musical instrument?		
a) yes	a) o	66%
b) no	b) o	16%
c) I'm not sure	c) o	18%

Would you like to learn to play a musical instrument?		
a) yes	a) o	76%
b) no	b) o	12%
c) I'm not sure	c) o	12%

(+) Large majorities of students in grade 3 indicated they were willing to spend time and money on learning to play an instrument. Less than one-fifth of all students indicated no such willingness with an equal number uncertain.

Regarding vocal music, students in Grade 3 responded as follows:

Do you like to sing songs?		
a) yes	a) o	78%
b) no	b) o	12%
c) I'm not sure	c) o	9%
Do you ever sing parts of songs to yourself when you are alone?		
a) yes	a) o	78%
b) no	b) o	16%
c) I'm not sure	c) o	5%

(+) Singing, like playing an instrument, was valued by most students in Grade 3 in Colorado.

Grade Six. Interest in performing musically was touched upon with these questions for students in sixth grade:

Do you think you would enjoy being able to sing well if you can't already?	
a) yes	a) o 80%
b) no	b) o 10%
c) I'm not sure	c) o 10%

If you had a choice, would you prefer to:	
a) listen to a musical performance	a) o 24%
b) participate in a musical performance	b) o 50%
c) I wouldn't want to do either	c) o 10%
d) I'm not sure	d) o 16%

(+) Interest remained high in Grade 6 in active participation in music. Participation was preferred to listening approximately two to one.

Grades Nine and Twelve. Several questions asked students in Grades 9 and 12 were related to valuing music as self expression:

If you grew up and had children to raise, would you want to give them music lessons?		G9	G12
a) yes	a) o	38%	53%
b) no	b) o	14%	8%
c) I'm not sure	c) o	47%	33%
(nonresponse)		2%	6%

(+) Considerably more students in Grade 12 than in Grade 9 valued music enough to expect to want any future children of theirs to have lessons.

Choosing activities for spare time was asked students at grade-levels 9 and 12 in this exercise:

Make a check mark beside the one thing you would most like to do with your spare time.		G9	G12
a) Read a book	a) o	12%	22%
b) Listen to music	b) o	26%	26%
c) Play a sport	c) o	46%	38%
d) Watch television	d) o	11%	12%
(nonresponse)		5%	2%

(+) or (-) Listening to music was more popular than either reading a book or watching television among students in Grade 9, but less popular than playing a sport. (Perhaps more informative would be comparing choices of participating in music and participating in sports.)

Pupil population groups. Preferences for certain kinds of music among certain population groups may indicate valuing music as a means of self-expression by students in Colorado.

(+) Minority and urban children preferred soul music

(+) Rural children preferred western music

(+) Non-minority children preferred rock music

In ninth grade

(+) Blacks enjoyed religious music, soul music and, to a certain extent, jazz

(+) Chicanos enjoyed Mexican folk music, soul music

(+) Non-minority or majority students enjoyed rock, folk and to some extent Broadway show music, chamber music, and symphonic

(-) Consistently, from 10% to 30% less boys than girls gave positive responses to musical participation and listening.

Liking Music of Various Types

The extent to which students enjoy music of various types was indicated in their responses to certain questions.

I enjoy listening on the radio to

	G6		G9		G12	
	OK	Turn it off	OK	Turn it off	OK	Turn it off
Hard rock	75%	23%	91%	8%	89%	10%
symphonic music (such as Beethoven)	32%	67%	24%	73%	44%	53%
religious music	48%	51%	30%	64%	28%	68%
soul music (such as Aretha Franklin or James Brown)	60%	39%	64%	32%	67%	31%
Mexican folk music	50%	49%	22%	72%	23%	73%
Grand opera (such as Rigoletto)	24%	75%	9%	86%	13%	84%
American folk music	69%	30%	46%	48%	65%	31%
country and western	66%	34%	42%	52%	45%	51%
Broadway show music (such as Hello Dolly)	54%	44%	43%	53%	64%	33%
Chamber music	22%	76%	17%	76%	30%	65%
jazz	79%	20%	60%	36%	68%	29%

(+) Higher percentages of students in Grade 12 than in Grade 6 enjoyed listening to symphonic, soul, Broadway show, and chamber music.

(-) Most students graduated from high schools in Colorado without having learned to enjoy symphonic music, religious music, Mexican folk music, country and western music, and chamber music.

The extent to which students have gained familiarity with various musical terms is shown below. (Some nonsense terms, i.e., "molto nebuloso" were included as a check against indiscriminate marking).

Mark each musical term that you have heard before.

	Have Heard of			Haven't Heard of		
	G6	G9	G12	G6	G9	G12
concerto	38%	79%	89%	61%	19%	6%
Dixieland	82%	89%	91%	18%	9%	4%
ragtime	59%	83%	90%	40%	15%	6%
symphony	86%	96%	93%	14%	3%	3%
confetti	23%	19%	20%	76%	79%	75%
adagio	17%	19%	32%	83%	77%	63%
acid rock	40%	72%	84%	59%	26%	11%
sonata	32%	53%	72%	67%	43%	23%
jam session	39%	76%	84%	60%	22%	10%
gavotte	13%	12%	16%	85%	86%	78%
mariachi	20%	24%	33%	79%	73%	61%
bluegrass	43%	52%	65%	56%	45%	29%
folk	92%	95%	94%	7%	3%	1%
cantata	22%	37%	56%	77%	60%	39%
Molto nebuloso	9%	6%	9%	89%	91%	86%

(+) Recognition of more technical terms such as "sonata," "concerto", and "cantata" increased between Grade 6 and 12. This was found especially true among the girls.

(-) Considerable unfamiliarity was found among boys and ethnic minorities, notably Chicanos.

Valuing Music For Itself

A few exercises touched on students' valuing music in and out of school.

I think that music is important

		G3
a) yes	a) o	58%
b) no	b) o	15%
c) I'm not sure	c) o	26%

Music is important in our lives

		G6
a) yes	a) o	62%
b) no	b) o	11%
c) I'm not sure	c) o	27%

Every school should teach its pupils about music.	
a) yes	a) o 66%
b) no	b) o 9%
c) I'm not sure	c) o 22%
(nonresponse)	3%

(+) or (-) While less than 70% of students in Grades 3 and 6 indicated "yes" to the importance of music, less than 20% indicated "no"; many were not sure.

IV. APPENDICES:

RATIONALE, METHODOLOGY,

AND

AN INVENTORY OF EDUCATIONAL OUTCOMES

DESIRED IN COLORADO

APPENDIX A

RATIONALE, PURPOSES, AND ACTIVITIES

OF THE ASSESSMENT

A few assumptions underlying Colorado's Assessment Program are listed below to aid the reader's understanding of the program's design and operation. Throughout the program, much careful work was directed toward making the assessment consistent both with evaluation theory and political feasibility toward improving educational opportunities for children in Colorado.

I. EXAMINATION AND IMPROVEMENT OF GOALS

Rationale of Assessment:

Educational goals take on importance and meaning if those developing the goals realize that subsequent assessment and evaluation will indicate the extent to which the goals are being achieved.

Educational goals, adopted by the State Board of Education, indicate statewide beliefs as to what schools should do for students. Local goals may supplement state goals, identifying unique needs of students within a school or district. Taken together, local and state goals, define "quality education".

Educational goals may, from time to time, be revised to more adequately represent common educational beliefs, informed by results of prior assessments based on goals.

Purposes of Assessment:

1. To demonstrate goals as working documents in the conduct of educational endeavors.
2. To determine the extent of consensus on goals presently stated for Colorado.
3. To encourage local districts to supplement statewide goals, identifying unique needs of students within a district or school.
4. To provide whatever information is helpful in revising, from time to time, statewide educational goals.

Activities Completed:

1. Identification of student needs regarding Goals For Education In Colorado (1970).
2. Revision of statewide goals (1971).

2. IDENTIFIYING PERFORMANCE OBJECTIVES

Rationale of Assessment:

Professional judgment, informed by experience and research, can identify capabilities which students need in order to enjoy the benefits mentioned and implied in educational goals. Continued refinement and revision may be made on the basis of new information and experience.

Statements of objectives, specifying what students should be able to do as a result of schooling may guide program development and evaluation.

Objectives may describe capabilities in specific performance terms expected at various points in the educational program and students' educational careers.

Purposes of the assessment:

1. To demonstrate procedures of stating and using performance objectives to achieve more general goals.

2. To identify performance objectives commonly considered important statewide in various curriculum areas.

3. To refine objectives for increased relevance to goals and amenability to measurement.

Activities Completed:

1. Judgment of year-end objectives by a sample of Colorado teachers (1969).

2. Refinement of objectives according to teacher judgment (1970) and results of assessment (1971).

3. Collection of objectives from various sources for sharing with local districts.

3. DETERMINING THE EXTENT TO WHICH PERFORMANCE OBJECTIVES ARE BEING ACCOMPLISHED

Rationale of Assessment:

Local districts may judge what information being collected statewide is informative regarding local goals and objectives. State averages may provide one reference point by which local results may be interpreted.

Criterion-referenced tests may be used to describe capabilities -- what students can do and cannot do. Norm-referenced tests may be used to compare certain scores to average scores. Both approaches may be considered in determining the extent to which performance objectives are being achieved.

Sampling provides information on groups (not individuals) useful in assessing general program effectiveness in reaching stated objectives. Costs of sampling are a fraction of every-pupil testing.

Purposes of Assessment:

1. To demonstrate procedures to create test exercises measuring the extent to which objectives are being achieved.

2. To determine status of learners in Colorado regarding the extent to which goals and objectives are being achieved.

Activities Completed:

1. Development of criterion-referenced item pools in nine common curricular areas (1969-72).

2. Administration of exercises on a sampling basis to 30,000 students in Colorado (1970 & 71).

3. Refined instruments and sampling procedures on the basis of results and experiences (1970-72).

4. Developed operational analysis program on state computer.

4. REPORTING

Rationale of the Assessment:

The Colorado General Assembly makes legislative decisions of great importance to education in Colorado. Information regarding needs of students, as developed by statewide assessment, may inform those decisions regarding general and special support. Continuing assessment may reveal impact of state actions in terms of increased student achievement and other indicators of "quality education".

Purposes of this Assessment:

1. To report educational needs with the precision and relevance needed for decision-making at various levels of responsibility.

2. To solicit and receive feedback regarding reports sent to the Colorado General Assembly.

Activities Completed:

1. Written and oral reports regarding statewide assessment results.

2. Advise on accountability and related information.

3. Fall testing under the Accountability Act, Reports to Districts.

5. ASSISTING LOCAL SCHOOL DISTRICTS

Rationale of Assessment:

Processes and procedures of stating goals and objectives, designing measures and reporting results have been designed for both state and local applicability. Each district may adopt or adapt any of these methods useful in local programs.

State assessment in no way replaces or relieves local authority and responsibility for continuing and improving local efforts in this area. Communication among all levels of responsibility is essential in developing a mutually beneficial exchange of information.

Purposes of Assessment:

1. To provide consultation and materials useful in assessing educational outcomes at all levels of responsibility.

2. To determine, with the aid of local districts, the utility of assessment information in planning and evaluating educational endeavors.

Activities Completed:

1. Meetings with key leaders in five largest districts regarding the substance and use of district results (1970-71).

2. Reports and on-site consultation on procedures used in identifying goals, stating objectives and assessing needs.

APPENDIX B

Methodology

Statewide assessment of such broad and diverse goals and objectives was made possible by two fairly recent inventions - sampling and the electronic computer. Without these tools, the Assessment would be narrowly constrained, if not totally impossible.

Sampling

Certain systematic procedures in selection of students and selection of content were observed to yield information indicative of student performances generally in the state on all objectives. Sample design for 1971 was similar to that field-tested in 1970, as described in the report Assessing Educational Outcomes in Colorado (December 1970). Salient features of the sampling design are described briefly below.

Selection of students. Samples of students were selected from the state population by three sequential steps:

1. Selection of districts: Stratified random sampling techniques were used to select districts representative of all districts in Colorado. Specifically, all districts in Colorado were listed in order of size of pupil enrollment, the smallest first. Starting with the smallest, each sixth district was selected as a sample district. Of the state's 181 school districts, 30 districts were selected in this manner. School District No. 1 (Denver) was added independently of the sampling because of that district's unique size. A total of 31 districts participated in the assessment as follows:

SCHOOL DISTRICTS SAMPLED IN COLORADO'S 1971 EDUCATIONAL ASSESSMENT

Stratum I - Districts with enrollments over 1500 pupils

Denver 1
Jefferson R-1
Adams 50
Adams 14
El Paso 2
Adams 27J
Otero R-1
Douglas Re1
Weld Re8
Gunnison Re-1(J)

Stratum II - Districts with enrollments between 1500-3000

Huerfano Re1
Clear Creek Re1
Routt Re2
Teller Re2
Larimer Re3
Baca Re4
Dolores Re1
Prowers Re1
Grand 1(J)
Routt Re1
Elbert C1

STRATUM III - Districts with enrollments under 300 pupils

Saguache Re1
Alamosa Re22J
Park 1
Morgan Re20
Logan Re5
Las Animas 88
Elbert C2
Elbert 200
Weld Re10
Washington 101

2. Selection of schools. Schools were selected at random from districts. Some districts, however, contained so few schools that all schools in the district were selected.

3. Selection of classes. Each school principal was asked to alphabetize the names of the teachers of classes containing the grades of students being assessed at the time given for the assessment at his school. Starting at the top of the list, the principal would select classes until the required numbers of students were obtained. If a fraction of a class was needed, the teacher would select the students randomly from an alphabetic class list.

A major modification from the 1970 design was the increase in the numbers of students in the ten largest participating districts to yield information useful within each of those districts. To counteract the over-representation of large districts in the sample, a weighting formula was applied in the analysis of data. (See next section on "Computer Analysis" in this Appendix).

Population and sample sizes are shown below according to three Strata:

TABLE 8

POPULATION N's AND SAMPLE n's IN
COLORADO'S 1971 EDUCATIONAL ASSESSMENT

Stratum	Grade 3		6		9		12	
	N	n	N	n	N	n	N	n
I	37,675	596	37,568	596	37,861	520	30,931	580
II	3,540	103	3,596	112	3,665	109	2,964	110
III	782	27	798	32	729	37	675	28

Selection of content. To sample student capabilities called for in the objectives (see Appendix A), objectives-referenced exercises were selected from, (a) those used in last year's Assessment, (b) those created by the California Test Bureau and the Laboratory of Educational Research at the University of Colorado, and (c) those available from the Instructional Objectives Exchange at the University of California at Los Angeles. Numbers of exercises and objectives used is shown below:

See page 86 following.

Exercices were judged for congruence with objectives by staff members of the Colorado Department of Education using the form shown on page 99 page.

Field work. Proctors hired by the Department were trained to administer the assessment forms in the 196 schools participating in the state sample. Their duties included reading instructions to students, answering questions, accounting for assessment materials and reporting irregularities.

Analysis of Data

A five-step process transformed the completed assessment instruments into data usable for this Needs Assessment. Central in all nine of these steps was the IBM 360 - Model 50 Computer of the Colorado Automated Data Processing Services, located in the Colorado State Capitol Building.

1. Batching. Each of the completed assessment instruments was hand-checked for missing data and compliance with marking instructions before being put in school and district batches. Each school and district batch was then tied and marked with an identifying number.

2. Keypunching and verifying. Student responses, both on the assessment exercises and on the biographical data sheets were transferred to data cards, 3 cards per instrument. Verification of keypunches was added for increased precision.

TABLE 9

NUMBER OF OBJECTIVES AND EXERCISES USED IN 1971 ASSESSMENT

Content Area	Number by Grade Level G3 Obj.	G3 Ex.	G6 Obj.	G6 Ex.	G9 Obj.	G9 Ex.	G12 Obj.	G12 Ex.	Totals All Grades Obj.	Totals All Grades Ex.
Health	7	18	6	20	6	24	9	26	28	88
Language Arts	7	24	4	21	6	25	5	27	22	97
Learner Self-concept	5	18	6	21	7	16	5	12	23	67
Mathematics	6	17	7	18	5	20	6	17	24	72
Music	3	22	2	32	2	40	2	40	9	134
Science	4	15	4	16	4	19	4	23	16	73
Social Studies	2	17	2	22	3	20	3	21	10	80
Totals All Areas	34	131	31	150	33	164	34	166	132	611

3. Filing the data. The data from the cards were filed on magnetic tape for entry into the computer. An edit program located contrdictory data which, after checking the source document, were corrected. A very low percentage of errors (less than .03%) made this task quite small.

4. Unweighted analyses. The number and percentage of students making each response on each of the 28 instruments (7 content areas at each of 4 grade levels) was produced on the first computer run. For each exercise, there were 3 pages of computer printout, giving results by population group, e.g., boys, girls, rural, urban, etc. An example of this printout is included at the end of this appendix. Results were obtained for state totals, each of the ten largest school districts and the three strata making up the sample.

5. Weighted analysis. Because the 10 larger districts were oversampled to yield results for each of those districts, the sample was over-representative of larger districts and under-representative of smaller districts: therefore a weighting formula was applied to offset this imbalance as follows:

$$(\#\text{ knowing answer}) = p_1 N_1 + p_2 N_2 + p_3 N_3$$

where p_1, p_2, and p_3 are the proportions of the sampled third-graders to answer a particular item correctly in Strata 1, 2, and 3, respectively and N_1, N_2, and N_3 are the total number of students in the population of Strata 1, 2, and 3, respectively and n_1, n_2, and n_3 are the sample sizes in Strata 1, 2, and 3, respectively.

Once the number knowing the answer was computed, it was a simple operation to find the percentage correct by:

$$\text{Percent correct} = \frac{(\#\text{ knowing answer})}{N_1 + N_2 + N_3}$$

Weighted data were produced only for the state totals.

6. State Analyses. For the entire state sample, percentages of students choosing each response option were listed by pupil population group (see sample printout). Both a weighted and unweighted analysis were run.

7. District Analysis. For each of the ten largest districts participating, an unweighted analysis was made by population group.

8. Strata Analysis. For each of the three strata an unweighted analysis was run.

Sample printouts following show typical assessment results in both weighted and unweighted form. Following the printouts are samples of the "working papers" written by staff members of the University of Colorado's Laboratory of Educational Research.

TABLE 10
CONTENT AREAS IN WHICH
"WORKING PAPERS" HAVE BEEN COMPILED

	1970	1971
Health	X	X
Language Arts	X	X
Learner Self-concept		X
Mathematics	X	X
Music	X	X
Physical Education	X	
Science		X
Social Studies		X

OVERVIEW OF THE ASSESSMENT

Process	By
1. Identifying desired outcomes	
1.1 Adopting long-range goals	State Board of Education
1.2 Adopting long-range objectives	State Board of Education
1.3 Judging year-end objectives	Professional Staff
2. Determining student performance	
2.1 Designing exercises	Special consultants
2.2 Drawing a sample	Special consultants
2.3 Administering exercises	Special proctors
2.4 Analyzing results	Professional staff and consultants
2.5 Determining students' performance	
3. Identifying learner needs	
3.1 Organizing reports	Professional staff
3.2 Interpreting reports	Ad hoc panel on needs

Reliability and Validity of the Instruments

Reliability is that characteristic of a measuring instrument which deals with consistency of results. Since the 1971 Needs Assessment Battery represented a criterion-referenced rather than a norm-referenced approach toward measurement, the Kuder-Richardson Formula #20 (coefficient of equivalence) was employed to assess the internal consistency of each subtest of the testing program.

A 16% sub-sample of students participating in the 1971 Needs Assessment program served as the baseline data for reliability determination. The reliability coefficients contained in Table 11, were derived from the raw data described in Table 12.

TABLE 11
RELIABILITY ESTIMATES FOR 1971 NEEDS ASSESSMENT

Reliability / 16 Tests	KR-20 Reliability				50-Item Reliability. Comparisons			
	Grade 3	Grade 6	Grade 9	Grade 12	Grade 3	Grade 6	Grade 9	Grade 12
Science	.765	.645	.605	.632	.916	.858	.810	.796
Mathematics	.693	.624	.667	.818	.869	.822	.840	.915
Language Arts	.693.	.427	.660	.573	.825	.662	.795	.713
Health	.616	.544	.463	.586	.817	.758	.545	.771
Learner Self Concept	.648	.850	.360	.273	.860	.940	.652	.631
Music Affective	.560	.641	.622	.899	.743	.736	.673	.918
Social Studies	.455	.487	.505	.665	.723	.693	.797	.825
Estimated Total Battery	.927	.920	.922	.936	---	---	---	---

The magnitude of a reliability coefficient varies directly with the number of items contained in a subtest. From Table 12, it can be observed that the number of items in a subtest varies from a low of 11 items for Grade 12 Learner Self Concept to a high of 40 items for the Music Affective subtest for Grades 9 and 12. For direct comparison of reliability coefficients, the Spearman-Brown Prophesy Formula was applied to the KR-20 coefficient of each subtest to determine a 50 item reliability. These data are contained in Table 11.

It was hypothesized that subtests whose 50-item reliability equaled or exceeded .800 would be considered as reliable instruments. An analysis of the 50 item coefficients in Table 11 reveals the following:

a) The Science and Mathematics subtests were reliable at the four grade levels.

b) The Language Arts subtests for Grades 3 and 9 were reliable, while the subtests for grades 6 and 12 were not.

c) The Health subtest was reliable at the Grade 3 level only.

d) The Learner Self Concept subtest was reliable at Grade 3 and 6 level only.

e) The Music Affective subtest was reliable at the Grade 12 level only.

f) The Social Studies subtest was reliable at the Grade 9 and 12 level only.

With this information the reader may be cautioned against generalizations based on the entire subtests listed as unreliable above. However, such reservations need not apply to interpretations of results from individual exercises listed in Parts II and III of this report. (The conclusions stated in Part II were based on results from individual exercises, not complete subtests.)

The estimated total battery coefficient were determined by computation of an average reliability of the subtests for a given grade level, and applying the Spearman-Brown Prophesy formula.

The raw data in Table 12 contain information on the number of items, sample size, mean, standard deviation, and standard error of measurement for each subtest in the reliability study. The standard error of measurement is a statistic which suggests a range within which an individual's true score would exist. For example, the Grade 6 subtest for the learner self concept has a standard error of measurement of 1.5. One standard error of measurement on either side of an obtained score would suggest that two times out of three his true score would fall within that range; two standard errors of measurement would define the range wherein 95 times out of 100 his true score would fall. If a student had a raw score of 10, one could say that two times out of three his true score would fall in the 8.5 - 11.5 range, and 95 times out of 100, his true score could fall in the 7-12 range. As a rule of thumb, the standard error of measurement on a good test rarely exceeds 50% of the magnitude of the standard deviation.

Validity is that quality of measurement which answers the question, "To what degree did the test measure what it was intended to measure and nothing else?" Criterion measurement instruments rely heavily upon content validity. Thus, the question becomes, "To what degree did the content of test items reflect the scope and relevant aspects of the educational objectives against which they were written?" For the 1971 Needs Assessment, individual items were revised or rejected on the basis of their relevance to subject-matter objectives agreed upon both by a wide sample of Colorado teachers and subject matter consultants of the Colorado Department of Education staff. It is not possible to determine the exact validity coefficient for the subtests on the 1971 Needs Assessment, except to say that from a content point of view it should be high. As an artifact of statistics, the validity coefficient cannot exceed the square root of the reliability coefficient. Employing this rule of thumb, the maximum validity would range from a low of .522 on the Grade 12 Learner Self Concept subtest to a high of .948 in the Grade 12 Music Affective subtest.

TABLE 12
RAW DATA FOR RELIABILITY SAMPLE ON 1971 NEEDS ASSESSMENT

Grade Level	GRADE 3					GRADE 6					GRADE 9					GRADE 12				
Subtest	No. Items	Sample N	Mean	Standard Deviation	Std. Error Meas.	No. Items	Sample N	Mean	Standard Deviation	Std. Error Meas.	No. Items	Sample N	Mean	Standard Deviation	Std. Error Meas.	No. Items	Sample N	Mean	Standard Deviation	Std. Error Meas.
SCIENCE	15	101	8.40	3.40	1.63	15	106	9.74	2.68	1.60	18	99	9.29	2.93	1.84	22	109	11.87	4.41	2.69
MATHEMATICS	17	117	9.70	3.21	1.78	18	111	8.65	3.01	1.85	19	117	10.41	3.29	2.69	21	130	12.97	4.62	1.97
LANGUAGE ARTS	24	125	16.31	3.46	1.92	21	116	13.81	2.45	1.85	25	109	17.13	3.47	2.02	27	119	18.14	3.22	2.10
HEALTH	18	102	12.25	2.81	1.74	19	112	12.89	2.59	1.75	23	111	15.87	2.57	1.88	21	110	13.84	2.73	1.76
LEARNER SELF CONCEPT	15	113	6.04	2.58	1.53	18	115	10.07	3.88	1.50	15	107	5.81	1.87	1.50	11	119	4.46	1.60	1.36
MUSIC AFFECTIVE	22	104	10.14	3.03	2.01	32	100	16.79	4.06	2.43	40	99	21.87	4.08	2.51	40	114	25.66	7.17	2.28
SOCIAL STUDIES	16	120	7.89	2.40	1.77	21	112	12.26	2.81	2.01	13	114	7.41	2.19	1.54	21	115	12.93	3.15	1.82

TEST HEALTH GRADE 06 QUESTION 19

		TOTAL	NONREP	ANSWERS A +	B	C	D
ALL PUPILS	N	41962	139	37346	2352	795	1331
	%	100.0	.3	89.0	5.6	1.9	3.2
SEX							
BOYS	N	21182		18573	1418	745	447
	%	100.0		87.7	6.7	3.5	2.1
GIRLS	N	19730	139	17864	795	49	884
	%	100.0	.7	90.5	4.0	.2	4.5
DIDN'T ANSWER	N	1050		911	139		
	%	100.0		86.8	13.2		
MEMBER OF MINORITY ETHNIC GROUP							
YES	N	7799	139	5940	745	348	626
	%	100.0	1.8	76.2	9.6	4.5	8.0
NO	N	33607		30919	1537	447	705
	%	100.0		92.0	4.6	1.3	2.1
DIDN'T ANSWER	N	557		487	70		
	%	100.0		87.4	12.6		
ETHNIC GROUP							
BLACK (NEGRO)	N	1670		904	278	278	209
	%	100.0		54.1	16.6	16.6	12.5
CHICANO (SPANISH AMERICAN)	N	5383	70	4270	487	139	417
	%	100.0	1.3	79.3	9.0	2.6	7.7
ORIENTAL	N	209		209			
	%	100.0		100.0			
OTHER (INCLUDING AMERICAN INDIAN)	N	2163	70	1975	119		
	%	100.0	3.2	91.3	5.5		
DIDN'T ANSWER	N	32536		29989	1467	377	705
	%	100.0		92.2	4.5	1.2	2.2
HOME LANGUAGE							
ENGLISH (AMERICAN)	N	36695	70	32914	2074	725	913
	%	100.0	.2	89.7	5.7	2.0	2.5
SOME OTHER LANGUAGE	N	2216	70	1938	70		139
	%	100.0	3.2	87.5	3.2		6.3
DIDN'T KNOW	N	2233		1885	70		278
	%	100.0		84.4	3.1		12.4

TEST HEALTH GRADE 06 QUESTION 19

		TOTAL	NONREP	ANSWERS A +	B	C	D
ALL PUPILS	N	41962	139	37346	2352	795	1331
	%	100.0	.3	89.0	5.6	1.9	3.2
HOME LANGUAGE (CONTINUED)							
DIDN'T ANSWER	N	818		610	139	70	
	%	100.0		74.6	17.0	8.6	
HOUSEHOLD HEAD'S EDUCATION							
LESS THAN GRADE SCHOOL	N	557		348	70	70	70
	%	100.0		62.5	12.6	12.6	12.6
FINISHED GRADE SCHOOL	N	5635	70	4493	417	327	327
	%	100.0	1.2	79.7	7.4	5.8	5.8
FINISHED HIGH SCHOOL	N	20666		18355	1517	209	586
	%	100.0		88.8	7.3	1.0	2.8
FINISHED COLLEGE (EARNED BACHELOR'S)	N	5541		5262	139	70	70
	%	100.0		95.0	2.5	1.3	1.3
DID SOME GRADUATE WORK	N	2360		2242	70	49	
	%	100.0		95.0	3.0	2.1	
DIDN'T KNOW	N	7204	70	6648	139	70	278
	%	100.0	1.0	92.3	1.9	1.0	3.9
FAMILY INCOME							
LESS THAN $4500	N	2566		2148	70	140	209
	%	100.0		83.7	2.7	5.5	8.1
$4500 - $9000	N	18009		15280	1725	279	725
	%	100.0		84.8	9.6	1.5	4.0
MORE THAN $9000	N	8775		8427	209	139	
	%	100.0		96.0	2.4	1.6	
DIDN'T KNOW	N	11987	139	10935	348	238	327
	%	100.0	1.2	91.2	2.9	2.0	2.7
DIDN'T ANSWER	N	626		557			70
	%	100.0		89.0			11.2
OF AGRICULTURAL MIGRANT FAMILY							
YES	N	305		305			
	%	100.0		100.0			
NO	N	36381	70	32163	2283	675	1192
	%	100.0	.2	88.4	6.3	1.9	3.3

TEST HEALTH GRADE 06 QUESTION 19

		TOTAL	NONREP	ANSWERS A ✦	B	C	D
ALL PUPILS	N	41962	139	37346	2352	795	1331
	%	100.0	.3	89.0	5.6	1.9	3.2
OF AGRICULTURAL MIGRANT FAMILY (CONTINUED)							
DION'T KNOW	N	2793	70	2515		70	139
	%	100.0	2.5	90.0		2.5	5.0
DION'T ANSWER	N	2484		2365	70	49	
	%	100.0		95.2	2.8	2.0	
PARTICIPATION IN ESEA TITLE I (ACADEMIC)							
YES	N	2477	70	1934	285		188
	%	100.0	2.8	78.1	11.5		7.6
NO	N	32975		29467	1997	487	1023
	%	100.0		89.4	6.1	1.5	3.1
DION'T KNOW	N	4682	70	4404		139	70
	%	100.0	1.5	94.1		3.0	1.5
DION'T ANSWER	N	1829		1542	70	169	49
	%	100.0		84.3	3.8	9.2	2.7
DESCRIPTION OF DISTRICT							
MOSTLY RURAL	N	8501		7791	543		169
	%	100.0		91.6	6.4		2.0
RESIDENTIAL AND COMMERCIAL/INDUSTRIAL	N	6192	70	5148	348	209	417
	%	100.0	1.1	83.1	5.6	3.4	6.7
MOSTLY RESIDENTIAL	N	24996	70	22491	1391	487	557
	%	100.0	.3	90.0	5.6	1.9	2.2
OTHER	N	765		626			139
	%	100.0		81.8			18.2
DION'T ANSWER	N	1508		1290	70	99	49
	%	100.0		85.5	4.6	6.6	3.2

APPENDIX C

AN INVENTORY OF EDUCATIONAL OUTCOMES

DESIRED IN COLORADO

(Partial)

Since 1969, the Colorado Department of Education has been collecting, revising, cataloguing and sharing educational objectives. Judgments of educators/teachers and curriculum experts as to appropriateness and importance of many of the objectives were sampled in late 1969. Objectives upon which the 1970 statewide assessment was based were refined for increased relevance and precision.

Following are listed instructional objectives in capsule form to indicate some of the educational outcomes commonly desired in Colorado.

A. LEARNING SKILLS

Language Arts - Grades 3 and 6
- Using contextual clues
- Distinguishing fact from opinion
- Using information sources
- Selecting correct usage

Language Arts - Grades 9 and 12
- Distinguishing between correct and incorrect usage
- Analyzing English composition

Mathematics - Grades 3 and 6
- Adding, subtracting, multiplying, and dividing
- Identifying standard measures
- Computing time, rate, and distance
- Finding information from a statistical table
- Computing prices, making change
- Applying concepts of positive and negative numbers

Mathematics - Grades 9 and 12
- Solving common problems
- Identifying number relationships
- Identifying structural properties
- Computation with fractions and decimals
- Identifying true and faulty logic
- Computing probability

Science - Grades 3 and 6
- Demonstrating scientific curiosity
- Explaining natural events

Science Grades 9 and 12
- Identifying processes and procedures
- Explaining natural phenomena

B. LEARNER SELF-CONCEPT

Describing self as capable

Predicting academic success

Identifying with capable learners

Predicting non-academic success

C. SOCIAL KNOWLEDGES AND SKILLS

Map Reading

Demonstrating Knowledge of Social Organization
- Reasons for laws
- Organization of government
- Legal processes

Identifying Appropriate Social Processes

Demonstrating Historical Perspective

D. HEALTH INFORMATION

Grade Three
- Identifying healthful eating habits
- Recognizing physically beneficial practices
- Recognizing harmful effects of smoking
- Identifying practices of dental care
- Recognizing correct uses of drugs

Grade Six
- Identifying healthful eating habits
- Recognizing physically beneficial practices
- Demonstrating knowledge of disease and mental illness
- Recognizing dangers of smoking and drugs

Grade Nine
- Identifying healthful eating habits
- Demonstrating knowledge of physical fitness, growth, and development
- Recognizing dangers of drugs

Grade Twelve
- Nutrition and weight control
- Demonstrating knowledge of physical growth and development
- Disease prevention
- Knowledge of mental illness
- Drug information

E. APPRECIATING MUSIC

Valuing Music as Self Expression

Liking Music of Various Types

Valuing Music For Itself

F. KNOWLEDGE OF OCCUPATIONS

Recognizing Education Needed

Work Involved

Identifying Occupations Related

Identifying Corresponding Field of Work

Development of Year-End Objectives

Others wishing to develop objectives specifying what performance capabilities students should acquire may be interested in the process used in Colorado.

Writing objectives. Consultants, representing several subject disciplines, met in a week-long work conference to write objectives. Used as the basis of these objectives was Goals for Education in Colorado, a document authorized by the Colorado State Board of Education in 1962. For example, from the general goal of

> "Adequate opportunities for all persons to acquire command of knowledge, skills, habits, and attitudes essential for effective learning throughout life . . ."

was derived this more specific objective:

> "The pupil will apply his ability to use parts of a book with facility as measured by an exercise directing the pupil to locate and use the following parts: (a) Title page, (b) Table of Contents, (c) Glossary, and (d) List of Illustrations."
> (Third Grade Language Arts; objective No. 24.)

Specifications for objectives provided that each contain these elements: (1) the subject toward which attention was to be directed, i.e., "the pupil," (2) the behavior sought, i.e, "will apply his ability to use," (3) the content, i.e., "parts of a book," and (4) a measuring device, i.e. "an exercise..."

Defining content areas. The objectives stated in the various subject disciplines were put in broader context by construction of a three-dimensional model (see page 100). The objectives were represented on one dimension of the model - that dimension identifying common program offerings in Colorado schools.

A second dimension of the model identified basic educational outcomes derived from Goals for Education in Colorado. In this way, general and specific aspects of the content to be assessed were related visually.

A third dimension of the model identified behaviors sought. These behaviors were classified according to the cognitive, affective, and psychomotor domains as developed by Bloom and others.

Thus, content areas were defined in a way which suggested possibilities (1) for item development, and (2) for constructing hypotheses on educational need. With definition of these content areas, it was proposed that sampling procedures be employed to select pupils and to select items to assess learning in the content areas so defined.

Judging objectives. Task Force members inspected the objectives for consistency with specifications and then submitted lists of objectives to a sample of teachers in Colorado for judgment. Objectives which were acceptable to teachers were used; those unacceptable to teachers were discarded.

For example, the Objective for Third Grade Language Arts stated above was deemed "very important" by 41.4% of the teachers ampled, "important" by 47.1% of the teachers sampled, "unimportant" by 6.9% and "very unimportant" by 1.1% of the teachers (3.5% not responding). Finding that 88.5% of the teachers sampled deemed this objective "important" or "very important," the Task Force judged the objective to be acceptable as a basis for assessment and evaluation of learning in Colorado. The form for exercise judgment is as follows:

Item # _____

Pool _____

_____
Judge

ITEM JUDGEMENT

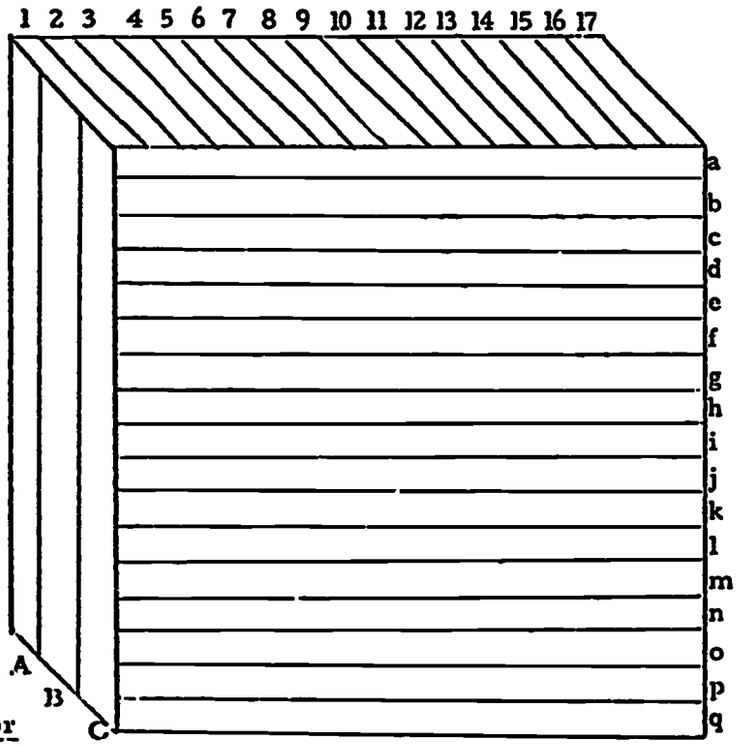
	Good				Bad
Face Validity - "Does the item measure what it appears to measure?"	1	2	3	4	5
1. Can be related to instructional activities commonly found in schools.	1	2	3	4	5
2. Interesting to lay persons and professional educators.	1	2	3	4	5
3. Appropriate to age of assessee, clear, unambiguous, not a trick question.	1	2	3	4	5
Content Validity - "To what extent does this item require demonstration by the student of the achievement which constitutes the objective of instruction in this area?"	1	2	3	4	5
1. Elicits a skill, attitude or knowledge necessary to perform the task specified in the objective.	1	2	3	4	5
2. Relates, logically or empirically, to other items assessing achievement of the same objective	1	2	3	4	5

Comments:

OVERVIEW OF VARIABLES

Basic Educational Outcomes

1. Knowledge of Science info, skills, concepts.
2. Knowledge of Mathematics info, skills, concepts.
3. Knowledge of Social Studies info, skills, concepts.
4. Ability to read rapidly with comprehension.
5. Ability to communicate in Writing.
6. Ability to Spell correctly.
7. Knowledge and appreciation of Music.
8. Ability to draw and to appreciate Art.
9. Knowledge of Health skills and concepts.
10. Physical proficiency. (S already being measured)
11. Proficiency in and knowledge of Home Economics.
12. Proficiency in and knowledge of one or more Industrial Arts.
13. Cognizance of Occupational Opportunities.
14. Interest in School, School Subjects, and Education.
15. Value of Self, Family, Society.
16. Ability and initiative to solve real and pressing problems.
17. Ability and desire to participate in group work.



Student Behavior

A. Cognitive
B. Affective
C. Psychomotor

Program

Curricular:

a. Science
b. Math
c. Social Studies
d. Reading
e. Eng. Comp., Grammar, Lit.
f. Spelling
g. Music
h. Art
i. Health, Safety, Recreation
j. Physical Education
k. Home Economics
l. Voc. Ed/ Industrial Arts
m. Foreign Languages

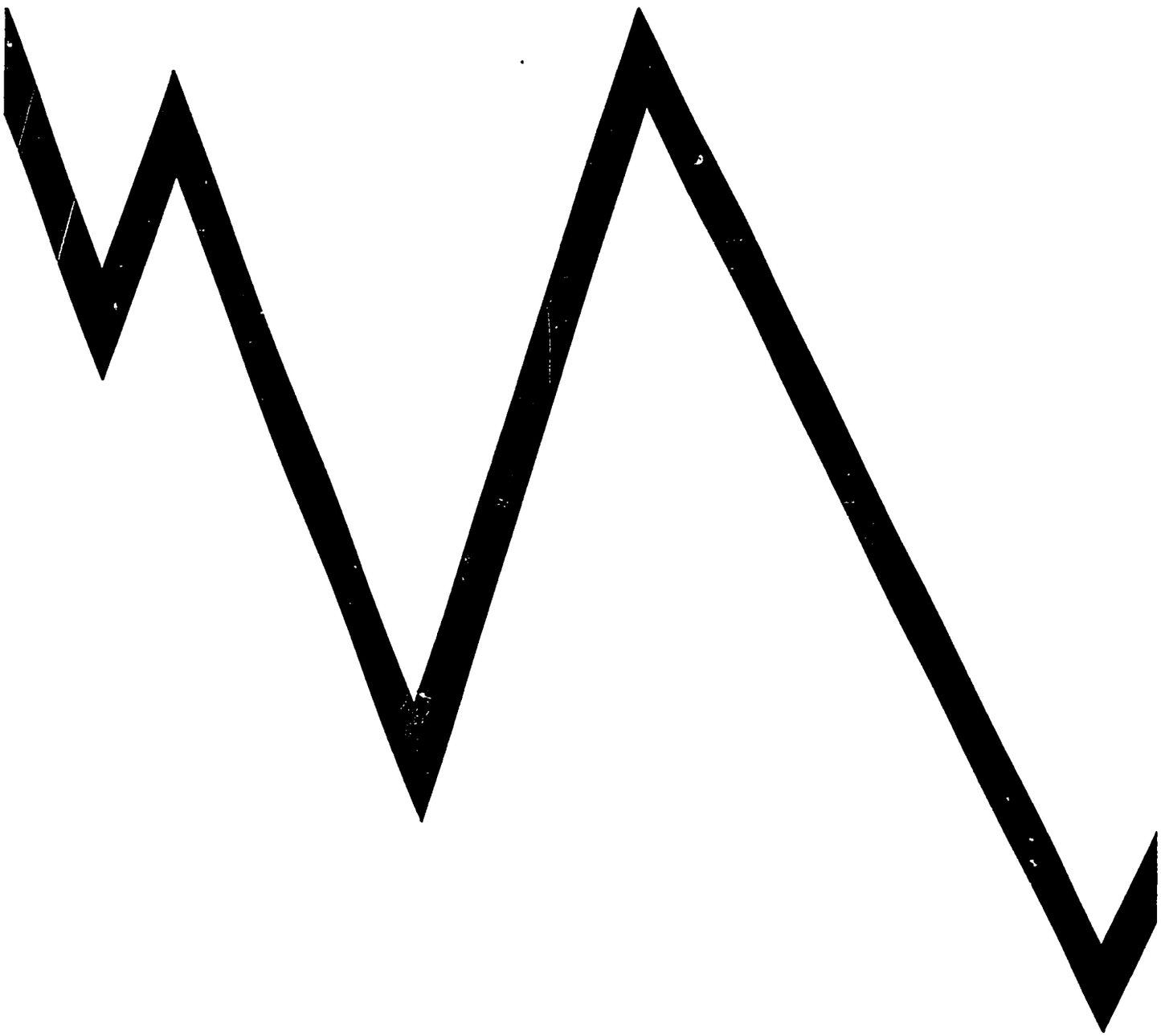
Co-curricular:

n. Guidance
o. Health
p. Psychological
q. Social
r. Library
s. Food
t. Transportation

In the Context of--

Student and family information:

Age/Sex/Race or Ethnic Origin/Enrolled in this school 3 years ago/Second language when in home/ I.Q. /Occupation of head of household/Education of mother.



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