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ABSTRACT

In preparation for evaluation of programed spelling instruction, a grade 6 spelling program was designed, teachers were given special training, and an educational motivation scale was developed. Of the three subject groups used to carry out the investigation--(1) control, taught by the conventional method; (2) experimental, taught by programed instruction materials; (3) experimental, taught by teachers using a methodology based on principles and techniques derived from programed instruction (programed based teaching)--the programed-based instruction group and the conventional method group did significantly better than the group using the programed text. It appeared that programed instruction in spelling could be used effectively in conjunction with teacher directed instruction. (Appended are the spelling program, lesson plans, spelling achievement tests, the motivation scale, and a record of the pilot study.) [Not available in hard copy due to marginal legibility of original document.] (MF)

FINAL REPORT TO THE COMMISSIONER OF EDUCATION FOR
AN EXPERIMENTAL PROGRAM SUBMITTED UNDER THE
PROVISION OF ARTICLE 73, SECTION 3602a,
SUBDIVISION 14 OF THE STATE
EDUCATION LAW 1963-64

THE EVALUATION OF PROGRAMED SPELLING

Sponsor: NEW YORK CITY SCHOOL DISTRICT

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BOARD OF EDUCATION OF THE CITY OF NEW YORK
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AN EXPERIMENT IN THE DEVELOPMENT AND EVALUATION OF PROGRAMED SPELLING

I. PROBLEM AND HYPOTHESES

Programed instruction is being widely investigated as a new method in education. The content of programs in use ranges from highly complex, abstract subjects to simple, concrete subjects.

While the existing evidence points to the general effectiveness of programed instruction, wide gaps of information are still apparent in regard to its effectiveness in many subject areas and with pupils of varying characteristics.

Although programed instruction offers a method for logically and sequentially ordering the learning materials to be presented to pupils, once a program is written, its ability to adapt to various pupils' differences or situational exigencies is primarily limited to a single factor--that of time. Branching programs are slightly more adaptive in the sense that two or three alternative responses are permitted. A human teacher, on the other hand, can be highly adaptive and is able to act and react differentially on the basis of a variety of situations. She can shift, modify or alter her method of teaching according to the needs, moods, interests or abilities of the pupils. It would seem then, that an effective teaching method would incorporate the best of the two systems.

Pupils from different backgrounds and having different levels of motivation for learning have always been a challenge to effective teaching. Conventional methods of teaching usually permit a great degree of flexibility and adaptability in teaching various kinds of children. While the effectiveness of programed instruction has been demonstrated for specific subjects, little research has been done in studying the differential effects of programed instruction with children having varying levels of motivation to learn.

Another aspect of learning that has been relatively neglected in research on programed instruction is its effectiveness with a factual type of learning as compared with the more abstract levels of learning. Thus, in spelling, pupils can learn to recite various spelling rules. At an early level of abstraction they can apply these rules to familiar words. At a higher level of abstraction they can apply these rules to totally unfamiliar words. There are many reasons to expect that different learning processes are involved in these different kinds of learning.

The purpose of this study was to investigate the effectiveness of programed instruction as teaching materials and as a teacher guide for pupils with varying levels of educational motivation. In order to accomplish the major purposes of the investigation the following activities were undertaken:

A. Design and development of a program (784 frames) entitled, "Programed Instruction for Grade 5 Spelling." (Appendix A)

B. Training teachers to use a teaching methodology for spelling based on programing principles and techniques called "programed based teaching."

C. Design and development of an educational motivation scale.

In order to carry out the investigation, three groups of pupils were selected. There was a control group taught by the conventional method, an experimental group taught by programed instruction materials, and an experimental group taught by teachers using a methodology based on principles and techniques derived from programed instruction (programed based teaching).

A. It was hypothesized that both experimental groups would exhibit:

   1. Greater retention of spelling facts than the control group.

   2. Greater ability to spell words which require the understanding of spelling concepts than the control group.

B. It was also hypothesized that the experimental group having teachers who use a method based on programing principles (programed based teaching) would exhibit:

1. Greater retention of spelling facts than the experimental group using the programed text.

2. Greater ability to spell words which require the understanding of spelling concepts than the experimental group using the programed text.

C. It was further hypothesized that there would be an interaction between methods of instruction and levels of educational motivation.

1. Programed instruction would be more effective with pupils having high levels of educational motivation than with pupils having low levels of educational motivation.

2. The conventional methods of instruction would be more effective with pupils having low levels of educational motivation than with pupils having high levels of educational motivation.

II. RESEARCH ACTIVITIES

A. Procedure

Nine schools were selected for participation in the study during the 1963-64 school year. Selection was made on the basis of [illegible] school IQ (100-110) and average reading (6th grade 6.0-6.9) grades. In each of six schools all three teaching methods were used. In the three remaining schools a single different teaching method was used in all of the three classes. Schematically, the procedure was as follows:

Schools	Methods		
	1	2	3
A	1 class	1 class	1 class
B	1 class	1 class	1 class
C	1 class	1 class	1 class
D	1 class	1 class	1 class
E	1 class	1 class	1 class
F	1 class	1 class	1 class
G	3 classes		
H		3 classes	
I			3 classes

It is almost axiomatic in educational research that no matter what change is introduced into an instructional procedure, pupil achievement generally increases merely as a result of the change. Educational researchers, recognizing this effect, have attempted to neutralize it by offering the control group some kind of placebo. In this experiment, teachers in all groups were given pre-experiment in-service training in techniques for teaching by their respective methods.

In addition to controlling for the "Hawthorne effect" it was recognized that the programed instruction groups were sufficiently unique so that a "halo effect" could occur among the teachers in the schools where the three different methods were used. In order to control for the possibility of contamination of methods within schools, a different single method was used in each of three schools (G, H, I).

Within schools A - F the assignment of classes to methods was made on a random basis. The three remaining schools were matched in IQ, reading, and initial spelling ability.

Pupils were classified according to two levels of educational motivation using the test constructed by the project staff.

The control group (conventional method) of classes received spelling instruction by the method described in the New York City Spelling Course of Study. The teachers were requested to limit the time for teaching spelling to twenty minutes per day.

The two experimental groups were also limited to twenty minutes per day of instruction in spelling. No further directed instruction in spelling was to be given.

The experimental group receiving instruction based on programing principles (programed based instruction) used the same words and rules as the

other two groups. The teachers of these classes used the programed text as their teaching guide. Prior to their actual teaching they participated in five workshops on methods and principles of programed instruction.

Teachers in the control group were also given five workshops in the teaching of spelling by the conventional method where the importance of adhering to the methods suggested in the conventional course of study was stressed.

There was no time restriction* placed on any of the groups as to when the experiment would end, on the theory that the pupils using the programed materials would be permitted to work until they completed the program. Since the teaching time for the programed text group was determined by the method, the control group and programed based group teachers were permitted to determine the time they would need for instruction.

All of the classes involved in the experiment were observed at least once. In order to examine the differences in the three methods one tape recording was made of a lesson covering the same content for each of the methods. These recordings were then transcribed and compared. Unfortunately, there was a great variation in teaching within each of the methods groups observed so that the reproduced (Appendix B) lessons cannot be considered representative of the kind of teaching that was found throughout their respective groups. The two lessons analyzed in this study were selected only on the basis of being the best approximations of their theoretical models.

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*For practical purposes the teachers were told they could take as long as they needed within a half term period.

B. Instruments

1. In order to ascertain the extent of a pupil's proclivity toward the educational process, a motivation scale was designed (Appendix D).

The content of the statements in the motivation scale include items covering the following areas:

a. School (general aspects)
b. School work
c. Self-evaluation as a student
d. Teachers
e. Parents and their school role
f. Peers and siblings
g. After-school activities and their relation to school

Several procedures were followed for the purpose of determining the reliability of the scale. An item analysis was made to determine the internal consistency of the scale.

The split-half method, corrected by the Spearman-Brown prophecy formula for the full-length of the test yielded a reliability coefficient of .96. Extensive validity studies were also carried out (Appendix D).

2. For evaluating the comparability of pupils on IQ, the machine-scored form of the Lorge-Thorndike Intelligence Test (Verbal Form A - Level 3) was used.

3. To control for reading accomplishment, the machine-scored form of the Stanford Achievement Reading Test (Form JM) was used.

4. A spelling test was constructed to measure pupils' initial spelling ability and their achievement at the end of the experiment. (Appendix C)

This test was constructed in two parts totaling 115 items. Each part was designed to test a different aspect of spelling learning.

Part I, consisting of 65 multiple-choice items, tested the pupils' learn- [illegible] factual materials. The items in Part I were designed to test the factual

learning of rules and various spelling definitions.

Part II, consisting of 50 items, tested the pupils' ability to utilize spelling rules in attacking unfamiliar words.

Reliability coefficients of .84 and .89 for Parts I and II, were obtained by the analysis of covariance technique using the within groups correlation and the Kuder-Richardson procedure, Formula 21, respectively.

C. Statistical Analysis

A factorial design (2 x 2 x 3), using analysis of variance and t tests was used in evaluating the data for equating the groups before treatments and for measuring differences in spelling achievement at the close of the study.

The following null hypotheses were tested:

1. There are no differences in performance among the three groups taught by the three methods.

2. There are no interactions between methods of teaching and levels of educational motivation.

In order to test the hypotheses the following paradigm was used in the analyses of data:

Motivation Level	Initial Spelling Level	Teaching Methods		
		1	2	3
High	High			
	Average			
	Low			
Low	High			
	Average			
	Low			

The .05 level was the criterion for accepting significant differences.

D. Results

The results reported in this section are based on a different sample size for each analysis. Cases were dropped for several reasons: principals did not always have average classes, much pupil transiency, and pupil absence. The initial means and number of pupils in the experimental groups before matching, in spelling, reading, IQ, and school motivation are summarized in Table 1.

In all of the following analyses pupils were matched on initial spelling ability.

In each of three schools, all the classes were taught by one of the experimental methods only (see p. 3). This meant that each school was exposed to one of the three treatments. In six other schools, each of the three classes was taught by one of the three methods. Every school in this second group covered the entire range of treatments under study. The design of the experiment called for comparisons of achievement between the schools which included only a portion of the teaching techniques and the schools which were involved in using all three teaching methods. The purpose of this analysis was to determine if there was any "halo effect" among the methods in the schools within which the three methods were used. If a "halo effect" did occur, it was predicted that it would manifest itself in a regression of means among the three methods in each of the six schools. During the course of the experiment several of the classes experienced large population shifts which necessitated their being dropped from the study. Because of this, it was not feasible to include the conventional method in this analysis of school classifications. The means for the programed text group and the programed based group according to school distribution are presented in Table 2.

The differences between the horizontal and vertical pairs of means, for the Spelling Post Test, Parts I and II, in Table 2 were evaluated by t tests. All pairs of horizontal means were significant at the .05 level. No statistical differ- were found between the vertical pairs of means. It was concluded that, for

TABLE 1

Initial Means and N's of Experimental Groups
Before Ma' :hing in Spelling

	METHODS					
	Programed Text	N	Programed Based	N	Conventional	N
Spelling Test I	37.47	285	35.71	279	33.78	230
Reading	4.92	284	4.81	278	4.55	234
IQ	104.41	291	103.50	280	99.65	233
School Motivation	486.04	224	500.24	193	487.02	112

TABLE 2

Means for Spelling Post Tests According to Distribution of Methods in Schools

Test I

Distribution of Methods in Schools	Programed Text	N	Programed Based	N
One Method Only in Each of Three Schools	43.71	65	47.88	65
Three Methods in Each of Six Schools	44.91	65	49.32	65
	44.31	130	48.60	130

Test II

Distribution of Methods in Schools	Programed Text	N	Programed Based	N
One Method Only in Each of Three Schools	33.58	64	36.54	55
Three Methods in Each of Six Schools	34.98	64	37.62	55
	34.28	128	37.08	110

this study, different administrative arrangements for distributing methods among schools did not affect teaching as measured by pupil performance.

Because of the loss of classes, "the one method only in each of the three schools," group was eliminated from further study. Since there were no differences found in methods due to their distribution in schools, it was felt that this procedure would not affect the results of the experiment outside of reducing the number of cases that would be used in further analyses.

Table 3 presents the initial means on the Spelling Pre Test, Part II, in the six schools. Table 4 presents the means for all groups on the Spelling Post Test, Part II, in the six schools. Table 5 presents the results of an analysis of variance for the post test data for the same groups. The obtained F value of 15.80 for the differences between the methods is significant beyond the .01 level. Comparisons of pairs of means with t tests indicate significant differences at the .01 level between the means of the programed text group and the programed based group. There was also a significant difference at the .01 level between the programed text group and the conventional method group. In both cases, the programed text group did not do as well. There were no statistical differences found between the programed based group and the conventional method group. The analysis of variance revealed an interaction between motivation level and initial spelling ability. In this interaction, pupils with low initial spelling ability and high motivation achieved significantly higher than pupils with similarly low initial spelling ability but with low motivation. There was also a significant triple interaction at the .01 level between teaching methods, initial spelling ability and motivation. Pupils in the programed based group with low initial spelling ability and high motivation achieved significantly better than pupils in the same group with low initial spelling ability and low motivation. It is interesting to note that there were no over all differences in achievement between high and low motivated pupils.

TABLE 3

Means for Pre Spelling Test II
in Six Schools

Motivation Level	Initial Spelling Ability	METHODS: Programed Text	N	Programed Based	N	Conventional	N
High	High	38.80	19	41.48	15	40.44	9
	Average	30.97	21	30.67	16	30.40	10
	Low	17.67	19	19.85	15	17.00	9
Low	High	39.89	19	40.27	15	41.76	9
	Average	30.85	21	30.61	16	28.11	10
	Low	16.71	19	17.80	15	19.60	9
	Total	29.21	118	30.12	92	29.72	56

TABLE 4

Means for Post Spelling Test II
in Six Schools

Motivation Level	Initial Spelling Ability	Programed Text	N	Programed Based	N	Conventional	N
				METHODS			
High	High	42.26	19	44.13	15	44.77	9
	Average	35.28	21	40.50	16	40.50	10
	Low	26.31	19	32.53	15	29.88	9
Low	High	41.26	19	44.66	15	44.88	9
	Average	36.90	21	38.25	16	40.00	10
	Low	24.21	19	26.40	15	29.66	9
	Total	34.43	118	37.78	92	38.35	56

TABLE 5

Analysis of Variance for Post Spelling Test, Part II, by Methods and Levels in Six Schools

Source of Variance	d.f.	Sum of Squares	Variance	F	Sig. Level
Between A-B-C	2	847	423.50	15.80	.01
Between 1-2-3	2	10,942	5,471.00	204.06	.01
Between I-II	1	86	86.00	3.21	
Interaction (A-B-C x 1-2-3)	4	27	6.75	.25	
Interaction (A-B-C x I-II)	2	73	36.50	1.36	
Interaction (1-2-3 x I-II)	2	123	61.50	2.29	.05
Interaction (A-B-C x 1-2-3 x I-II)	4	595	148.75	5.55	.01
Within	248	6,649	26.81		
Total	265	19,342			

On the basis of these results the hypothesis, that both experimental groups would exhibit greater ability to spell words which require the understanding of spelling concepts than the control group, was rejected.

The hypothesis, that the programed based group would exhibit greater ability to spell words which require the understanding of spelling concepts than the experimental group using the programed text, was accepted.

The hypothesis of an interaction between methods of instruction and levels of educational motivation was rejected. It was concluded, on the basis of these data, that the programed text was a less effective teaching method for teaching spelling concepts than the programed based method or the conventional method.

The distribution of scores for the Spelling Post Test, Part I, by method, motivation level, and initial spelling level indicated that the cells were neither matched nor proportional. It was decided to use a simple analysis of variance for the three methods with equal N's in each group. The groups were matched in initial spelling ability by dropping subjects from each group. Means on the Spelling Pre and Post Test, Part I, are presented in Table 6. The results of the analysis of variance are presented in Table 7. An obtained F of 4.83 indicated significant differences among the means at the .01 level. Separate t tests between pairs of means indicated a significant difference at the .05 level between the programed text and the conventional method and a significant difference at the .01 level between the programed text and the programed based method. There was no significant difference found between the programed based method and the conventional method.

It was concluded, on the basis of these data, that the programed text was also less effective for teaching spelling facts than the programed based method or the conventional method.

TABLE 6

Means for Pre and Post Spelling Test I
in Six Schools

	METHODS					
	Programed Text	N	Programed Based	N	Conventional	N
Pre Test	40.07	69	40.39	69	40.01	69
Post Test	44.85	69	49.80	69	48.16	69

TABLE 7

Analysis of Variance for Spelling Post Test, Part I, by Methods in Six Schools

Source of Variance	d.f.	Sums of Squares	Variance	F	Sig. Level
Between Groups	2	874.56	437.28	4.83	.01
Within Groups	204	18,444.96	90.42		
Total	206	19,319.52			

The three groups of classes were also evaluated for the time they needed to complete the experimental course of study. An outer limit of one term (five months) was selected to terminate the experiment. Before the experiment began it was decided that all of the material should be covered well within this time limit. Table 8 summarizes the time taken by classes and groups to complete the course of study.

Time scores are used for whole classes rather than pupils in this analysis of the methods. With the exception of the programed text group this analysis reflects teaching data rather than pupil data. The characteristics of the pupils are presented in Table 1.

Contrary to expectations, many of the classes required the full half term (19.3 hours) to complete the course of study. All of the teachers who required the full half term to complete teaching the course of study reported that they could have used more time were it available. Because of the pre-established time ceiling, the range of scores for the control group was attenuated.

The results of an analysis of variance for the time scores for the three groups are presented in Table 9. The obtained F (40.02) was significant beyond the .01 level. Comparisons of individual pairs of means using t tests indicated significant differences at the .01 level between the programed text group and the programed based group and between the programed text group and the control group. The difference between the programed based group and the control group was not significant. Had the control teachers been given more time the differences between the programed based group and the control group might have been more marked. This was indicated by the fact that 7 out of the 9 teachers in the control group used the maximum time allotted, whereas only 2 out of the 9 teachers in the programed based group used the maximum time allotted. In terms of time the programed text was significantly more efficient than either of the other two teaching methods.

TABLE 8

Mean Time Taken in Hours for Classes by Methods to Complete Course of Study

Class	Programed Text	Programed Based	Conventional
1	4.2	14.6	19.3
2	4.9	7.0	19.3
3	4.1	16.7	19.3
4	3.7	16.7	8.0
5	4.7	16.7	19.3
6	4.6	19.3	19.3
7	3.8	17.3	17.3
8	4.2	19.3	19.3
9	4.4	12.0	12.0
	4.3	15.5	17.0

TABLE 9

Analysis of Variance for Time Used to Complete Spelling Course of Study by Experimental Groups

Source of Variation	Sum of Squares	d.f.	Mean Square	F	Sig. Level
Between Groups	870.13	2	435.06	40.02	.01
Within Groups	260.87	24	10.87		
Total	1,1[illegible].00	26			

1. Case Studies

Separate analyses of the data were carried out for the two tape recorded classes. As mentioned previously, each tape recorded lesson seemed most representative of the conventional method of instruction, and the programed based instruction respectively. Selected descriptive statistics of these classes are presented in Table 10.

Since these classes were chosen on the basis of representativeness of method rather than matching of groups, they were not equal in initial spelling ability, motivation, or IQ. In order to compensate for these initial differences, spelling gain scores were used to evaluate differences in achievement. As can be seen from Table 10, the programed based group had a significantly greater mean gain score than the conventional method group on the Spelling Test, Part I. The difference in mean gain scores between the two groups for the Spelling Test, Part II, was not significant.

Both the programed based lesson and the conventional lesson contain many similar elements which are basic to all sound teaching. In each there is a clear statement of what the lesson aims to achieve. There is much pupil responding as an outcome of the questioning process and of the expressed approval by the teachers for correct answers. Errors are immediately analyzed for correction. In both classes there is an interplay of visual, auditory, and kinaesthetic stimuli to enhance learning.

Contrasts between the techniques employed in these lessons are marked even in the areas of great similarity. The strongest difference relates to the general format in the presentation of material. In the programed based lesson, incisive clarity and simplicity are reflected throughout. These elements make it easy for children, especially those of low ability, to follow the development of the lesson and to retain the content. The economy and preciseness of wording may be responsible for the avoidance of errors in this teaching segment and for the

TABLE 10

Summary of Data for Classes Used
in Tape Recorded Lessons

Variable	Group Means Conventional	Programed Based	Sig. Level
N (pupils)	20	18	
IQ	92.2	84.0	.01
Reading	3.5	3.3	N.S.
Motivation	544.3	506.3	.01
Time to complete study	19.3 (hours)	19.3 (hours)	N.S.
Spelling Gain--Test I	10.6	15.9	.01
Spelling Gain--Test II	18.0	18.8	N.S.

superior gains shown by this group on the Spelling Test, Part I. Moreover, there is a constant repetition of the words which are basic to a clear understanding of the material being taught. Words such as keep, leave out, space, and apostrophe in the formation of contractions appear with regularity in almost every question and strengthen the factual and conceptual aspects of the learning.

The conventional lesson, on the other hand, progresses at a much more leisurely pace and in a more circuitous manner. An effort is made to use contractions within various contexts without probing into the structure of contractions and its application to shall and will. The lesson merely requires that the children apply the rule, which had been learned in previous lessons, to shall and will. As a result, the value of the various contexts into which the contra tions have been placed appears to be nebulous and irrelevant.

Compounding the weakness of the lesson is the fact that the questions are not precisely worded which results in many inaccurate student responses. In addition, an undue amount of time is devoted to describing the contexts, and to repetitious pupil statements which interfere with the learning of the specific task at hand. Reinforcement of correct responses tends to be irregular. This deprives the pupil of security in the accuracy of his knowledge. Although the constant repetition in the programed based lesson of the word good in praising a correct response may be mechanical and less attention getting as the lesson progresses, it, nevertheless, provides each child with similar reassurance about his contribution to the lesson. The variation of words in praising accurate answers, as it appears in the conventional lesson, may contain value judgments for the children about the significance of the questions they answered and the level of ability they displayed in their responses. This, too, may hinder learning.

From an analysis of the two lessons, and an evaluation of the results on the final achievement test of the experiment for these two classes, it would appear the relationship between learning theory principles in teaching and pupil

achievement would be a fruitful area for future study.

E. Discussion

The results of this study did not confirm the main hypotheses. The rejection of the hypothesis concerning the ordering of the effectiveness of the teaching methods must, however, be seen in the light of the differences in time taken to complete the course of study. For the Post Spelling Test, Part II, the largest difference in mean achievement was between the programed text group (34.43) and the conventional method group (38.35). However, the difference in mean time between them was 4.3 hours compared to 17.0 hours. Although it was anticipated that there would be time differences among the three groups it was decided that because the time variable was self-determining for the programed text method, it should also be self-determining for the other two methods. Equating the conditions of time for all groups resulted in significant variations in the amount of time used by each teaching method. While the programed text method was not as an effective teaching method as the other two methods, it did prove to be more efficient. Since all of the groups made significant gains when compared to their initial achievement levels the results of this experiment should be evaluated according to two criteria: effectiveness and efficiency. These results also suggest that the optimum use of the programed instruction in spelling would occur when used in conjunction with teacher directed instruction.

It would seem that the results of this experiment have implications for future research with programed instruction, particularly in those studies concerned with the effectiveness of the method compared with other methods of instruction. The results of this experiment indicate the possibility that the time (in this case, time being a correlate of quantity of material) that pupils are exposed to teaching is as important a factor in teaching effectiveness as the methods themselves are. This interpretation is based on the hypothesis that an intra-pupil learning process is going on that may be only partially related to the method a teacher employs in

presenting materials. In other words, in the teaching-learning act, the teacher may be an organizer and presenter of materials which pupils assimilate according to both general and individually unique learning abilities. Some evidence for this point of view was obtained in the pilot study (Appendix E) where no differences in pupil achievement were obtained from several methods of writing programed materials. This finding is in agreement with other research which found no difference in pupil achievement between randomly ordered and sequentially ordered frames. All of the research related to this problem, however, was restricted to programs or units of programs consisting of 50 frames or less. In trying to explain these kinds of results, Roe* suggested that pupils working with a scrambled sequence program which is not too long are challenged by the problem its illogical order presents and become more highly motivated in working with it.

These kinds of results indicate that future experimentation with programed instruction will have to utilize designs which take into account the various aspects of the time variable. Since one of the characteristics of programed instruction is a reduction in the time needed to cover a given amount of material as compared to other methods, and since time is probably a highly important variable in the teaching-learning process, comparisons between programed instruction and other instructional methods becomes an extremely difficult enterprise.

Within the programed text group, it was found that the variable of time was unrelated to reading ability, IQ or final achievement in spelling. In this case, time was not a correlate of the quality of the material. The lack of relationship between IQ and time, reading and time, and spelling achievement and time, are particularly interesting in view of the common findings of the high correlation

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*K. V. Roe, H. W. Case, and A. Roe, Scrambled Versus Ordered Sequence in Auto-Instructional Programs, Los Angeles, University of California, Report No. 51-48, May, 1961.

between these variables. Two possible explanations present themselves. It may be that frequent success is differentially reinforcing in favor of the lower achieving pupil insofar as it motivates him to work faster than he would when taught by more conventional methods. Related to this supposition is the fact that the reading ability required to work with the program was at the level of the entire group so that the effect of ability on time was below an operable threshold. These two factors, frequency of success which is related to the small step structure of the program, and a reading level of the program which is of minimal difficulty, probably upset the time and ability variables relationships.

Contrary to the widely accepted belief that programed instruction, through the use of small, developmental steps, can eliminate differences in pupil achievement, the results of this study indicate that the ranking of pupils on initial spelling ability was maintained through the close of the study. Furthermore, as would be expected for most learning materials, within ability level groups, pupils with the lowest initial spelling ability made the greatest gains in spelling gain scores with the programed materials. These results occurred although the error rate within the program was low for all groups.

Although it is conceivable that most pupils could be brought to one hundred per cent terminal performance with certain materials and through unlimited teaching time, perfect performance does not seem to be a feasible or practical goal. Perfect performance for all pupils in all learning is based on what is probably a false assumption, and that is: any concept can be learned if it is broken down into sufficiently small steps. The point rejected by this kind of thinking is that there are concepts, thoughts and ideas whose parts do not add to a whole. Although the lower ability pupils were perhaps motivated to work faster by the nature of the materials, their final achievement was of the order that could be predicted from a knowledge of their initial achievement.

The confounding of the time variable with the methods variable vitiates any definitive interpretation of the achievement results between the programed text method and the other two methods. However, with regard to the programed based method and the conventional method there was no significant difference between them in completion time. There was also no significant difference between them in final achievement scores. Since the programed based method was the pivotal point of the entire study, speculations regarding reasons for these results are in order. As stated previously, the teachers using the programed based method were given a five session in-service training course in programed instruction and provided with the programed text to be used in planning their lessons. During the experiment each of the 27 teachers was observed at least once during their spelling lessons. These observations were for the purpose of identifying teacher behaviors which could be related to their respective theoretical teaching models. With the exception of one teacher in the programed based group there were no observable differences among or between the teachers in the programed based group and the conventional group. The lack of observable differences is possibly due to the insufficiency of the training given to the teachers in the programed based group. While five training sessions may have been sufficient to reinforce the pre-established teaching behaviors of the conventional method teachers, it was probably too short a time to build an entirely new repertoire of teaching behaviors for the teachers who were to use a programed based method.

Although having only face validity, the observations and interpretations of the tape recorded lessons give the clearest picture of some of the differences between a programed based method of instruction and conventional methods of instruction. These two lessons indicate that many aspects of learning theory can be operationalized and related to teaching method.

The lack of significant differences in achievement between pupils of high and low motivational levels makes difficult any interpretation of the

interactions between motivation and other variables. Because of these results the hypotheses concerning the relationship between teaching methods and motivation must be rejected.

Because of several internal and external limitations of this research a replication of this study with an improved design would yield important knowledge. At least two important changes in design would be necessary. Unless sufficient time could be devoted to training teachers, it would be advisable to select teachers who already possessed the required teaching characteristics. Secondly, as suggested previously, it would be necessary to control for time conditions between groups. While time itself might only be related to spaced versus massed practice (which is relatively easy to control) it can encompass such factors as quantity of material and/or repetitiousness (practice) of material. In comparing programed instruction with other methods of instruction some compromise will have to be made between the conditions of time and the amount of time among methods. Programs used for experimental purposes will have to be somewhat longer for a given content, while teachers will have to be restricted in the amount of time they can use in teaching the same content.

F. Conclusions and Recommendations

In the comparisons between groups the programed based instruction group and the conventional method group did significantly better than the group using the programed text. Perhaps the most outstanding difference between the groups was the time they required to cover the teaching content of the experiment. The group using the programed text required one fifth the amount of time the other two groups required to complete the course of study. Although the groups used for this analysis were not statistically equivalent in IQ or initial spelling, the time differences between them were of the magnitude to be educationally meaningful. From these results it would seem that programed instruction, at least in spelling, could be used effectively in conjunction with teacher directed instruction.

APPENDIX A

THE SPELLING PROGRAM

The New York City course of study entitled, Teaching Spelling,[1] was selected as the source for obtaining words for constructing the spelling program.

The original plan was to select only words that are generally taught at the 5th grade level in conformity with the present course of study. However, difficulty was encountered in trying to select a logical format for programing words according to this procedure.

One of the main problems was that those words which are logically related to words at the 5th grade level are taught at other grade levels. An example of this would be the word "colonies" which is a level 4 word. The related word "colony" is a level 6 word and is therefore taught in another grade. It seemed appropriate that these words should be learned concurrently rather than limiting the teaching of them to the principle of graduated levels of frequency of use. Furthermore, the modification of "colony" to the form "colonies" is brought about by the application of a spelling rule. Since one of the major features of programed instruction is the ordering of learning materials into a logical sequence, it was decided that the present course of study in spelling would have to be modified in order to be programed. This meant that two distinct problems would have to be resolved. First, the spelling materials themselves would have to be organized according to some meaningful classification system, and second, a method of presenting the materials to pupils would have to be devised. A number of discussions were held with curriculum specialists as to how spelling words could be grouped. On the basis of these discussions, a review of the literature, and an examination of the existing spelling list, words have been grouped in five ways:

1) according to spelling rules found in the manual

2) according to common phonetic elements or related families

3) as compound words

4) as confused endings

5) as isolates which fall into none of the above groupings

1. Development of Programed Materials

As a result of this analysis, it was decided to program only those aspects of spelling which could be taught as conceptual material. The actual material to be programed was selected from several grade levels.

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[1] Teaching Spelling, Course of Study and Manual, Curriculum Bulletin 1953-54 Series, No. 6, New York, New York: The Board of Education of the of New York, 1954, 136 pp.

The rules are summarized below:

1) The formation of plurals by adding s, es; by changing y to i and adding es; by changing to a new form. A branching sequence on vowels and consonants was included in this section.

2) The letter q is followed by u.

3) How to add voweled suffixes (including -ing) to words ending in silent e.

4) Syllables.

5) When to double a final consonant before a voweled suffix.

6) The meaning of some frequently used suffixes.

7) Contractions.

8) Abbreviations.

9) When i comes before e.

An examination of suggested activities and an analysis of the lists of words in the spelling manual showed that the above generalities were suggested for teaching in grades 3-6. Some were explicitly stated, while some others were implied in the types of words suggested for different grade levels. The materials prepared are directed to the teaching of the rule or generality. Illustrative words are more or less incidental to the teaching of the rule. Each of the nine generalities above appears as a separate chapter. The chapters range in length from 3 to 34 pages.

As material was written, it was tried out on an individual basis with from two to four children. After individual tryouts and discussions with the children, certain frames had to be revised. Sometimes this involved a complete rewriting of the content of the frame, while at other times it meant a redesign of the format of the frame. It was found that where more than 3 or 4 words were called to a child's attention so that he might deduce a common element, he made careless errors toward the end of the frame. Certain phraseology, while seemingly clear to the writer, for example, "Look at these words," did not produce the desired response from pupils. Very specific directions as to how to look, for example, "at the next-to-the- last letter," or "from left to right," or "at the words in the list above," had to be prepared. Lengths of lines for answers had to correspond to a reasonable degree to the size of the answer expected. Certain items had to be paired on the same line to elicit the correct response. For example, where a letter was expected as a response, the word "letter" and the answer blank had to appear on the same line, as "letter _____."

After revisions based on individual tryouts, materials were again tried out, in order to ascertain the suitability of the correction. Group tryouts involving about 70 children followed this second trial. With the completion of group tryouts, programed booklets were corrected and revised in preparation for final copy to be used in the experiment beginning in September 1963.

The total number of frames developed and tried out was 1038. According to the estimates of specialists in the field of programing, this is approximately 20 hours of classroom instruction. On the basis of a daily 20 minute period in spelling, this should be enough material to cover 10-12 weeks of work.

Although approximately half the words taught at the fifth grade level can be categorically related to a teachable concept, there is no attempt at ordering words beyond that of frequency of use subdivided by subject area in the existing New York City course of study. In a review of the literature on the teaching of spelling, Porter concludes that, ".... concentration upon gross 'teaching methods' rather than the.... nature and organization of the subject-matter being taught...."[2] has plagued the teaching of spelling.

2. Development of Teaching Methodology

There were two essential and related problems faced in designing a teaching methodology based on programed instruction. One was to organize the material in a logical and sequential system and the other was to provide techniques which would maximize the transference of basic programing principles to classroom teaching.

The training of teachers to use a "programed methodology" for teaching spelling was done during a 10 hour in-service course divided into 5 sessions. The teachers using the conventional method for teaching spelling were also trained in a 10 hour in-service course. Separate curricula were used in each course. These are described in the following section. All of the teachers participating in the in-service course were given college equivalency credit for salary increments.

The outlines and syllabi for the in-service courses were as follows:

(a) Teachers using Programing Techniques:

SESSION	TOPIC	CONTENT AND ACTIVITIES
I	Introduction - Programed Instruction	An introductory lecture on the theory and technique of programed instruction. Representative types of programs were distributed to the teachers. Various techniques of programing were described.
II	Programed Spelling Project	The spelling project was described in detail. The programed spelling text was distributed for review and study. The differences between the organization of the spelling program and the present course of study were emphasized. At the end of this session the teachers were asked to write a short unit of a program in spelling.

[2] D. Porter, An Application of Reinforcement Principles to Classroom Teaching, Boston, Mass.: Graduate School of Education, Harvard University, 61, p. 46.

SESSION	TOPIC	CONTENT AND ACTIVITIES
III	Construction of Programed Instructional Materials	This session was used for analyzing the program assignments and discussing the various elements of program construction such as prompting, schedules of reinforcement, small steps, and stimulus response relationships.
IV	Methodological Changes	Seminar on the effects of programing on teaching methodology - the use of the question for shaping pupil behavior, function of tests, etc.
V	Summary	Review of programing principles and how they apply to classroom teaching. The restructuring of the course of study in spelling.

The teachers in this course were given reading assignments related to the theory and practice of programed instruction.

(b) Teachers Using the Conventional Method of Instruction:

This group used as a text the New York City course of study in spelling. The in-service class sessions were used for reviewing the conventional teaching method.

APPENDIX B

TRANSCRIBED LESSONS

The following are parallel lessons in the teaching of contractions by the conventional method, the program based method, and the program itself. The transcriptions for the conventional method and the program based method are preceded by the teacher's lesson plan. It should be noted that these lessons are only parts of the sequence in the teaching of contractions. Oral and written work, teacher and pupil statements and responses, are recorded for the conventional and the program based methods.

Teacher's Lesson Plan - Conventional Method Instruction

Aim: To teach and apply contractions of shall and will

Motivation: Ask: "What form of language have we been studying in spelling the last few days?" (contractions)

Development:

1. What is a contraction?

2. Why do we use contractions?

3. Name some contractions which were formed from the word not.

4. Name some contractions formed from the word are.

5. Tell children that "today we will learn the contractions using shall and will."

6. Sentences on board in which children have to form contractions from the underlined words. (Taken from compositions about "Emperor's New Clothes").

   a. When we catch those thieves, we will put them into a dark dungeon.

   b. They shall eat nothing but bread and water.

   c. After we catch them they will be sorry they robbed me.

7. Have sentences on the board (quotations from American History--changed slightly) in which children have to break up contractions into original words.

   a. We won't fire until we see the whites of their eyes.

   b. They won't give up the ship.

   c. We won't ask what our country can do for us but what we can do for our country.

8. Dictation - Tomorrow on our trip we'll take a tour entitled "The Age of Exploration."

   Put on board leaving out all forms of punctuation. Children come up and correct the sentence.

Follow-up: Assignment

Write five sentences pertaining to our Social Studies unit which show the use of contractions made from shall and will.

Conventional Method Instruction

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	We have been studying something in spelling within the past few days. What have we been studying? David?			
David:	For the past few days we have been studying contractions.			
Teacher:	What is a contraction? Eric?			
Eric:	A contraction is a word that means that one big letter to make it shorter by taking off two words that go to it or more. (sic)			
Teacher:	Was it one big word to begin with?			
Eric:	Yes, it is one big word. (Eric was interrupted by Antoinette who wished to correct him. Eric called on Antoinette).			
Antoinette:	Eric, you mean that it is two words that you make up as one.			
Teacher:	Form into one. Why do you use contractions at all? Alfred?			
Alfred:	We use contractions to make our sentence shorter and to make our words shorter when we say it.			
Marvin:	I have something to add to things you said. You mean we have to have contractions because we, when we use it, you think things it may be shorter. (sic)			
Teacher:	That's what he said. Why do you use contractions? What is the most important reason? Edgardo?			
Edgardo:	Because it is the easiest way to say it.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	All right. It comes from your mouth more easily. What are some of the contractions that we have been using? Let us start here. We studied some contractions made up from the word not. Do you have some of those? (Antoinette volunteers). Antoinette?			
Antoinette:	One of the contraction words is could not.			
Teacher:	What is the contraction?			
Antoinette:	couldn't - c-o-u-l-d-n-'-t (spells it out)			
Teacher:	Good. (Children raise hands to volunteer further examples. Children then call on each other for answers). Lillian?			
Lillian:	Another contraction with the word not is don't - d-o-n-'-t (spells it out)			
Teacher:	Good.			
	(Lillian calls Basilio)			
Basilio:	Another contraction with the word not is wouldn't - w-o-u-l-d-n-'-t (spells it out)			
	(Basilio calls Eric)			
Eric:	Another contraction is won't - w-o-n-'-t (spells it out)			
Teacher:	All right. Let us go on to some others. We have also studied contractions using the word are. What are some of those? Iraida?			
Iraida:	you're - y-o-u-'-r-e (spells it out)			
	(Iraida calls Lucille)			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Lucille:	Another contraction using are is their. (Stammers t - h - e - r - i - e - r - r)			
Teacher:	You need help.			
	(Lucille calls on Julia for help).			
Julia:	Lucille, I would like to correct you. The way to spell their is t-h-e-'-i-r (spells it out)			
Teacher:	You're not following the rule that we formed. Before we go on, let's talk about the rule that we formed. What is it? What did we decide about forming contractions usually? Aida?			
Aida:	Forming contractions with two words we usually keep the first word and substitute an apostrophe for the letters that are missing in the second word.			
Teacher:	All right. And what didn't Julia do? Spell they're, Antoinette?			
Antoinette:	Basilio and Julia, I'd like to make a correction. They're is spelled t-h-e-y-'-r-e (spells it out)			
Teacher:	All right. Fine. I have some sentences on the board, do you recognize them?* Where are they from? On this board I am talking about. (Points to board). Ida?	*1. We shall put the thieves into a dark dungeon. 2. They will eat nothing but bread and water. 3. The thieves will be sorry and we will not be robbed again.		
Ida:	Those sentences are from our composition that we had to write.			
Teacher:	About what?			
Ida:	About the Emperor's New Clothes.			
Teacher:	Yes, and who are we supposed to be? Iraida?			
[illegible]:	We were supposed to be the emperor.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	What were we supposed to be doing? Connie?			
Connie:	We are supposed to be thinking of a way of how to catch the two thieves.			
Teacher:	Yes. All right. Today, we want to be learning new contractions. We are going to use the word shall and will in our contractions. Most of you know some of the words already. These are sentences from your composition. I am going to call you up and come up to the board and look at the words that I have underlined. Read the sentence and write the contraction formed from the two underlined words over it. Please explain what you are doing. Edgardo?			
Edgardo:	We will put the thieves into a dark dungeon. We'll put the thieves into a dark dungeon.			
Teacher:	Read that again.			
Edgardo:	We shall put the thieves into a dark dungeon.*		*we'll (written above we shall)	
Teacher:	What is the contraction?			
Edgardo:	we'll - w-e-'-l-l (spells it out)			
Teacher:	All right. What letters did you omit? (Long pause). Don't you know?			
Pupil:	Edgardo, you omitted the letters s - h - a			
Teacher:	What did he do in its place?			
Pupil:	Larry and Edgardo, you substituted an apostrophe.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	All right, ... for the missing letters. Let's go on to the next one. Call on somebody, Edgardo. (Edgardo calls Jose).			
Jose:	They will eat nothing but bread and water. they'll			
Teacher:	The contraction form			
Jose:	The contraction form is they'll*		*they'll (written above they will)	
Teacher:	That's good, call on somebody. (Jose calls Aida).			
Aida:	Jose, you omitted the w and i, and substituted an apostrophe.			
Teacher:	All right, call on someone, Bizeleo.			
Bizeleo:	We will not be robbed again.			
Teacher:	Oh, but the beginning of the sentence is over here.			
Bizeleo:	The thieves will be sorry and we will not be robbed again.			
Teacher:	What do you do with will not. Instead of saying "we will not be robbed again," what would we say? Eric?			
Eric:	We won't be robbed again.			
Teacher:	Good. won't*		*won't (written above will not)	
Teacher:	That's it. What did you do, Corrine?			
Corrine:	I formed the contraction won't from the words will not. I omitted			
	(teacher interrupts)			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	This is an exception to the rule because we're not keeping the first word. But what did you substitute?			
Corrine:	I substituted I			
Teacher:	For what? Eric?			
Eric:	Bizeleo, you omitted the i and w.			
Teacher:	No, he didn't. This is an exception to the rule. We are not keeping the word will at all. What did he do, Alicia?			
Alicia:	He omitted the n - o from the not.			
Teacher:	Omit the n? But I see it. Alfred?			
Alfred:	He omitted the o.			
Teacher:	Yes, and substituted .... ?			
Alfred:	.... and substituted an apostrophe.			
Teacher:	All right class. You erase the board quickly and I'll put on			
Pupil:	(interrupts) What happened to the ill?			
Teacher:	That is what I am going to put on the board now. I want you to look at the sentence I am going to write.* Take a look at that sentence. Read it. Lucy?	*On tomorrow's trip ill behave.		
Lucy:	On tomorrow's trip ill behave.			
Teacher:	What is wrong with it, the way it is written? Alf redo?			

	Oral Work	Board Work		Pupil Notebook
Alfredo:	The word ill needs an apostrophe and a capital letter because the I is a pronoun and it always has to be capitalized.**	Teacher **As pupil tells teacher the correction, teacher erases ill and writes I'll.	Pupil	
Teacher:	All right, fine. Now look at the next board, I have some other sentences here.*** What is the difference between the sentences on this board and the sentences that were on the other board? Ida?	***1. We'll never give up the ship! 2. We won't fire until we see the whites of their eyes. 3. We won't ask what our country can do for us, . but what we can do for our country.		
Ida:	The difference with that sentence is the other way you were supposed to .... (Pupil stops Ida--calls on Lucy).			
Teacher:	(To Ida). You forget it?			
Lucy:	Ida, I would like to make a contraction. I mean, I would like to make a correction. The difference between the board that we are just doing, and the one that was written down there is that on the other one we had to make the contraction, and on this board the contractions are made already.			
Teacher:	Very good. And what do you suppose we'll have to do with that? Andreda?			
Andreda:	We have to put the exact words that .... (child stops) (calls on another pupil) Carol?			
Carol:	Andreda, we will have to break them up into the words that they were.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	Yes, into the original word. Would you come up, read the sentence out loud, and tell me what the contraction was originally? What the words were before the contraction was formed? William?			
William:	We shall never give up the ship.			
Teacher:	Read it again.			
William:	We'll never give up the ship.			
Teacher:	Yes. These sentences are taken from history, only changed a little bit to suit our purposes. All right. Write underneath the sentences.* All right, now read it.		*Pupil writes we shall.	
Pupil:	We shall never give up the ship.			
Teacher:	Yes, what other way could you have written that? Walcott?			
Walcott:	There is another way of writing we shall.			
Teacher:	Not another way of writing we shall.			
Walcott:	we will			
Teacher:	The original word is the contraction for either we shall or we will. All right. Next. (Walcott calls on Antoinette). Antoinette?			
Antoinette:	**		**Pupil writes will not.	
Teacher:	Read the sentence as it is.			
Antoinette:	We won't fire until we see the whites of their eyes. (Pupil changes the original words and says:) We will not fire until we see the whites of their eyes.			

	Oral Work	Board Work		Pupil Notebook
Teacher:	The original word	Teacher	Pupil	
Pupil:	The original word is we will not.			
Teacher:	The original word before the contraction was formed was we will not or we shall not. Eric?			
Eric:	We won't ask what our country can do for us but what we can do for our country. The will word is we will not.* We will not ask what our country can do for us but what we can do for our country.		*Pupil writes will not.	
Teacher:	Yellow papers were given out. They should be headed.			
Pupil:	That was a sentence that President Kennedy liked best--one of them that Kennedy liked best.			
Teacher:	I am going to dictate a sentence to you and I am going to use a contraction in that sentence. I want you to listen carefully, I will say it three times. First time, just listen. There shouldn't be a pen in anyone's hand. Second time, you begin to write, and the third time you listen again and look for your mistake.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	"Tomorrow - at the museum - we'll take a tour - entitled, 'The Age - of Exploration.' "* Now I'll read it, I'll say it once more. (Teacher repeats sentence again). (Continues to write it). (A third repetition follows). Once more. I said three times, but I'm going to wind up saying it about ten. (Repeats sentence fourth time). I will help you a little bit by putting the difficult words on the board.** (Repeats sentence fifth time). I am going to put the sentence on the board. I want you to check your papers, but I will put it on leaving out several things that should be there, because it will be a review of many things that we have learned.***	**entitled museum exploration		*Pupils write on papers as teacher dictates: Tomorrow at the museum we'll take a tour entitled "The Age of Exploration."
	Are you going to be ready to come up and begin correcting it? Check your papers against that. See if you have the correct things in it. Louis?	***Writes sentences with errors: tomorrow at the museum well take a tour entitled "The Age of Exploration."		
Louis:	I put a "t" in the beginning of the sentence.****		****As he says it, Louis changes small "t" to a capital "T."	
Teacher:	What kind of "t"?			
Louis:	A capital "t" because it is the beginning of the sentence.			
Teacher:	All right. (Calls on Edward).*****		*****Edward starts to capitalize the m in museum.	
	No, that is not necessary. That's not the name of the museum, it is just the word museum. Something very important. (Edward calls Alicia).******		******Alicia puts (') in we'll.	

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Alicia:	I put an apostrophe in we'll because it			
Teacher:	What's the word we've been studying?			
Alicia:	.... Because it is a contraction.			
Teacher:	And what does the apostrophe stand for?			
Alicia:	The apostrophe stands for we will.			
Teacher:	It stands for letters that have been omitted. What are those letters? Eric?			
Eric:	the w and the i			
Teacher:	Yes, all right. Tomorrow at the museum we'll take a tour entitled, "The Age of Exploration." Why have I put quotation marks around this phrase* and capitalized it? Basileo?	*Points to "The Age of Exploration."		
Bazileo:	I think you put the capital letters there, because it is the name of a tour.			
Teacher:	Yes, the name of a tour, the title of a tour. All right. Over here, I have an assignment for you to do now.** Would you read it, please, Walcott?	**Write 5 sentences pertaining to our Social Studies unit which show the use of contractions.		
Walcott:	Write five sentences pertaining to our Social Studies unit which show the use of contractions.			
Teacher:	Good. What does the word "pertaining" mean? Let's make sure that everyone understands. Thea?			
Thea:	Something to do with Social Studies work.			

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Teacher:	Good. All right. Five good sentences about our Social Studies unit. How many of you did not understand? We are going to take five sentences that have to do with our Social Studies units.			
	We'll go to visit a college tomorrow.			
	Show me the use of the contraction in the sentence.			
Pupil:	You mean the sentence has to have a contraction?			
Teacher:	Yes.			
	(Pupils begin to write sentences).			

Teacher's Lesson Plan - Programed Based Instruction

Aim: To write correctly the contractions for I will, he shall, you will, we shall, they will

Procedure:

1. During the past two weeks we have been learning about contractions. A contraction is a short word which is formed from two words and has the same meaning as the two words. When we write a contraction, what do we leave out? What do we leave in the place where the letters were? What mark do we put in this space?

2. Today we are going to learn to write the contractions for a word with will or shall.

3. Look at the contraction I'll. I'll can mean I shall or I will. When I write the contraction I'll, how many letters from will or shall do I keep? Which letters do I keep? Which letters from will do I leave out? from shall? What is the contraction for I will? I shall? Copy the contraction. What do we leave in the place where the letters were left out? What mark do we put in this place?

4. To write the contraction for you will or you shall, which letters from will or shall do we keep? What do we leave in the place where the letters were left out? What mark do we put in this space? Write the contraction for you will, you shall.

5. When we write the contraction for he will or he shall, which letters from will or shall do we keep?
What do we leave in the place where the letters were left out? What mark do we put in this space?

he will	I will	you will
he shall	he shall	we shall
		they will

Program Based Instruction

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Teacher:	During the past two weeks we have been learning about contractions. Contraction* is the short word for two or more other words. Contraction has the same meaning as the words from which it comes. In order to write contractions we have to do several things. When we write the contraction, what do we leave out? (Children raise hands to volunteer. Teacher selects Sharon).	*Writes the word contraction as she says it.		
Sharon:	A space and an apostrophe. (This is a wrong answer. Teacher asks question again, stressing the words underlined below).			
Teacher:	What do we leave out, Sharon?			
Sharon:	Letters.			
Teacher:	Good. *In the place where the letters were, what do we leave? (Children raise hands to volunteer. Teacher selects Carol).	*Writes the word letters on the board.		
Carol:	A space.			
Teacher:	Good. *In that space what mark do we put? (Children raise hands to volunteer. Teacher selects Andy).	*Writes the word space on the board.		
Andy:	An apostrophe.			
Teacher:	Good. *Today we are going to learn to write the contraction of a word with will or shall. Let's look at the contraction I'll. **I'll can mean I will*** or I shall***. When we write the contraction I'll, which letters from will and shall do we keep? (Children raise hands to volunteer. Teacher selects Carol. Carol?	*Writes the word apostrophe on the board. **Writes the contraction I'll as she says it. ***Writes I will and I shall as she says them.		

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Carol:	l l			
Teacher:	Good. Which letters from will* do we leave out? (Children raise hands to volunteer. Teacher selects Annanette). Annanette?	*Points to the word will on the board.		
Annanette:	w i			
Teacher:	Good. Which letters from shall* do we leave out? (Children raise hands to volunteer. Teacher selects Charles). Charles?	*Points to the word shall on the board.		
Charles:	s h a			
Teacher:	Who will come up and circle the letters in will and shall that we keep? (Children raise hands to volunteer. Teacher selects Rebecca). Rebecca?*		*Rebecca circles l l in will and shall already written on the board. will shall	
Teacher:	(To Rebecca) Good. Who will come up and cross out the letters in will that we leave out? (Children raise hands to volunteer. Teacher selects Angela). Angela?* (To Angela) Good. Who will cross out the letters in shall that we leave out? (Children raise hands to volunteer. Teacher selects Tony). Tony?** Good.		*Angela crosses out w i in will. **Tony crosses out s h a in shall.	
Teacher:	When we leave out the letters w i or s h a what do we leave in the place where the letters were? (Children raise hands to volunteer. Teacher selects Denise). Denise?			
Denise:	A space.			
Teacher:	Good. What mark do we put in that space, Denise?			
Denise:	Apostrophe.			

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Teacher:	Good. What is the contraction for I will? (Children raise hands to volunteer. Teacher selects Docia). Docia?			
Docia:	I'll			
Teacher:	Good. What is the contraction for I shall? (Children raise hands to volunteer. Teacher selects Jackie). Jackie?			
Jackie:	I'll			
Teacher:	Good. Open your books and copy the contraction for I will or I shall.* When you have finished check with model on the blackboard. (Pause) After you have checked, put your pens down. (Pause)			*Children copy I'll✓ (The ✓ mark was added after they checked with the board).
Teacher:	If we want to write the contraction for *he will or **he shall, which letters from ***will and ***shall will we keep? (Children raise hands to volunteer. Teacher selects Andy). Andy?	*Writes he will as said. **Writes he shall as said. ***Points to will and shall as said.		
Andy:	l l			
Teacher:	Good. Which letters from *will will we leave out? (Children raise hands to volunteer. Teacher selects Thomas). Thomas?	*Points to will as said.		
Thomas:	w i			
Teacher:	Good. Which letters from shall* will we leave out? (Children raise hands to volunteer. Teacher selects Tony).	*Points to shall as said.		
Tony:	s h a			

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Teacher:	Good. What will we leave in the place of where the w i and s h a were? (Children raise hands to volunteer. Teacher selects Tommy). Tommy?			
Tommy:	A space.			
Teacher:	Good. What mark will we put in that space? (Children raise hands to volunteer. Teacher selects Diane). Diane?			
Diane:	An apostrophe.			
Teacher:	Good. Write the contraction for he will or he shall. (Pause)			Children wrote: he'll
Teacher:	Angela, would you put it on the blackboard?		Angela wrote: he'll	
Teacher:	Good. Check it. Pens down.			Children check with board and ✓
Teacher:	If we want to write the contraction for you will* or you shall**, we have to leave out two letters from the word will.	*Wrote you will as said. **Wrote you shall as said.		
Teacher:	Write the two letters* that you would leave out. (Children raise hands to volunteer. Teacher selects Fred). Fred?	*Teacher wrote two cue lines: ___ ___		*Children wrote w i in notebook.
Fred:	Leave out w i.		Fred wrote: w i as he said it.	
Teacher:	Good. Check it. Which three letters would you leave out from the word shall? (Children raise hands to volunteer. Teacher selects Denise). Denise?	Teacher wrote three cue lines: ___ ___ ___		Children check notebooks.
Denise:	s h a		Denise wrote and said s h a.	

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Teacher:	Good. Check it.* Pens down. Which two letters** would you keep from the word will or the word shall? Michael?	**Teacher put two cue lines on board. ___ ___		*Children look at board and checked notebook. ✓
Michael:	1 1 *		*Michael wrote and said: 1 1	
Teacher:	Good. Check it.* In the place where the letters were, you would have to leave something.** Write what you would leave.*** Edna?	**Teacher wrote cue lines: s _ _ _ _		*Children look at board and checked notebook. ✓ ***Children wrote s p a c e
Edna:	A space.*		*Edna wrote and said: a s p a c e	
Teacher:	Good. In that space which mark* would you put?** Sharon?	*a _ _ _ _ _ _ _ _ _ _		**Children wrote a postrophe
Sharon:	Apostrophe.*		*Sharon wrote and said: a postrophe	
Teacher:	Good. Write the contraction for you will or you shall.* (Pause) Rebecca?** Good. Pens down. (Teacher writes on board). On the blackboard I have written*** five groups of words. Each group has will or shall in it. Write only the contraction for each group of words. (Pause while children write in books). Diane, do the first.	*** I will ___ he shall ___ we will ___ they shall ___ you will ___	**Rebecca said and wrote: you'll	*Children wrote: you'll
Diane:	I'll*		*Diane writes and says: I'll	Children ✓ notebooks.
Teacher:	I'll is the contraction for which two words? Sharon?			
Sharon:	I will or I shall.			

	Oral Work	Board Work: Teacher	Board Work: Pupil	Pupil Notebook
Teacher:	Good. The next one -- he shall,* Rebecca?	*Points to board.		
Rebecca:	he'll*		*Writes on board and says: he'll	Children compare books with board and√.
Teacher:	He'll is the contraction for which two groups of words? Denise?			
Denise:	he shall			
Teacher:	And another group? Annette?			
Annette:	he will			
Teacher:	Good. We will*-- Angela?	*Points to board.		
Angela:	we'll*		*Writes and says: we'll	Children compare books with board and√.
Teacher:	Good. We'll is the contraction for we will and it is also the contraction for another group of words. Which group? Carol?			
Carol:	we will			
Teacher:	That's already on the blackboard.* We will and another one? Denise?	*Points to board.		
Denise:	we shall			
Teacher:	Good. They shall* -- Gocia?	*Points to board.		
Gocia:	they'll*		*Writes and says: they'll	Children compare books with board and√.
Teacher:	Good. You will* -- Angela?	*Points to board.		

	Oral Work	Board Work		Pupil Notebook
		Teacher	Pupil	
Angela:	you'll *		*Writes and says: you'll	Children compare books with board and√.
Teacher:	Good. When we write the contraction for a word as will or shall, which letters from will or shall do we keep? Leslie?			
Leslie:	the two l's			
Teacher:	Good. Which letters from will do we leave out? Jackie?			
Jackie:	w i			
Teacher:	Good. Which letters from shall do we leave out? Annette?			
Annette:	s h a			
Teacher:	What do we leave in the place where the letters were? Freddie?			
Freddie:	A space.			
Teacher:	We leave a space, but what do we put in that space, Freddie?			
Freddie:	Apostrophe.			
Teacher:	Good. Close your books. Last child in each row please collect them.			

Programed Text Lesson

147.	147. Many times we contract a word with will or shall. You probably use some contractions with will or shall every day. For example: a. I'll race you to the corner. b. You'll have to give me back my eraser because I need it now. c. If you'll give me your apple, I'll give you my cookies. (Go to the next frame.)
148. will or shall	148. I'll means I will. I'll can also mean I shall. I'll means I _____ or I _____.
149. will or shall	149. You'll means you will. You'll can also mean you shall. You'll means you _____ or you _____.
150. L L (or ll)	150. I'll means I will or I shall. When you change I will and I shall to I'll, you keep the word I. You also keep only 2 letters from the words will and shall. The 2 letters that you keep from will and shall are the letters __ __.
151. l l (LL)	151. You'll means you will or you shall. When you change you will or you shall to you'll, what are the only 2 letters left from will and shall? __ __

151. l l (or LL)	152. Whenever we have to contract will and shall with another word, we keep only the __ __ from will and shall.
153. space	153. Whenever we leave out a letter in writing a contraction, we leave one _____ where the letter was left out.
154. l l (or LL)	154. To write will as a contraction, we leave out wi and keep only the __ __.
155. l l (or LL)	155. To write shall as a contraction, we leave out sha and keep only the __ __.
156. one	156. Even though we leave out more than one letter, we still leave only _____ space where the letters were left out.
157. one space	157. To show that one letter was left out in writing a contraction, we leave one space where the letter was left out. To show that 2 or more letters are left out in writing a contraction, we still leave only _____ _____ where the letters were left out.
158. I ' ll	158. Write the contraction for I will and I shall on the line below. Leave one space where you left out the letters. _____

159. you l l	159. Write the contraction for you will and you shall. Leave one space where you left out the letters. Leave your space where the space comes in the lines below. _____ _____
160. apostrophe (or')	160. Besides leaving space for the letters left out in writing a contraction, we also put an apostrophe above that space to show that letters were left out. The space shows that letters were left out. The _____ also shows that letters were left out.
161. I ' ll	161. Write the contraction for I will and I shall. Leave space where it belongs. Put an apostrophe where it belongs. _____
162. you ' ll	162. Write the contraction for you will and you shall. Leave space where it belongs. Put an apostrophe where it belongs. _____
163. l l	163. Remember, when we write the contraction for any word and will or shall, we keep only the letters __ __ from will or shall.
164. l etters	164. We leave one space where any l _____ are left out.

165. apostrophe (or')	165. We put an _____ in that space.
166. I ' ll I ' ll you'll you'll	166. Write the contractions for the words below. I shall _____ I will _____ you shall _____ you will _____

APPENDIX C
SPELLING ACHIEVEMENT TESTS

BOARD OF EDUCATION OF THE CITY OF NEW YORK
Bureau of Curriculum Research
130 West 55th Street, New York, N.Y. 10019

SPELLING TEST - PART I (FACTS)

Sample Questions and Answers

Question - Booklet Sample

1. A bird is _____.

1	2	3	4
a book	an animal	a thing	a plant

2. Which word below is spelled correctly? _____

1	2	3	4
cendy	kandy	canddy	candy

3. Which word below is an abbreviation? _____

1	2
Sunday	Tuesday
3	4
Wed.	Friday

Answer - Sheet Sample

	1	2	3	4
1.	‖	‖	‖	‖
2.	‖	‖	‖	‖
3.	‖	‖	‖	‖

SPELLING TEST - PART 1

1. A word that tells about one person or one place or one thing is called a _____.

1	2	3	4
possessive word	singular word	a plural word	a guide word

2. A word that means more than one person or more than one place or more than one thing is called a _____.

1	2	3	4
possessive word	singular word	a plural word	a guide word

3. Many words that mean one person or one place or one thing can be made to mean more than one by adding _____ to them.

1	2	3	4
-er	-y	-s	-ion

4. In a sentence a word that is used to name a person, a place, or a thing is called a _____.

1	2	3	4
noun	person	verb	suffix

5. Read this sentence to yourself.

Bob and Jack are brothers.

The words Bob, Jack, brothers are used as names.

Another word for names is _____.

1	2	3	4
brothers	verbs	nouns	persons

6. In question 5, Bob is the name of one person. We say the word Bob is a _____.

1	2	3	4
singular name	pronoun	plural name	plural noun

7. In question 5, brothers is a name word which means more than one person.

We say the word brothers is a _____.

1	2	3	4
family name	boy's name	plural name	singular name

8. In the alphabet, letters that are not vowels are called _____.

1	2	3	4
nouns	capitals	diphthongs	consonants

9. Which group of letters below has no vowels in it? _____

1	2	3	4
laxo	eiou	ctsr	tupm

10. Which group of letters below has only vowels in it? _____

1	2	3	4
auto	prsm	eiuo	nzbd

11. Which part of the word hex tells you how to make it mean

more than one hex? _____

1	2	3	4
hex	ex	x	h

12. Which part of the word fish tells you how to make it mean

more than one fish? _____

1	2	3	4
sh	h	fi	fish

13. Which part of the word scratch tells you how to make it mean

more than one scratch? _____

1	2	3	4
sc	ch	scratch	s

14. Which part of the word guess tells you how to make it mean more than one guess? _____

1	2	3	4
gu	ess	s	guess

15. Which part of the word ferry tells you how to make it mean more than one ferry? _____

1	2	3	4
fe	y	ferry	ry

16. Which part of the word key tells you how to make it mean more than one key? _____

1	2	3	4
ey	y	ke	key

17. Which part of the word child tells you how to make it mean more than one child? _____

1	2	3	4
ch	ld	child	d

18. Whenever you write a word with the letter q in it, which letter do you always write after the letter q? _____

1	2	3	4
r	p	i	u

19. Sometimes we add a group of letters to the end of a word. For example: we might add the ending -ing to the word shape to make a new word. The group of letters we add to the end of a word is called a _____.

1	2	3	4
prefix	appendix	suffix	index

20. If we add a group of letters to the end of a word we change the _____ and _____.

1 meaning and spelling of the word
2 meaning and plural of the word
3 numbering and prefix of the word
4 the naming and length of the word

21. The words move, shove, and drive end in the letter e which is one of 5 letters we call _____.

1 suffixes
2 consonants
3 prefixes
4 vowels

22. The word shape ends in an e which we do not hear. If we add the ending -ing to the word shape, the e at the end of the word is _____.

1 heard
2 kept
3 dropped
4 doubled

23. The ending -ly starts with the letter l which is called a _____.

1 consonant
2 vowel
3 suffix
4 prefix

24. If we add the ending -ly to the word shape, the e at the end of the word shape is _____.

1 kept
2 dropped
3 doubled
4 heard

25. Say the word be to yourself. The e at the end of be has the sound of _____.

1 silent e
2 long e
3 short e
4 final e

26. When you add -ing to the word be, you get the word _____.

1 ing
2 being
3 bing
4 beeing

27. We can find out how to say a word correctly by looking at the way it is marked in a book called the _____.

1	2	3	4
dictionary	almanac	encyclopedia	magazine

28. In our language every word must have at least one sound in it called a _____.

1	2	3	4
silent sound	consonant sound	vowel sound	letter sound

29. Depending on how it sounds in a word, the letter y can be called _____.

1	2	3	4
a singular	a plural	a vowel	prefix

30. The following words have been divided into parts.

beau ti ful	beautiful
bi cy cle	bicycle

If we divide words into parts as we did beautiful and bicycle, we call each part a _____.

1	2	3	4
group	syllable	suffix	prefix

31. Each part of a word must have a sound in it called a _____.

1	2	3	4
letter sound	accented sound	consonant sound	vowel sound

32. We must hear certain sounds in all words in order to count the number of parts in the words. These sounds are called _____.

1	2	3	4
vowel sounds	consonant sounds	soft sounds	letter sounds

33. The words did, act, fed, have one part because they have only one _____.

1	2	3	4
consonant sound	short sound	vowel sound	long sound

34. Look at these 3 words: see, come, look.
Each of the 3 words has one part or one _____.

1	2	3	4
consonant	vowel	syllable	diphthong

35. We do not hear the e at the end of the words: move, shove, drive.
When we do not hear a letter at the end of a word, we say the letter is a _____.

1	2	3	4
silent letter	unnecessary letter	long letter	consonant letter

36. In the word every written below, the mark over the first part of the word tells us how to say the word correctly.

ev́ - er - y

The mark over the ev́ in the word every is called _____.

1	2	3	4
quotation mark	apostrophe mark	accent mark	long mark

37. When we say the name of a vowel, we say the vowel sound that is called the _____.

1	2	3	4
name sound	short sound	long sound	accented sound

38. A letter with a mark over it like this: ā has a _____.

1	2	3	4
short sound	long sound	quiet sound	accent sound

39. A letter with a mark over it like this: ă has a _____.

1	2	3	4
short sound	consonant sound	long sound	accent sound

40. In the words below, which o has the right mark over it to show how o sounds when we say the word no? _____

1	2	3	4
nŏ	nó	nô	nō

41. In the words below, which i has the right mark over it to show how i sounds when we say the word it? _____

1	2	3	4
ít	ĭt	īt	ît

42. In the words below, which a has the right mark over it to show how a sounds when we say the word at? _____

1	2	3	4
ăt	āt	át	ât

43. In the words below, which e has the right mark over it to show how e sounds when we say the word me? _____

1	2	3	4
mé	mê	mē	mĕ

44. The word reading has how many parts when we say it? _____

1	2	3	4
one (1) part	two (2) parts	three (3) parts	four (4) parts

45. The word sandy has how many parts when we say it? _____

1	2	3	4
one (1) part	two (2) parts	three (3) parts	four (4) parts

46. The word keep has how many parts when we say it? _____

1	2	3	4
one (1) part	two (2) parts	three (3) parts	four (4) parts

47. The word some has how many parts when we say it? _____

1	2	3	4
one (1) part	two (2) parts	three (3) parts	four (4) parts

48. The word powerful has how many parts when we say it? _____

1	2	3	4
one (1) part	two (2) parts	three (3) parts	four (4) parts

49. The words start, park, and bass end in letters t, k, and s, which we call _____.

1	2	3	4
prefixes	suffixes	consonants	vowels

50. The words sit and sob each have one part or one _____.

1	2	3	4
consonant	sound	diphthong	syllable

51. In the 2 words sit and sob, the letters just before each last letter are i and o. The letters i and o are called _____.

1	2	3	4
middle letters	vowels	consonants	diphthongs

52. When you add -ing to the word sit, it looks like this: _____.

1	2	3	4
siting	siteing	sitting	sitiing

53. The word commit has 2 parts (com mit). When you say the word commit, you say the second part with more force or strength. This means that the second part of commit is _____.

1	2	3	4
accented	lengthened	shortened	repeated

54. When you add -ed to the word commit, it looks like this: _____.

1	2	3	4
committed	commiteed	commited	commitedd

55. If we add the ending -ed to a word, we change the time of the word from present time to _____.

1	2	3	4
sometime	part time	future time	past time

56. When you add -ing to an action word, you can get another kind of action word, or you can get a word used like a _____.

1	2	3	4
noun	contraction	abbreviation	diphthong

57. The -er at the end of the word baker means _____.

1	2	3	4
more	a person who	past time	manner

58. The -er at the end of the word smaller means _____.

1	2	3	4
more	a person who	past time	less

59. If we add the ending -ion to the word vacate, we change the meaning of the word a little bit. Vacate means to leave or to go away. When we add -ion to vacate, we get the new word vacation. The word vacation means _____.

1	2	3	4
vacant manner	more vacant	one who vacates	the act of going away

60. When you say that someone does a job in a slow way or manner, what ending would you add to the word slow? _____

1	2	3	4
-er	-ing	-ly	-ed

61. When we contract something we _____.

1	2	3	4
accent it	shorten it	lengthen it	write it

62. When we write a contraction, we write two words as _____.

1	2	3	4
one word	accented words	longer words	plural words

63. We contract words by leaving out some _____.

1	2	3	4
apostrophes	accents	plurals	letters

64. In a contraction 2 things show that something has been left out. They are _____.

1	2
a period and a comma	a letter and a space
3	4
an apostrophe and a comma	an apostrophe and a space

65. Do contractions change the meaning of words? _____

1	2	3	4
yes	no	sometimes	only the nouns

END OF PART 1

NAME_____ SCHOOL_____

CLASS_____ ROOM_____ TEACHER_____

SPELLING TEST - PART II (CONCEPTS)

For each of the following words, numbered 1 through 26, write the word on the line next to it to show how it is written when it means more than one.

For example: cat _____cats_____

The word cats written on the line next to the word cat shows how the word cat is written to make it mean more than one cat. All of these words below will change their spelling when you make them mean more than one. To some words you will need to add only one letter at the end. For other words you will have to change a few letters in the word. Therefore, on the empty line, write the whole word that means more than one, not just its ending.

Be sure to copy correctly as much of the word as you need from the part that is given. The whole word that means more than one must be spelled in full correctly. If you write just the ending, the whole word will be marked wrong.

Now write each of the words, numbered 1 through 26, so that they mean more than one.

1. medley _____
2. hydrometer _____
3. newsboy _____
4. onyx _____
5. amenity _____
6. peach _____
7. address _____
8. barbiturate _____
9. pinch _____
10. osprey _____
11. metagalaxy _____
12. tooth _____
13. dormouse _____
14. charwoman _____
15. scroll _____
16. contest _____

(CONTINUED ON NEXT PAGE)

NAME_____ SCHOOL_____

Continue to write each of the words, so that they mean more than one.

17. cherry _____

18. council _____

19. diorama _____

20. puppy _____

21. allergy _____

22. crayfish _____

23. lady _____

24. stepchild _____

25. policeman _____

26. key _____

In questions 27 through 30, the space in each word shows that one letter has been left out. You are to write the missing letter in the space to complete the word.

For example: w a g o ___ (You would write the letter n to complete the word.)

Now you do questions 27 through 30 just like this one.

27. s q ___ a t

28. k u m q ___ a t

29. r a c q ___ e t

30. q ___ i n t u p l e t s

Questions 31 through 46 ask you to write each of the two or more words as a contraction.

For example: he is _____he's_____

The word he's is written on the line next to the words he is to show how these two words would be written as a contraction. Now you write the contractions for the words in questions 31 through 46 just like this.

31. I am _____

32. you have _____

33. here is _____

34. we have _____

(CONTINUED ON NEXT PAGE)

NAME_____ SCHOOL_____

Continue writing the contractions for these words.

35. cannot _____

36. they are _____

37. would not _____

38. will not _____

39. there are _____

40. he will _____

41. you would _____

42. he had _____

43. of the clock _____

44. she shall _____

45. they should _____

46. it is _____

Questions 47 through 70 ask you to add endings to words. First you will see the word. Then you will see the ending you are to add to it. And then you will see the space for you to write the word with the ending added to it.

For example: send -ing sending (You would write the word with the ending added to it.

Now do questions 47 through 70 just like this one.

47. bare -ed _____

48. be -ing _____

49. stop -ed _____

50. pick -ing _____

51. delete -ing _____

52. pad -ing _____

53. smooth -ing _____

54. agree -ing _____

55. park -ed _____

56. complete -ly _____

(CONTINUED ON NEXT PAGE)

NAME_____ SCHOOL_____

Continue to write the word with the ending added to it.

57. near -ed _____

58. cooperate -ion _____

59. regret -ed _____

60. dissent -ing _____

61. repel -ing _____

62. direct -ed _____

63. leisure -ly _____

64. break -ing _____

65. repeat -ed _____

66. bare -ing _____

67. even -ing _____

68. leaven -ed _____

69. sit -ing _____

70. display -ing _____

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BOARD OF EDUCATION OF THE CITY OF NEW YORK
BUREAU OF CURRICULUM RESEARCH

THE EVALUATION OF PROGRAMED SPELLING

APPENDICES

Part Two

APPENDIX D

DEVELOPMENT OF THE SCHOOL MOTIVATION SCALE

1. Development of the Scale

The School Motivation Scale has been designed to measure the extent of a student's involvement in the educative process. It is based upon the assumption that motivation, as a major variable in learning behavior, acts as a positive or negative catalyst between the pupil and the presentation of learning materials.

In its present form, the instrument consists of 134 statements each of which contains five options. The pupil checks the option which reflects the degree of his emotional contiguity to the aspect of the learning construct contained in the sentence. Option values are scaled from one to five. The total score for a student is obtained by the method of summated ratings in the manner of the Likert-type scale. To preclude the possibility of response sets, 39 per cent of the items contain a negative affect toward school. As a result, these necessitate a reversal of option values.

The content of the statements is based upon experience derived from the counseling of students, upon a series of individual interviews with fifth grade pupils, and upon the related literature. Areas comprising the educational environment which the children are required to respond to and which form the categories for the statements are:

School (general aspects)

School work

Self-evaluation as a student

Teachers

Parents and their school role

Peers and siblings

After-school activities and their relation to school

Items which were originally composed within the categories have been randomized in the motivation scale.

In order to bring the instrument within the capacity of fifth grade pupils of diverse abilities, statements were structured for simplicity of vocabulary, and for clarity and conciseness of meaning. Instructions were developed which were easy to follow and which provided a sufficient number of examples. A system of coding was devised to identify the testees. By way of correcting the initial draft, the scale was administered to small groups of fourth and fifth grade pupils Testing sessions were followed by a series of individual and group interviews to elicit the student evaluations which served as the base upon which changes were effected.

The revised form of the scale was administered to 11 fifth grade classes in four public elementary schools in New York City. This procedure provided a sample of 341 pupils.

IQ scores for these children were obtained from the school records and range from 72 to 152. A perusal of Table 1 indicates that the pupil population approximates a normal group in intelligence. The fact that the girls have a slightly higher mean IQ than the boys may be attributable to their greater adeptness in the language skills which comprise a considerable portion of standardized intelligence tests.

TABLE 1

School Motivation Scales Sample Population:

Intelligence Quotients

Sex	N	M	Md	S.D.
Boys	169	104.74	104.42	15.14
Girls	172	108.53	107.52	14.89
Total	341	106.66	105.91	15.11

Another salient characteristic which relates to the pupils is that of social class. On the last page of the test booklet, each child detailed his father's and mother's employment. The father's work, equated with the occupational groupings of the 1960 census, served as a means of establishing the socio-economic status of the family. In cases where the father's vocation had been omitted or was difficult to interpret, the mother's work was substituted. Thus, 22 mothers were included in the formulation of the socio-economic categories of the population sample. Because family employment was totally lacking or was wholly incomprehensible in 41 booklets, the socio-economic levels pertain to 300 cases. Table 2 shows that the gamut of the city professional and industrial complex has been tapped.

TABLE 2

School Motivation Scale Sample Population:

Distribution of Parent Occupations

Occupational Groups	Number	Per Cent
Professional and Technical	30	08.7
Managers, Officials and Proprietors	37	10.8
Clerical	25	07.3
Sales	40	11.7
Craftsmen and Foremen (Skilled)	61	17.8
Operatives (Semi-skilled)	59	17.3
Service workers	30	08.7
Laborers	18	05.2
Omitted	41	12.0
Totals	341	99.5

Several steps were taken in order to create an atmosphere which would be conducive to a candid expression of personal feelings by the pupils. For one, the motivation scale was administered by the designer of the instrument who was not previously known to the children. Moreover, the booklets did not require pupils to identify themselves by name. Third, reassurance was given that school personnel would not review the papers. And finally, teachers were quietly requested to refrain from circulating in the room, thereby neutralizing any deleterious effect their presence might have in the immediate testing situation. The testing session occupied approximately one hour of each student's time.

2. Analysis of the Scale

Statistical evaluation of the instrument was undertaken to establish the reliability and validity of the scale.

(a) Item Validation and Reliability

After papers had been decoded, a numerical value from 1 (a negative affect) to 5 (a positive affect) was attached to each checked option. These ratings were then totaled in each booklet to represent the score for the pupil. The higher the score, the greater the involvement with school; the lower the score, the greater the alienation from school. Scores ranged from 211 to 620.

An item analysis was made to assess the instrument's effectiveness in discriminating between the varying motivations in the pupil population. This indicated that 121 of the items were significant at the .01 level, and 4 items were significant at the .05 level. An inability to differentiate can be attributed to 9 of the items. From the foregoing, it seems apparent that the instrument evidences ample sensitivity in distinguishing the diverse motivations of school children.

Two procedures were followed in measuring the reliability of the scale. The split-half method, corrected by the Spearman-Brown prophecy formula for the full-length of the test yielded an r of .963 which indicates that the scale has strong internal consistency. A ten-week retest was given to half the group in order to evaluate the scale's stability. The booklets are still in the process of being marked.

(b) Validity

Validation of the instrument has been centered in logical and in empirical techniques. The methods and content employed in devising the scale, and the psychological constructs upon which these are based are an expression of its logical soundness.

Empirical validity involved two criterion groups which had been selected on the basis of behavior patterns which are patently descriptive of positive or negative motivation toward school.

The permanent record of each child was studied. Personality listings were converted into numerical values according to the following formula:

Rating	Meaning
5	Positive behavior
4	Maturing behavior
3	Varied behavior
2	Regressive behavior
1	Poor behavior

Teacher descriptions of pupils and parent-teacher conferences were noted. Where there was evidence of a Confidential File for a child, the guidance counselor was consulted for a substantiation and clarification of the information it contained. The health record was also evaluated with particular emphasis upon teacher-nurse conferences, medical examinations, and observations of nervous symptoms.

A student became a member of a criterion group if the entire record exhibited a manifest and consistent polarity. In all, 60 students were assigned to the Positive Criterion Group, and 42 students were designated for the Negative Criterion Group.

Specific standards for selecting the Positive Criterion Group were these:

(1) A rating of 5 or 4 and no more than one rating of 3 on personality items.

(2) A rating of Excellent or Good in Social Behavior and Work Study Habits (new permanent record), or a rating of Satisfactory in Social Living (old permanent record).

(3) An absence of any negative comments on the permanent record and health record.

(4) A statement pertaining to outstanding ability or to school participation, when it appeared on the record, made identification easier.

Selections of the Negative Criterion Group followed two alternate methods. If there was a Confidential File for a pupil, this fact superseded all other considerations, and the child was automatically placed in the negative group. If, however, there was no Confidential File, then a combination of these factors was employed to identify the child:

(1) Numerous ratings of 1, 2, and 3 on personality items.

(2) A rating of Fair or Unsatisfactory in Social Behavior and Work Study Habits (new permanent record), or a rating of Needs Improvement in Social Living (old permanent record).

(3) Notations on the health record regarding nail biting, nervousness, emotional disturbances, or excessive use of the lavatory.

(4) Descriptions on the permanent record citing unsatisfactory behavior.

It was predicted that pupils reflecting a positive affect toward school would obtain motivation scores above the median. Those displaying a negative affect toward school were expected to achieve scores below the median score. As can be seen in Table 3, of the 60 students in the Positive Criterion Group, 38 (i.e., 63 per cent) were correctly identified. In the Negative Criterion Group, 32 of the 42 (i.e., 76 per cent) were successfully designated. The procedure for the tetrachoric r extracted a correlation of .61.

TABLE 3

Distribution of Motivation Scores of Criterion Groups

Scores on School Motivation Scale	Pupil Positive Affect	Pupil Negative Affect	Totals
Above Md	38	10	48
Below Md	22	32	54
Total	60	42	102

It is conceivable that the correlation might have been even higher, had teachers been more perceptive in noting the symptoms of the quiet, conforming child who harbors feelings of antagonism toward school. Instead, teachers often reward this facade of docility with fine ratings. A number of these pupils may have been incorrectly placed in the Positive Criterion Group because of this, and thereby provided a somewhat inaccurate criterion for the motivation scale to match. Nevertheless, it is believed that the scale has substantial empirical validity.

(c) Educational Motivation and Intelligence

In order to perceive any evidence of dynamic interfunctioning of the variables, a correlation was made between the IQ scores and the motivation scores. This produced a Pearson r of -.038. One would surmise from this result, that intelligence and motivation, both potent factors in school success, belong to separately active constellations in the self structure. The nature of their functioning in a specific learning situation such as that provided by programed instruction will be determined in the Experimental Study, thus contributing further elucidation in this area.

From Table 4 it can be seen that there is a marked contrast between the motivation levels of boys and girls in the learning experience. The difference between the means of the two groups is statistically significant beyond the .01 level.

TABLE 4

School Motivation Scale Scores by Sex

Students	N	M	Md	S.D.
Boys	169	466.33	472.80	71.83
Girls	172	503.90	519.25	68.80
Total	341	487.83	495.76	71.12

Since the number of disruptive pupils and eventual dropouts is conspicuously greater among boys than girls, the evidence presented here is iterative of the fact that boys, at a rather early age, experience greater dissatisfaction with school. It implies, too, that the present school environment may be more congruent with the psychological drives and needs of girls than with those of boys in this age group.

3. Discussion of the Scale

It has been the purpose in this section of the Report to present in detail the fundamental principles and procedures which guided the development of the School Motivation Scale and to delineate a statistical analysis of the results. The over-all evaluation of the data has led to the conclusion that this instrument meets the reliability and validity requirements for sound testing and experimentation.

It should be added, however, that although this motivation scale will be used in conjunction with an experiment in spelling, its content and purpose are in no way related to specific subject matter. It is a self-contained psychological instrument applicable to a myriad of school situations in which a clarification of the deeper dynamics of a child's behavior may have great pertinence. In potential usefulness and value, therefore, it goes well beyond the confines of this Experimental Study.

BOARD OF EDUCATION OF THE CITY OF NEW YORK

BUREAU OF CURRICULUM RESEARCH
Curriculum Center
130 West 55th Street
New York 19, New York

William H. Bristow, Assistant Superintendent
David A. Abramson, Assistant Director

SCHOOL MOTIVATION SCALE

The scale was prepared by Dorothy Silverman, teacher assigned as Assistant in Research, under the supervision of David A. Abramson. It was designed as part of an experimental project, "The Development and Evaluation of Programmed Spelling," conducted by the Bureau of Curriculum Research as a part of a cooperative research project with the New York State Department of Education. Fred Guggenheim is project coordinator.

DIVISION OF CURRICULUM DEVELOPMENT
Jacob H. Shack
Acting Associate Superintendent

DIVISION OF RESEARCH AND EVALUATION
J. Wayne Wrightstone
Acting Associate Superintendent

Joseph O. Loretan
Deputy Superintendent

Calvin E. Gross
Superintendent of Schools

#239-1,000 ds-9/6/63

(THIS SCALE WAS DEVELOPED FOR EXPERIMENTAL PURPOSES AND CANNOT BE US[illegible] IN SCHOOLS WITHOUT NORMS.)

THIS IS NOT A TEST

It is just a way of helping us find out how boys and girls like yourselves feel about many things.

THERE ARE NO RIGHT OR WRONG ANSWERS..... only answers which show how you really feel about these things. All people are different from each other, and for this reason their answers about many things will be different.

Everyone has a right to his own feelings and ideas.

NO ONE IN THIS SCHOOL WILL READ THESE PAPERS.

To be helpful to us and to yourself, answers should be as exact as possible.

- - - - -

DIRECTIONS

On the next pages are some statements. At the top of each page you will find a list of answers:

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

Read each sentence carefully. Then, on the answer sheet, next to the number of the sentence, darken the space under the number which shows how you feel.

EXAMPLES:

o) I like to help my mother..... o) 1 2 3 4 5

The student has filled in the space under number 1 which stands for never. This means that he (or she) never likes to help mother. For each of you the answer will depend on how you yourself feel.

oo) Television programs are boring..... oo) 1 2 3 4 5

The student has filled in the space under number 4 which stands for most of the time. This means that he (or she) feels that television programs are not interesting.

In the next example, fill in the space under the number which stands for the word or words which best describe your feelings.

ooo) It is fun to play jokes on friends..... ooo) 1 2 3 4 5

- - - - - - -

THERE IS NO TIME LIMIT. FILL IN ONLY ONE ANSWER FOR EACH SENTENCE. YOUR ANSWERS SHOULD SHOW YOUR REAL FEELINGS.

Remember: There are no right or wrong answers.

Turn the page and begin.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

1. I ask my parents to buy good books for me to read for school.

2. I like school more than other children do.

3. If I had the chance, I would help my teacher after school.

4. It pleases me to get my report card.

5. Studying at home is fun.

6. I take books from the library to read for school.

7. I feel that my teacher is my friend when I have to give an answer.

8. It is good to try hard in school.

9. School rules are fine for me.

10. When something worries me, I try to talk it over with my teacher.

11. It is fun when the whole family watches a television program I can use for school.

12. It please me to talk about what I learn in school with my parents.

13. I would rather do extra work for school than watch television.

14. I think that school is nice.

15. Teachers know just how much work children can do.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

16. My friends and I say nice things about school.

17. I would rather do work for school than be with my friends.

18. It is fun to find out my marks on tests.

19. I ask my parents to take me to visit places which will help me in my school work.

20. Children who are smart in school work are fun to be with outside of school.

21. During the summer vacation I feel sorry I am not in school.

22. My teacher is nice to me.

23. I look for television programs which will help me in my school work.

24. People who want to be a success in life must have a lot of school.

25. My teacher understands me.

26. It is helpful when parents check the homework.

27. I like to show my good marks to everybody.

28. My teacher helps me.

29. It makes me happy to tell the class about visits I make to different places.

30. I pay close attention to the lessons the teacher gives.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

31. A teacher's work is hard.

32. It is right for teachers to tell parents everything their children do in school.

33. It pleases me to do a lot of homework.

34. I feel good in the morning when I think about going to school.

35. There are times when I think I would like to be a teacher when I grow up.

36. I am kind of sorry when the school day is over.

37. I like to tell the class about the books I read.

38. I like to have my parents visit school and talk to my teachers.

39. Away from school, children should do things that are the same as school work.

40. It is fun to bring things to class to make the room look nice.

41. Going to school makes boys and girls smart.

42. The books we have in school are interesting.

43. I find it easy to like school.

44. It is more important to do homework after school than to rest.

45. During a lesson, I think only about the work we are doing.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

46. Teachers are smarter than other people.

47. It makes me feel good to think about my school work.

48. I like to show my report card to my parents.

49. I would rather take a test I know I will fail than stay away from school.

50. School is very important to me.

51. I am glad when my parents can help me with my homework.

52. I like to tell my teacher about all the nice things that happen to me.

53. I wish I could go to summer school like the older boys and girls in high school.

54. I like my teacher.

55. At home, I like to talk about the things that happen in school.

56. Trying to do what they want me to do in school is easy.

57. I love to have my parents come to school.

58. I like school just the way it is.

59. I try to answer in class whenever I can, even if the answer may be wrong.

60. Homework is more important than having a good time with friends.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

61. Time goes fast in school.

62. I feel sure that I will finish high school.

63. I like to bring things to class for the teacher to show everybody.

64. I am glad to have my parents tell other people about my school work.

65. To be called to the front of the room to show my good work to the class, would make me happy.

66. School is a friendly place.

67. Teachers know more than just school work.

68. It is good to watch television programs that teachers say are important.

69. It makes me happy to have my parents compare my marks with the marks of other children.

70. My teacher is interesting.

71. Our school gives us chances to show how smart we are.

72. I like the things we study in class.

73. It is wrong for parents to give presents for good report cards.

74. I am pleased with all the things we do in school.

75. It is nice to be a teacher's pet.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

76. I enjoy being in the library.

77. The homework we get is important.

78. It must be nice to talk about school with a brother or sister.

79. I know that fire drills are important, but I hate them because they stop the lesson.

80. I am proud of my school.

81. Parents should love a slow child more than a smart child.

82. I enjoy putting up my hand to give an answer during a lesson.

83. Teachers are my friends.

84. The library has the kind of books I like to read.

85. It makes me happy to please my parents with my school marks.

86. I would rather stay in school than go on trips with the class.

87. I want the boys and girls in my class to be my friends.

88. It is wrong for me to be afraid of school.

89. It is nice when the teacher pins up the good papers on the wall for everybody to see.

90. When the day is over, I like to think about school.

1. never 2. once in a while 3. half the time 4. most of the time 5. all the time

91. Teachers pick the right books for us to use in school.

92. If the teacher calls on somebody else when I have my hand up, I gladly try again.

93. Winning school contests is important to me.

94. Children should help teachers.

95. Children should wear their best clothes to school.

96. Preparing something for school is more important than going to a movie.

97. I think the school day should be longer.

98. I like to show my homework to my parents.

99. I find it easy to learn in class.

100. The things we learn in school will be useful when we grow up.

101. I would rather stay in class and work than go to watch an assembly program.

102. I hate to be out of the room on a pass because I miss part of the lesson.

103. Children should study in a special place set aside for that at home.

104. I do extra book reports to raise my marks.

105. What we learn in school is more important than what we learn outside of school.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

106. School makes me feel smart.

107. Parents should worry if their child is poor in school work.

108. Every boy and girl should try to get to school on time.

109. It is very important to me to show the teacher how smart I am.

110. I would rather do extra work for school than go to the movies.

111. To listen to World Series baseball games in class is a pain.

112. I am smarter in school than outside of school.

113. It is good when brothers and sisters try to see who can do the best work in school.

114. My teacher likes me.

115. When boys and girls make fun of a child for trying hard, he should work hard anyway.

116. When I have to be away from school, I miss it.

117. I try to show my test papers to my parents.

118. I have the feeling that school is made for me.

119. The marks on a report card mean a lot.

120. My teacher likes me very much.

1. never
2. once in a while
3. half the time
4. most of the time
5. all the time

121. I try to help my teacher.

122. School is more interesting to me than anything I do outside of school.

123. I am pleased when I am one of the few boys and girls in class who know the answers.

124. I like to study hard for tests.

125. I am happy in school.

126. Boys and girls should give up watching television programs when they have to study for tests.

127. I try to get very high marks in my school work.

128. Children who are bad in school should be taken out of class.

129. School makes me feel good.

130. Class work helps me feel important.

131. I do my homework with great care.

132. Lunch is the worst time of the school day.

133. I learn better in this school than I would in another school.

134. At home I do extra work for school besides my homework.

- - - - - - - -

Sit quietly and wait until the booklets and answer sheets are collected.

APPENDIX E

THE PILOT STUDY

The basic purpose of the pilot study was to test several hypotheses concerning alternate methods of program construction. Since these various programing methods are in turn related to basic theoretical assumptions underlying the learning process, the results of this study have implications beyond specific techniques of program construction.

The available research pertaining to programed instruction variables are pointedly contradictory. Coulson and Silberman[1] found no significant differences in learning between a multiple choice format of programing versus a constructed response format. Fry, on the other hand, concludes as a result of his research, "....constructed training responses result in more learning than do multiple choice responses if the criterion of learning is recall."[2]

The validity of the principle of active participation of the learner through overt responding in programed instruction is also questionable. A study by Holland[3] comparing learning from programs requiring students to write their answers with programs which were read as complete material resulted in fewer errors on a criterion test for the pupils using the constructed response programs. Studies by Silverman and Alter,[4] Goldbeck, Campbell, and Llwellyn,[5] and Evans, Glaser, and Homme,[6] found no significant differences between overt and non-responding

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[1] J. E. Coulson and H. F. Silberman, "Effects of Three Variables in a Teaching Machine." The Journal of Educational Psychology, Vol. 51, No. 3, June, 1960, pp. 135-143.

[2] E. B. Fry, "Teaching Machines - An Investigation of Constructed Versus Multiple Choice Methods of Response." Automated Teaching Bulletin, Vol. 1, No. 2, December, 1959, p. 12.

[3] J. G. Holland, "Design and Use of a Teaching Machine Program." Paper presented at the American Psychological Association, September, 1960, (Harvard University, mimeo).

[4] R. E. Silverman and M. Alter, "Note on the Response in Teaching Machine Programs." Psychological Report, Vol. 7, 1960.

[5] R. A. Goldbeck, V. N. Campbell, and J. E. Llwellyn, "Further Experimental Evidence on Response Modes in Automated Instruction." Technical Report No. 3, 1960, American Institute for Research, Contract No. 3077.

[6] J. L. Evans, R. Glaser, and L. E. Homme, "A Preliminary Investigation of Variations in the Properties of Verbal Learning Sequences of the "Teaching Machine" Type. In A. A. Lumsdaine and R. Glaser (Eds.), Teaching Machine and Programmed Learning, Washington, D. C.: National Education Association, 1960 pp. 446-451.

programs. In a study of the relative effects of logical sequencing versus random sequencing of program frames Gavurin and Donahue[7] found the logically sequenced program to be superior in both the fewer number of trials to criterion and the fewer errors made with program items. They did not obtain any significant differences in measures of retention. A similar study by Roe[8] involving sequential and randomly ordered frames, resulted in no significant difference in effectiveness for the two types of programing.

In a later study, however, Roe[9] found that the randomly sequenced group performed significantly worse on learning time, errors made during learning, and on post-learning test scores.

1. Hypotheses

This pilot study sought to determine whether there are any differences in pupil achievement as a result of using different program formats.

It was hypothesized that the greater the number of programing principles adhered to in the construction of a program, the greater pupil achievement would be as measured by tests of immediate and delayed retention.

The specific hypotheses that were tested are:

a) The linear constructed, overt, response program which provides immediate reinforcement is more effective than linear programs which use a multiple choice response format, a linear no-response program, a scrambled constructed response program and a text book presentation.

b) The linear program which uses a multiple choice response format is more effective than a linear no-response program, a scrambled constructed response program and a text book presentation.

c) The linear no-response program and a scrambled constructed response program is more effective than a text book presentation.

d) The scrambled constructed response program will be more effective than a text book presentation.

Pupil achievement is considered as consisting of factual and conceptual learning. Each of the aforementioned hypotheses are tested for factual and conceptual learning and for immediate and delayed retention.

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[7] E. I. Gavurin and V. M. Donahue, "Logical Sequence and Random Sequence." Automated Teaching Bulletin, Vol. 1, No. 4, Spring, 1961, pp. 3-9.

[8] K. V. Roe, H. W. Case, and A. Roe, Scrambled Versus Ordered Sequence in Auto-Instructional Programs, Los Angeles, University of California, Report No. 61-48, May, 1961.

[9] A. Roe, "A Comparison of Branching Methods for Programmed Learning." Journal of Educational Research, Vol. 55, No. 9, June-July, 1962, pp. 407-4[illegible]9.

2. Description of Pilot Study School

The school selected for the pilot study consisted of 52 classes having a total population of approximately 1650 pupils. The distribution of classes by grade in the school is as follows:

First	Second	Third	Fourth	Fifth	Sixth
5	5	7	7	8	6

The mean class size for the school is 32.8 pupils.

Reading grades and IQ scores for the third and sixth grades for the school were obtained from the results of the city-wide testing program.

	3rd Grade	Date	6th Grade	Date
IQ	99.2	3/62	98.9	10/61
READING	3.9	4/62	6.1	11/61

The reading tests used in the third and sixth grades were the Metropolitan Achievement Tests, elementary and intermediate forms.

The IQ tests used in the third and sixth grades were the Otis Alpha and The Otis Beta.

Ethnically, the school is predominantly white. Thirteen per cent of the pupils are Negro and 5 per cent are Puerto Rican. Only 1 per cent of the school population is non-English speaking.

3. Description of Pupils

Eight fifth grade classes from the school were selected for participation in the pilot study. The total number of pupils selected was 248. Mean class size was 31 pupils. The range was 24 to 38 pupils per class. Within each class, the five forms of the program were randomly assigned to pupils. Each experimental condition had approximately 49 pupils (49.6). The comparability of the experimental groups was evaluated using IQ and reading ability test scores from school records. The spelling section of the Metropolitan Achievement Test was administered as a pretest to further test for the comparability of groups on initial spelling ability.

Five fifteen-minute work periods were allotted for the pupils to complete the various forms of the program.

The teachers were requested not to teach spelling during the length of the experiment which lasted for 5 days.

4. Instruments Used

The spelling section (Test 3) of the Metropolitan Achievement Tests, Intermediate Battery was used as a pretest for establishing the spelling equivalency for all of the experimental groups. This sub-test consists of 55 recognition type items.

The post test (criterion test) was constructed by the project staff. It is a 50 item constructed response type test based on the content of the spelling program. Since the objective of the spelling program is the teaching of specific concepts and rules, the test items were designed to evaluate the application of these concepts and rules in generalized spelling situations. An item analysis of the test was performed. Three types of spelling scores were used as criterion measures. Those items which required the learning of concepts (spelling rules) were incorporated into a 35 item subscale score named, "Concepts." Those items which involved rote memorization were incorporated into a 15 item subscale score named, "Facts." A total spelling score was obtained by combining the two subscale scores.

5. Description of Pilot Study Programs

In order to test the hypotheses concerning alternate methods of programing five forms of a program covering the same content were developed.

Form 1 - Linear Constructed Response. This program follows the traditional linear model of utilizing constructed responses with immediate feedback of the correct response. The items are sequentially ordered and progress by small steps. The program includes one branching sequence to insure knowledge of certain prerequisite information.

Form 2 - Multiple Choice Response - This program is identical in construction to that of Form 1, with one exception. In responding to each of the frames the pupil must choose the correct response from four provided choices. In addition to seeing the correct answer he also sees three incorrect answers.

Form 3 - Scrambled Constructed Response - Same as Form 1, except that within each unit the frames have been randomly sequenced.

Form 4 - Linear No-Response - Same as Form 1, except the responses called for in Form 1 are provided in each frame.

Form 5 - Textbook - During the writing of the four forms of the program the project team agreed that a fifth form was in order: that of presenting the content of the program in conventional book form. It was decided that this form could provide a bench mark against which to evaluate the other forms of the program; particularly if it was found that there were no significant differences among them. Although the original four forms vary in construction, they all contain some basic features of programed instruction. The fifth form's claim to a relationship with programed instruction is no greater than that of any well written textbook.

A summary of the significant characteristics of the five forms of the program can be seen in Table 1.

6. Statistical Procedures

For statistical analysis the following null hypotheses were tested:

a) There are no significant differences between the Immediate Retention Test scores of children randomly assigned to the five treatment groups in factual and conceptual learning.

b) There are no significant differences between the Delayed Retention Test scores of children randomly assigned to the five treatment groups in factual and conceptual learning.

c) There are no significant differences between time scores of children randomly assigned to the five treatment groups.

The Pilot Study design anticipated an equal number of observations in each cell but loss of observations occurred for essentially random reasons unrelated to experimental variables. A simple analysis of variance for unequal sample size was used for the analysis of data. The effect of the treatments upon the variances was tested by Hartley's test for homogeneity of variance. The components of variation were used for individual comparisons of treatment means.

7. Results of the Pilot Study

The results of this study as indicated in Table 2 for both immediate and delayed retention as measured by the criterion total test score, indicate there are no significant differences between the five different forms of programed instruction in spelling.

When the content of the criterion test was analyzed into factual and conceptual scores separately, significant differences between the methods were apparent. Significant differences between the methods for fact scores were found for both immediate and delayed retention. There were, however, no significant differences between the methods on conceptual scores.

When the various methods were evaluated according to time needed to complete the programs, a significant difference was found. The analysis of variance results for the experimental hypotheses can be found in Table 3.

The statistical data for the following individual comparisons of means can be found in Tables 4, 5, and 6.

For immediate retention of facts the linear constructed response program, the multiple choice response program, and the scrambled constructed response program were all significantly more effective than the text form of the program and the linear no-response program.

Although not significant, the ordering of the effectiveness of the five forms of the program for the learning of facts on immediate retention did occur in the direction predicted, with the exception of the scrambled constructed response form.

TABLE 1

Summary of the Structural Characteristics of the Spelling Programs for Teaching Plurals

	Constructed Response	Multiple Choice Response	No-Response	Scrambled Constructed Response	Text Form	
Prompting	✓	✓	✓	✓		
Active pupil participation	✓	✓		✓		
Immediate feedback	✓	✓		✓		
Sequentially ordered items	✓	✓	✓		✓	
Interlocking of items	✓	✓	✓			
Small steps	✓	✓	✓			
Recall type items	✓			✓		
Recognition type items		✓				
Number of frames	129	129	129	129	--	

TABLE 2

Summary Tables for Analysis of Variance for Matching Variables

	Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F*
Intelligence Quotients	Treatments	302.7	4	7.9	
	Experimental Error	858.3	173	4.9	1.6
	Total	1161.0	177		
Pre-Test Spelling Scores	Treatments	497.6	4	124.4	
	Experimental Error	32,426.1	173	187.4	.7
	Total	32,923.7	177		
Reading Level	Treatments	14.6	4	3.6	1.5
	Experimental Error	432.9	173	2.5	
	Total	447.5	177		

* $F_{.99}(4,173) = 3.41$
$F_{.95}(4,173) = 2.42$

TABLE 3

Analysis of Variance Summary Tables for Experimental Variables

Variables	Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Immediate Retention Total Scores	Treatments	894.9	4	223.7	1.3
	Experimental Error	28,983.4	173	167.5	
	Total	29,878.3	177		
Immediate Retention Fact Scores	Treatments	322.5	4	80.6	3.8*
	Experimental Error	3,666.8	173	21.2	
	Total	3,989.3	177		
Immediate Retention Concept Scores	Treatments	151.3	4	37.8	.5
	Experimental Error	14,276.2	173	82.5	
	Total	14,427.5	177		
Delayed Retention Total Scores	Treatments	1,197.4	4	299.4	1.9
	Experimental Error	24,798.5	159	156.0	
	Total	25,995.9	163		
Delayed Retention Fact Scores	Treatments	213.1	4	52.3	2.7*
	Experimental Error	3,170.4	159	19.9	
	Total	3,383.5	163		
Delayed Retention Concept Scores	Treatments	403.9	4	100.9	1.4
	Experimental Error	11,900.8	159	74.8	
	Total	12,304.7	163		
Time	Treatments	29,801.2	4	7,450.3	44.7*
	Experimental Error	28,842.9	173	166.7	
	Total	58,644.1	177		

* Significant at .05 level.

TABLE 4

Components of Variation for Experimental Means

Immediate Retention - Fact Scores

Program Format	Number of Subjects	Mean	F	Level of Significance
Constructed Response With:	35	10.2		
Text	39	7.1	8.4	.01
Answer Supplied	39	7.5	6.7	.01
Scrambled	37	9.6	.4	.25
Multiple Choice	28	10.2	.02	.25
Multiple Choice With:	28	10.2		
Text	39	7.1	7.3	.01
Answer Supplied	39	7.5	5.8	.05
Scrambled	37	9.6	.3	.25
Scrambled With:	37	9.6		
Text	39	7.1	5.4	.05
Answer Supplied	39	7.5	4.0	.05
Answer Supplied With:	39	7.5		
Text	39	7.1	.1	.25

TABLE 5

Components of Variation for Experimental Means

Delayed Retention - Fact Scores

Program Format	Number of Subjects	Mean	F	Level of Significance
Constructed Response With:	31	9.5		
Text	35	8.1	1.5	.25
Answer Supplied	36	7.0	5.4	.05
Scrambled	34	9.8	.09	.25
Multiple Choice	28	9.9	.10	.25
Multiple Choice With:	28	9.9		
Text	35	8.1	2.3	.25
Answer Supplied	36	7.0	6.6	.05
Scrambled	34	9.8	2.5	.25
Scrambled With:	34	9.8		
Text	35	8.1	2.5	.25
Answer Supplied	36	7.0	7.1	.01
Answer Supplied With:	36	7.0		
Text	35	8.1	1.2	.25

TABLE 6

Components of Variation for Experimental Means

Time to Complete Program

Program Format	Number of Subjects	Mean	F	Level of Significance
Constructed Response With:	35	52.6		
Text	39	25.4	83.8	.01
Answer Supplied	39	31.5	50.6	.01
Scrambled	37	57.4	2.4	.25
Multiple Choice	28	50.8	.3	.25
Multiple Choice With:	28	50.8		
Text	39	25.4	61.5	.01
Answer Supplied	39	31.5	35.6	.01
Scrambled	37	57.4	4.1	.05
Scrambled With:	37	57.4		
Text	39	25.4	117.7	.01
Answer Supplied	39	31.5	77.2	.01
Answer Supplied With:	39	31.5		
Text	39	25.4	4.4	.05

For delayed retention of facts the constructed response program, the multiple choice program, and the scrambled constructed response program were all significantly more effective than the no-response program.

When the experimental groups were compared by time taken to complete the program, the text form of the program took significantly less time to complete than all of the other forms of the program. The no-response program also took significantly less time to complete than the constructed response program, the multiple choice program, and the scrambled constructed response program. The means for the experimental groups on the criterion tests are presented in Table 7.

There are several limiting factors to this experiment. The criterion test and an alternate form of it were not available at the beginning of the experiment so that the pre-program proficiency level of the pupils on the content of the program could not be established. In addition, the program itself consisted of only 129 frames.

While the results of this pilot study cannot be generalized to other learning situations, they do have heuristic value. These results and those of other researchers indicate that significant teaching/learning variables have as yet not been identified either singularly or in significant interactions. The variables explored in this study should be further studied in factorial designs where they can be tested in various combinations.

In addition to the experimental results, some interesting insights occurred during the initial writing of the program. Before the programs were used as part of the pilot study they were tried out on a comparable group of students. A pre-test and post-test was administered. A comparison of pre-test and post-test results indicated that while pupils improved in spelling, little learning took place in relation to understanding the rules. In attempting to understand these results, it was hypothesized that the source of error lay in the program. An analysis of the content of the program revealed that a "set" had been established on the part of the programer whereby all critical information was programed for correct spelling. The result of this was that words, like singular, plural, and noun, whose meanings were essential to the understanding of the rules, were programed for spelling rather than for meaning.

The insight gained from this pilot study was that even when great care is exercised in the preparation of learning materials, without a continual source of objective evaluation it becomes impossible to know whether the desired outcomes are being attained. Unless controls accompany curriculum production, curriculum writers may never become aware that they may be missing their instructional objectives. In the aforementioned example, the psychological phenomenon of "set" acted to mislead a carefully designed and executed program. As a result, the first draft of the program was completely rewritten in order to be related to the teaching objectives.

TABLE 7

Means for Experimental Groups on Criterion Tests

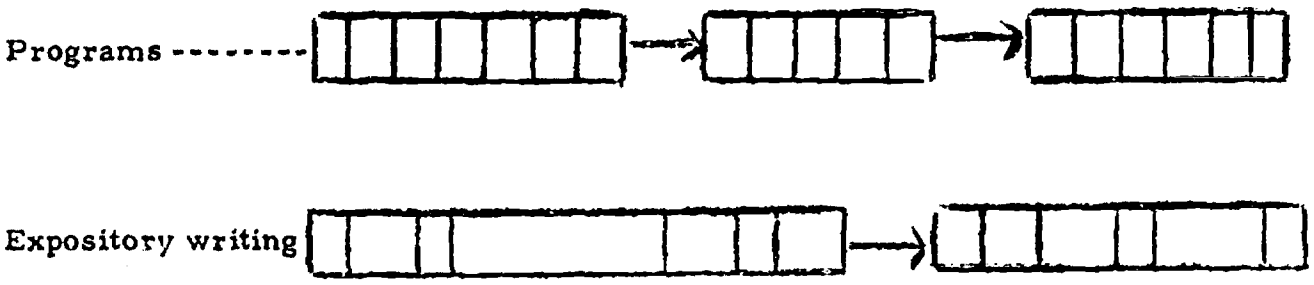
Criterion	Constructed Response	Multiple Choice	No Response	Scrambled	Text
Immediate Retention - Total Scores	31.1	31.5	26.3	30.2	26.6
Immediate Retention - Fact Scores	10.2	10.2	7.5	9.6	7.1
Immediate Retention - Concept Scores	20.9	21.4	18.8	20.6	19.6
Delayed Retention - Total Scores	31.5	33.0	26.1	32.9	28.9
Delayed Retention - Fact Scores	9.5	9.9	7.0	9.8	8.1
Delayed Retention - Concept Scores	22.0	23.1	19.1	23.1	20.8
Time Scores	52.6	50.8	31.5	57.4	25.4

One of the unique features of programed instruction was revealed by converting the program into expository writing. Differences in concept organization and presentation between the two methods became readily apparent. In a program, each frame is related to those before and following. This is accomplished by having specific items (stimulus or response) in the frames dovetail. The dovetailing content is usually repetitious and serves two purposes:

a) It reduces the need for students to refer back in the program for significant information, and,

b) It establishes a continuity between the frames which in other ways are discrete units.

The differences between a programed instruction presentation and a textbook presentation can be seen from the following schematic:



Where the rectangles represent frames, the divisions within the rectangles represent the content of the frames (in terms of elements), the solid arrow lines represent the elements carried from one frame to another and constitute the interlocking feature of the program.

As a consequence of this difference between programs and conventional textbooks the extensive repetition was dropped in preparing the fifth form, since it became apparent that a program was not a textbook with minor modifications.

Criterion Spelling Test Used In Pilot Study

The Post Test is an untimed (completion time is generally 15 to 30 minutes) fifty item instrument. It purports to measure the spelling facts and spelling rules learned from the programed booklets. Fifteen of the items test learning of facts, and thirty-five of the items test for the ability to apply learned concepts (spelling rules) to unfamiliar words (words not taught by the programed booklet and words beyond grade level).

Test items answered correctly are totaled for a maximum score of 50. In addition, each item is scored to yield subtest scores for facts (15 points maximum) and concepts (35 points maximum). The items related to concept testing consist of familiar and unfamiliar words.

NAME: _____ CLASS: _____

DATE: _____

_____

_____

TEST ON SPELLING RULES

1. Read the sentence below to yourself. Under the sentence are 3 questions about words in the sentence. Answer these questions.

   Sentence: Bob and Jack are brothers.

   a) Bob, Jack, brothers are words used as names. Another word for names is _____.

   b) Because Bob is the name of one person, we say that Bob is a _____ name.

   c) Because brothers tells about two persons, we say that brothers is a _____ name.

   d) We can therefore say as a rule that any word that names two or more things is a _____ _____.

2. a) Look at this sentence: The boy and girl worked at the desk by the window. Boy, girl, desk, window are _____ names because they tell about _____ person, place, and thing.

3. Look at this sentence and answer the questions below it.

   Sentence: The fifth grade classes shared the music books.

   a) Classes and books are called names or _____.

   b) Classes and books are _____ names.

4. Most names that tell about one person, one place, or one thing can be made to mean more than one by adding _____ to them.

5. What would you add to box, dish, patch, guess to make them mean more than one? Add _____.

6. Something about the words box, dish, patch, guess told you what to add to them to make them mean more than one. Put a circle around the part or parts of each word listed below that told you how to make it mean more than one.

box dish patch guess

7. Make these words mean more than one. Write your answer in the space next to the word.

berry _____ city _____

key _____ bay _____

8. Put a cirlce around the part or parts of each word listed below that told you how to make it mean more than one.

berry baby city bay

9. Make these words mean more than one. Write your answer in the space next to the word.

woman _____ child _____

10. Name the vowels. _____

11. The letters of the alphabet that are not vowels are called the _____.

12. Circle the letters that are not vowels in this word: c a l e n d a r

13. Make these words mean more than one.

cowboy	_____	melody	_____
puppy	_____	pinch	_____
address	_____	fox	_____
medley	_____	osprey	_____
barbiturate	_____	phalanx	_____
allergy	_____	canary	_____
county	_____	baloney	_____
crayfish	_____	metagalaxy	_____
mouse	_____	diorama	_____
body	_____	assembly	_____
policeman	_____	parley	_____
valley	_____	amenity	_____
onyx	_____	ideology	_____
oth	_____	subway	_____

Samples of Pilot Study Programs
Linear Construction Response

WORDS TO BE PRONOUNCED WITH THE CHILDREN: Single; singular; plural; noun; Syllables

o n e	(1) Some words tell about one thing, like: boy; girl; house; dog. When a word means one thing, we say that it is a singular word. A singular word means _ _ _ thing.
s i n g u l a r	(2) When a word talks about one person, one place, or one thing, like: boy, house, book, we say that it is a singular word. A _ _ _ _ _ _ _ _ word tells us about one person, one place, or one thing.
s i n / g u / l a r	(3) A syllable is a part of a word in which we hear or say a vowel sound. The word singular has 3 vowel sounds in it when we say it. Therefore, we say that singular has 3 syllables. Write the 3 syllables in the word singular in the space below. _ _ _ / _ _ / _ _ _
s i n g u l a r	(4) Singular words tell about one person, one place, or one thing. John tells the name of one person. Home tells the name of one place. Book tells the name of one thing. Because they tell the name of one person, place, or thing, these words are _ _ _ _ _ _ _ _ words.

p e r s o n p l a c e, or t h i n g	(5) Look at the underlined words in this sentence: As he sat near the window in school, the boy saw his book lying in the yard. Window is the name of one thing. School is the name of one place. Boy is the name of one person. Book is the name of one thing. Yard is the name of one place. Window, school, boy, book, yard are each used as singular names in the sentence because each one tells about one _ _ _ _ _ _, _ _ _ _ _ _, or _ _ _ _ _ _.

Multiple Choice Response

WORDS TO BE PRONOUNCED WITH THE CHILDREN: Single; singular; plural; noun; syllables

o n e t h i n g	(1) Some words tell about one thing, like: boy; girl; house; dog. When a word means one thing, we say that it is a singular word. A singular word means a. many things b. two things c. one thing d. no thing
s i n g u l a r w o r d	(2) When a word talks about one person, one place, or one thing, like: boy, house, book, we say that it is a singular word. A word that tells us about one person, one place, or one thing is called a a. clear word b. singular word c. spelling word d. new word

s i n/ g u/ l a r	(3) A syllable is a part of a word in which we hear or say a vowel sound. The word singular has 3 vowel sounds in it when we say it. Therefore, we say that singular has 3 syllables. The three syllables in the word singular are: a. sin/gu/lar b. sing/u/lar c. s/ing/ular d. sin/g/ular
s i n g u l a r w o r d s	(4) Singular words tell about one person, one place, or one thing. John tells the name of one person. Home tells the name of one place. Book tells the name of one thing. Because they tell the name of one person, place, or thing, these words are a. new words b. plural words c. spelling words d. singular words
p e r s o n, p l a c e, or t h i n g	(5) Look at the underlined words in this sentence. As he sat near the window in school, the boy saw his book lying in the yard. Window is the name of one thing. School is the name of one place (or one building). Boy is the name of one person. Book is the name of one thing. Yard is the name of one place. Window, school, boy, book, yard are each used as singular names in the sentence because each one tells about a a. window, book, or tree b. name, boy, John c. person, place, or thing d. person, animal, thing

s i n g u l a r w o r d s	(6) Singular comes from the word <u>single</u>. <u>Single</u> means <u>one</u>. Words that have to do with one person, one place, or one thing are a. singular words b. new words c. plural words d. spelling words

<u>Linear - No Response</u>

	(1) Some words tell about <u>one</u> thing, like: <u>boy</u>; <u>girl</u>; <u>house</u>; <u>dog</u>. When a word means <u>one</u> thing, we say that it is a <u>singular</u> word. A singular word means <u>o</u> <u>n</u> <u>e</u> thing.
	(2) When a word talks about one person, one place, or one thing, like: <u>boy</u>, <u>house</u>, <u>book</u>, we say that it is a <u>singular</u> word. A <u>s</u> <u>i</u> <u>n</u> <u>g</u> <u>u</u> <u>l</u> <u>a</u> <u>r</u> word tells us about one person, one place, or one thing.
	(3) A <u>syllable</u> is a part of a word in which we hear or say a vowel sound. The word <u>singular</u> has 3 vowel sounds in it when we say it. Therefore, we say that <u>singular</u> has 3 syllables. Write the 3 syllables in the word <u>singular</u> in the spaces below. s i n/g u/l a r

	(4) Singular words tell about one person, one place, or one thing. John tells the name of one person. Home tells the name of one place. Book tells the name of one thing. Because they tell the name of one person, place, or thing, these words are s i n g u l a r words.
	(5) Look at the underlined words in this sentence. As he sat near the window in school, the boy saw his book lying in the yard. Window is the name of one thing. School is the name of one place. Boy is the name of one person. Book is the name of one thing. Yard is the name of one place. Window, school, boy, book, yard are each used as singular names in the sentence because each one tells about one p e r s o n, p l a c e, or t h i n g.
	(6) Singular comes from the word single. Single means one. S i n g u l a r words are words that have to do with one person, one place, one thing.
	(7) A word that is used to name a person, a place, or a thing is called a noun. A word that is used to name one person, one place, or one thing is called a s i n g u l a r noun.
	(8) A word used as a name in a sentence is called a noun. Noun is another word for n a m e.
	(9) The name of one person in this sentence has a line under it. Bobby threw the ball.

Scrambled Constructed Response

WORDS TO BE PRONOUNCED WITH THE CHILDREN: single; singular; plural; noun; syllables

p l u r a l	(1) When a noun means more than one person, place, or thing, it is a plural noun. Boys, beaches, doors mean more than one person, place, or thing. Boys, beaches, doors are _____ nouns.
s	(2) Compare these words by looking from the singular form to the plural form. Singular: girl, home, book Plural: girls, homes, books To make girl, home, and book plural, we add the letter _ to the singular form.
p l u r a l n o u n	(3) The singular noun plus s makes a p_____ n ___.
s	(4) To make most singular nouns mean more than one, we add the letter s to the singular form. We may say this is another way: to make most singular nouns plural, add an _ to the singular form.
s i n g u l a r n o u n	(5) The boy caught a fish. Boy is a singular noun because it tells about one person. Fish is a s _ _ _ _ _ _ _ n _ _ n because it names one thing.
s i n g u l a r n s	(6) What is the same about these words? Mary, house, cooky, boy They are s_____ n____ or names.

(Scrambled Constructed Response - Cont'd.)

s i n g u l a r	(7) Singular words tell about one person, one place, or one thing. John tells the name of one person. Home tells the name of one place. Book tells the name of one thing. Because they tell the name of one person, place, or thing, these words are _ _ _ _ _ _ _ _ words.
	(8) These singular nouns all become plural by adding s to them. Write the plural of each word next to the word. bead _____ number _____ bean _____ oat _____ boot _____ pilgrim _____ boy _____ play _____ card _____ pound _____ crop _____ question _____ fall _____ root _____ folk _____ rose _____ friend _____ shoe _____ germ _____ ski _____ glove _____ sock _____ grape _____ stamp _____ lesson _____ tool _____ lot _____ toy _____ member _____ twin _____ movie _____ yard _____

Text

1. SINGULAR WORDS

Some words tell about one thing, like: boy, girl, house, dog. When a word tells about one thing, we say that it is a singular word. A singular word means one thing. A singular word can tell about one person: boy; about one place: house; about one thing: book.

A syllable is a part of a word in which we hear or say a vowel sound. The word "singular" has 3 vowel sounds in it when we say it. Therefore, we say that "singular" has 3 syllables. The 3 syllables in the word "singular" are sin - gu - lar.

Singular words tell about one person, one place, or one thing. "John" tells the name of one person. "Home" tells the name of one place. "Book" tells the name of one thing. Because they tell the name of one person, place, or thing, these words are singular words.

Look at the underlined words in this sentence. "As he sat near the window in school, the boy saw his book lying in the yard." Window is the name of one thing. School is the name of one place. Boy is the name of one person. Book is the name of one thing. Yard is the name of one place. Window, school, boy, book, yard are each used as singular names in the sentence because each one tells about one person, place, or thing.

"Singular" comes from the word "single." "Single" means one. Singular words are words that have to do with one person, one place, one thing.

2. SINGULAR NOUNS

A word that is used in a sentence to name a person, place, or a thing is called a noun. A word that is used to name one person, one place, or one thing is called a singular noun. "Noun" is another word for name. In this sentence: "Bobby threw the ball," Bobby is the name of one person. Bobby is a singular noun.

In the sentence: "The boy found the book," boy is the noun that names one person.

In the sentence: "The boy caught a fish," boy is a singular noun because it tells about one person. Fish is also a singular noun because it names one thing.

Look at this sentence. "The school is a big building." School is a singular noun because it names one place. Building is also a singular noun because it names one place or thing.

Read this sentence: "Father cut the grass in the yard." Father, yard, grass are singular nouns because they name one person, one place, and one thing.

Any word that is used to name one person, place, or thing is called a singular noun. Mary, house, cooky, boy each have something the same about them. They are singular nouns or names.

3. PLURAL NOUNS (adding s)

Sometimes we want a noun to name more than one person, place, or thing. When a noun names more than one person, one place, or one thing, we say that it is a plural noun. The word "plural" means more than one. The word "plural" has 2 syllables (parts): plu - ral.

To make most singular nouns mean more than one, we add the letter s to the singular form. We may say this in another way: to make most singular nouns plural, add an s to the singular form.

Compare these words by looking from the singular form to the plural form.

Singular	Plural
girl	girls
home	homes
book	books