


DEPARTMENT OF UPPER ELEMENTARY EDUCATION
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RETENTION IN RELATION TO TWO DIFFERENT TEACHING METHODS IN
FOURTH GRADE SOCIAL STUDIES


by
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CHAPTER I

INTRODUCTION

In the field of social studies in the elementary school quite often the charge is levelled that there is too much repetition of subject matter and a resultant lack of efficient utilization of time. If some teaching method or methods could be found that would promote greater pupil retention for longer periods of time, then there would be less need for repetition and more time for new content to be introduced. It is assumed that the content for retention would not be detailed in nature, but would deal as much as possible with basic understandings and unifying concepts.

Problem

This paper seeks to examine the question--Do students retain more knowledge if : (a) taught through teacher-lecture or (b) taught by committee research? A secondary question might also be asked-- If the amount of ~~learning~~ is approximately the same by each method, is the amount of ~~retention~~ approximately the same?

Hypothesis

The hypothesis is that students ~~learn~~ understandings better if these are gained through committee research and presentation than if they are simply presented to them by the teacher and that these students also ~~retain~~ comparatively more.

Review of the Literature

Much of the literature relating to retention is found in experimental education journals or journals of psychology. Little has been reported about retention in "normal" situations--that is, outside of the laboratory. The first man to study retention seriously was Ebbinghaus in 1885. Using himself as a subject, he found that the rate of memory loss was very high immediately after learning to the level of one correct trial. The curve of forgetting that he established has been accepted for a long time, but is being criticized now because of the methodology used and because of the material used--nonsense syllables.

Since the time of Ebbinghaus, experimenters have come to realize that nonsense syllables do not provide a good basis for the study of retention. Since much that is remembered results from association, the more meaningful the materials, the greater the possibility of retention. Gilliland¹ reports that forgetting is a function of several factors--time, materials, method of learning, motivation and interest, age, overlearning and underlearning, method of measuring recall, retroactive inhibition, and individual differences.

It has been found that differing teaching methods used on the same children produce significant differences in the amount of retention. Ray's study², using "directed discovery" (pupil research)

¹A.R. Gilliland, "The Rate of Forgetting," Journal of Educational Psychology, (Vol. XXXIX, 1948), pp. 19-20.

²Willis E. Ray, "Pupil Discovery vs. Direct Instruction," Journal of Experimental Education, (Vol. XXVIV, No. 3, March 1961), p. 279.

and "direct and detailed instruction" (formal teacher lecture), found that both were equally effective with regard to initial learning, but that six weeks later the "directed discovery" group showed statistically greater retention. He also observed that the greater the involvement of the child in the learning experience, the greater the retardation of forgetting. In another study by Stovall¹ it was reported that lecture plus discussion aided significantly in promoting retention.

A study of retention as a function of IQ was conducted recently by Klausmeier and Check² in which sixty fourth grade children were tested for retention of materials that were scaled to their ability level. It was found that there was no significant difference in retention between the levels of children when the material was scaled in this manner. In this same vein Stroud and Schoer³, in their study of college sophomores, found that learning scores were positively related to retention scores⁴. They say that "by and large, individual differences in learning are reflected in individual differences in retention."⁵

¹Thomas F. Stovall, "Lecture vs. Discussion," Phi Delta Kappan, (Vol. XXXVIV, March 1958), p. 256.

²Herbert J. Klausmeier and John Check, "Retention and Transfer in Children of Low, Average, and High Intelligence," Journal of Educational Research, Vol. LV, No. 7, April 1962) p. 319.

³James B. Stroud and Lowell Schoer, "Individual Differences in Memory," Journal of Educational Psychology, (Vol. L, No. 16, 1959).

⁴Ibid., p. 290.

⁵Ibid., p. 293.

A paper that was of great help to the writer was Ellis Little Beecher's study of retention calculation.¹ In this study the value of the conventional method of computing retention is questioned.² The following questions are posed: (1) Will the pre-test scores remain constant over a period of time? (2) Is learning taking place between the time of course completion and the time of the re-test administration? (3) If the pre-test score does not remain constant and if there is learning taking place later, will these changes significantly affect the calculation of the percentage of retention of meaningful materials?³ Using an experimental method of computing retention Beecher found a lower percentage of retention.

An interesting study that might shed some light on this paper was one done by Ballard in 1913.⁴ The phenomenon that he encountered was what he called reminiscence, or the opposite of forgetting. He found that when he tested groups of children for retention that many of them actually did better some time after learning (with no opportunity for further learning) instead of following the usual forgetting curve.⁵ There are three factors which favor reminiscence: (1) the use of meaningful materials, (2) incomplete learning (occurring when the learning experience has been cut short), and (3) a strong motivation to recall the material.⁶

¹Ellis Beecher Little, "Pre-test and Re-test Scores in Retention Calculation," Journal of Experimental Education, (Vol. XXIV, No.2, Dec. 1960)

²Ibid., p. 162., (dividing the score for material retained of material learned by the score of the material learned in the course--using raw scores).

³Ibid., p. 163.

⁴R. Stagner and T.F. Karowski, Psychology, (N.Y.: McGraw, 1952), p.273.

⁵Ibid.

⁶Ibid.

Definition of Terms

- Retention--defined operationally as either (a) remembering in terms of raw scores received on the tests or (b) remembering in terms of specific questions on the tests.
- Learning--defined operationally as either (a) a gain of correct answers in terms of raw scores or (b) a gain of correct answers in terms of specific questions on the tests.
- Teacher-lecture--the method of teaching by which the teacher presents the desired material in an informal style using pictures, maps, other teaching aids, and class discussion (referred to throughout the paper as method A),
- Committee-research--the method of teaching by which the children gain their own facts and understandings through reading of materials in the classroom and in the library relating to their particular committees (guided by the teacher) and culminating in committee reports given by ~~each committee~~ to the whole class (referred to throughout the paper as method B).
- Pre-test--the test given immediately before the beginning of the unit (Test I).
- Post-test--the test given immediately after the completion of the unit (Test II).
- Re-test--the test given to the children eight and one half weeks after the completion of the unit (Test III),
- Adjusted scores--such that an answer on the post-test was correct only if it was incorrect on the pre-test and correct on the post-test

and that an answer on the re-test was retained only if it was incorrect on the pre-test, correct on the post-test and correct on the re-test.

Reminscence--the opposite of forgetting (does not involve learning).

CHAPTER II

DESIGN AND PROCEDURE

This study was conducted during the internship of the writer (October 22-December 16, 1962) at Caroline Brevard School, Tallahassee, Florida. The class was a fourth grade, consisting of twenty-eight pupils, of whom twenty-three completed the three sets of tests necessary for the study. The average age of the participating students was nine and one half and the average IQ (California Mental Maturity Test) was 108. Natural classroom procedures were followed during the teaching of the unit. That is, when a student or students wished to read about or discuss an area of the unit being taught, even if it was out of its planned place, it was discussed. The writer was both the teacher and the collector of the data.

The subject of "India" was chosen because of the current interest in Indian affairs, the high interest appeal, and the wide selection of materials available. The basic goals of the unit were:

1. To familiarize the child with some of the early history of India.
 - a. To know the civilization of India is one of the oldest on earth.
 - b. To know that there was a developed society in India before the arrival of the Europeans.
 - c. To know that many European nations fought for control over India, especially the Dutch, the Portuguese, and the English
 - d. To know that the English controlled India for over a century and that they left a great impression there.
2. To learn about the India of today--the land, the people, and the culture.
3. To know something about the role and importance of modern India and some of the problems facing her.

The over-all design of this study was to test for differences in retention resulting from differing teaching methods. For this purpose a test was devised which contained two sub-tests: (1) questions based on the "teacher-lecture" approach (A) and (2) questions based on the "committee-research" approach (B). The same test was administered three times: (1) immediately preceding the unit (pre-test), (2) immediately after the completion of the unit (post-test), and (3) eight and one half weeks after the completion of the unit (re-test).

The testing device used to test retention was a multiple choice test designed in advance of teaching the unit.¹ The questions that were used were selected on the basis of relevance to the unit and their applicability to future learnings. The test was necessarily brief because of the reading level of the fourth grade students and their rather limited attention span. The children at no time knew of the special nature of the study or that the questions were sub-grouped.

The unit was formally begun on November 16. The day preceding this the pre-test was administered with the explanation that the teacher needed to know what they already knew about India in order to teach the unit more effectively. The children were quite concerned over whether their marks would "count" on their report card social studies grades. They were assured that they would not, but that each should do his best anyway.

The procedure for administering the test (the same for all administrations) was to pass out the test papers, read the test aloud to the children while they read along silently, and allow

¹See Appendix A.

thirty minutes to complete the test. No explanation was given concerning unfamiliar words or terms. As soon as they completed the test they were to hand them in. The children were advised not to guess unless they were fairly sure of an answer. Tests were not returned.

The teaching of the unit lasted for one month, interrupted by Thanksgiving and several other holidays and cut short by Christmas. Teaching time allotted was approximately forty minutes each afternoon. Each day the "teacher-lecture" and "committee-research" approaches were used.

The "teacher-lectures" were conducted with the researcher "telling" the children material that they either would not be able to locate in the available books or that was too difficult for them to understand, or that would be better illustrated orally. Frequent use was made of pictures, maps, records, and Indian foods and handicrafts. Two guests came and spoke to the children also. Approximately one-third of the class time was spent in listening to teacher lectures.

The second phase of the teaching, conducted concurrently, was "committee-research". The day after the unit was introduced a class discussion was held and it was decided which areas should be delved into. The committees were designated as "history and government", "religion," "agriculture," "people," and "occupations." Approximately five children served on each committee. The children had free access to the materials in the room and were also allowed to go to the library during the social studies period and free time.

Approximately two-thirds of the class time was devoted to committee research. The reason for the longer amount of time for this method was that it was felt that it involved the time spent in locating materials before beginning study and that a longer period was therefore warranted.

At the end of the unit the post-test was administered after the children gave their committee reports and a program was put on for the other fourth grades. Immediately following this test a random selection of two groups of seven to eight children were taken to a library conference room for a tape recording of a discussion centered around basis understandings (for example; What is history? Why do people live near water? Why do they wear what they do?). Both groups discussed approximately the same things.

The next day the post-test papers were returned and discussed briefly. The papers were all collected and then analyzed. An index of discrimination was applied to the questions and it was found that several questions should be dropped from the study because of zero or negative percentages of discrimination.

Eight and one-half weeks later (February 6) the test was readministered without warning (much to the surprise of the children). The three sets of tests were then assembled for each child. It was found that twenty-three of the children had completed the three sets necessary. The other tests were discarded and not used in this study.

CHAPTER III

RESULTS OF THE STUDY

Presentation of the Data

An index of discrimination, as previously mentioned, was applied to test II (post-test) so that some idea of the discriminatory power of the test questions might be found. It was concluded that questions five, eighteen, and twenty-one should be dropped. This left questions one, two, three, four, ten, twelve, thirteen, fourteen, and twenty in sub-group A (teacher-lecture questions) and questions six, seven, eight, nine, eleven, fifteen, sixteen, seventeen, and nineteen in sub-group B (committee-research questions). There were then nine questions in each sub-group.

The mean, the median, the standard deviation, and standard error were computed (using small sample statistics) for each of the two sub-tests for each of the three administrations of the test. These results are shown in Table I. The frequency distributions of each test and sub-

TABLE I

	Mean	Median	SD	SE	Number of Correct Answers for Class
I (Pre-test)	A 3.26	3	1.65	.33	75
	B 3.93	4	2.01	.41	90
II (Post-test)	A 6.61	7	2.01	.41	152
	B 5.65	5	2.10	.43	120
III (Re-test)	A 6.83	7	1.95	.39	157
	B 5.87	6	1.96	.39	135

test demonstrate visually the the distribution of raw scores (used in all the computations unless designated otherwise). Figure I shows this distribution.

At this stage it was felt necessary to derive a number of correlations in order to see more clearly the relationships between the various tests and sub-tests and to see if the same children who did well on one section did well on the other section also. The Pearson product-moment correlation was used for this. See Table II.

TABLE II
Pearson Product-Moment Correlation Coefficients

$r_{I_A I_B}$	$r_{II_A II_B}$	$r_{III_A III_B}$	$r_{I_A II_A}$	$r_{I_A III_A}$	$r_{II_A III_A}$	$r_{I_B II_B}$	$r_{I_B III_B}$	$r_{II_B III_B}$
.05	.56	.66	.22	.10	.80	.01	-.03	.65

Scattergrams plotting the raw scores of the test II_A scores against test III_A scores and test II_B scores against test III_B scores show two of the correlations visually. See Figure II.

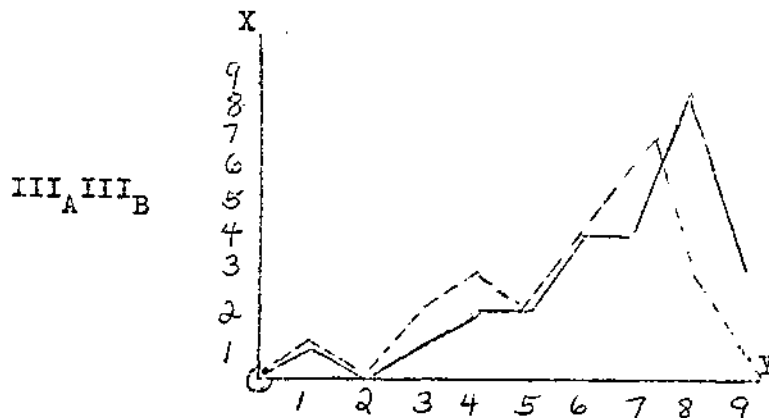
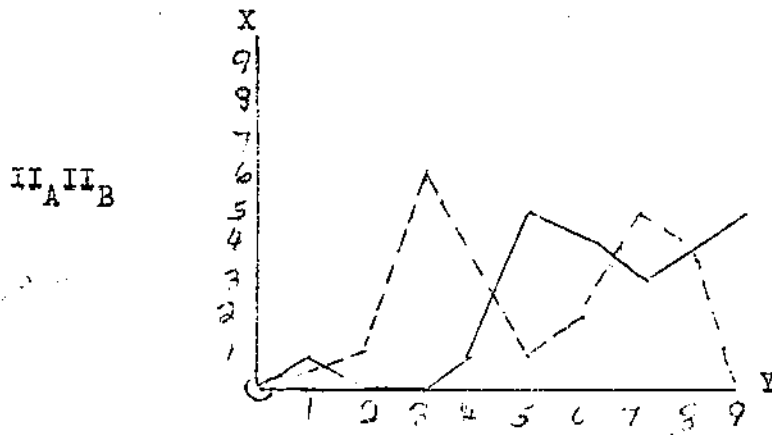
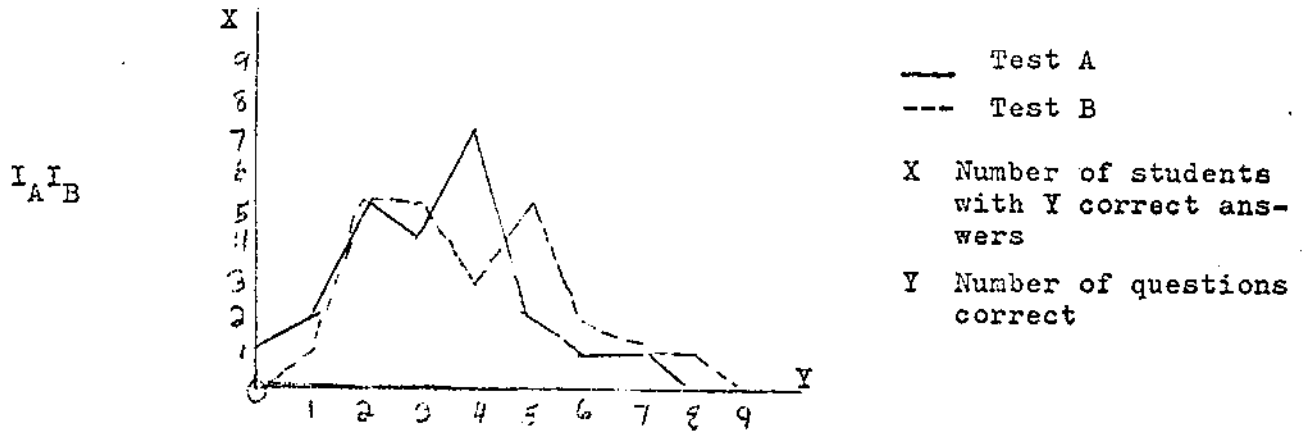
The next step in relating test scores was to apply a t test to find the significance between the differences of the means of successive administrations of the tests and thus to clarify whether the changes in test scores on the two sub-tests were due to an actual increase in learning. See Table III.

TABLE III

$I_{A II_A}$	$II_{A III_A}$	$I_{B II_B}$	$II_{B III_B}$
7.3	.88	5.1	.65

For twenty-two degrees of freedom a t of 1.72 is necessary at the .05 level of significance.

FIGURE I
Frequency Polygons



After having seen the tests as a whole and how they related to each other, it was necessary to compute the percentages of retention for each child. The writer encountered some difficulty in this because of the character of a number of the children's test scores-- these children had shown a sometimes considerable raw score improvement between test II and test III. Thus, when the percentages of retention were calculated, their scores showed over 100 per cent retention.¹ Since it did not seem probable that the children retained more than they learned during the unit, it was decided to use a correction formula for guessing to see if this made the scores any more reasonable. Applying this correction formula became extremely complicated because of the test construction since some of the questions had two choices, some had three choices and others had four choices. However, it was found at the end of this calculation that the scores still did not seem to represent what was being looked for--that is: Did the children retain what they learned during the unit time?

Therefore one more method of calculation was tried. An item count was used for each section of each test for each child. Using Little's² article as a basis an item was counted as having been learned during the unit if it was wrong on test I and right on test II. In order to have retained an item learned during the unit, the pupil must have gotten it wrong on test I, right on test II, and right again on test III. It is true that the child might have gotten a question right by accident on test I and therefore not have re-

¹Using the formula post-test-pre-test (amount learned) divided into re-test-pre-test (amount retained) percentage of retention.

²Little, op. cit.

ceived credit for his correct answer on test II. However, since the children were warned not to guess, and it was not possible to tell whether they had gotten a question right by guessing, such a possibility was left out of consideration. The different results obtained by the three different methods of analysis are shown in Table IV.¹ The last method tried is considered the most reliable by the writer. It must be noted, however, that this method does not allow for gain made between test II and test III.

In order to gain some idea of whether those who retained the most learned the most by each method, the students were ranked by their adjusted scores on the post-test and re-test and a Spearman rho was computed for the class. For sub-test A a correlation of .14 was found--for sub-test B, a correlation of .09--little or no correlation for either test. Therefore, using this means of defining "learned" and "retained" (adjusted scores) there was no relation between the amount learned and that retained.

However, scattergram plotting of the raw scores of the amount learned against the amount retained do show that, using raw scores, for sub-test A especially, there was some correlation.

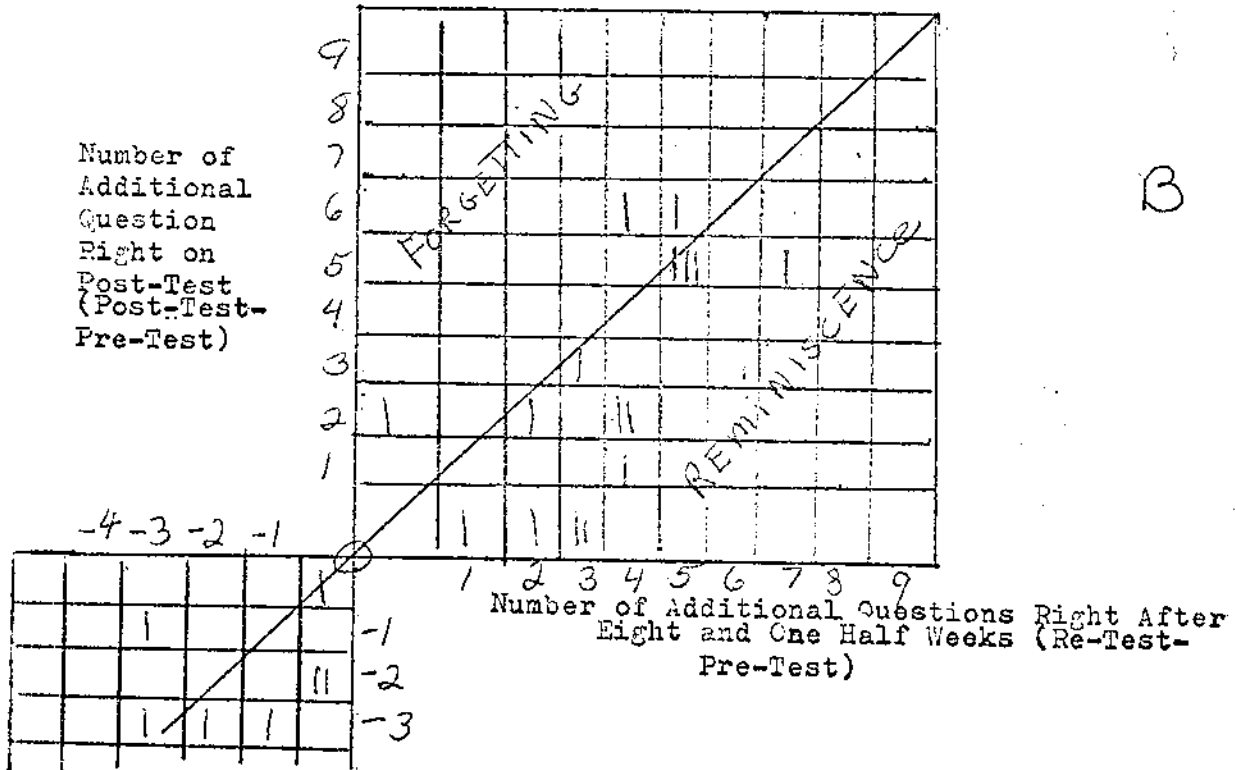
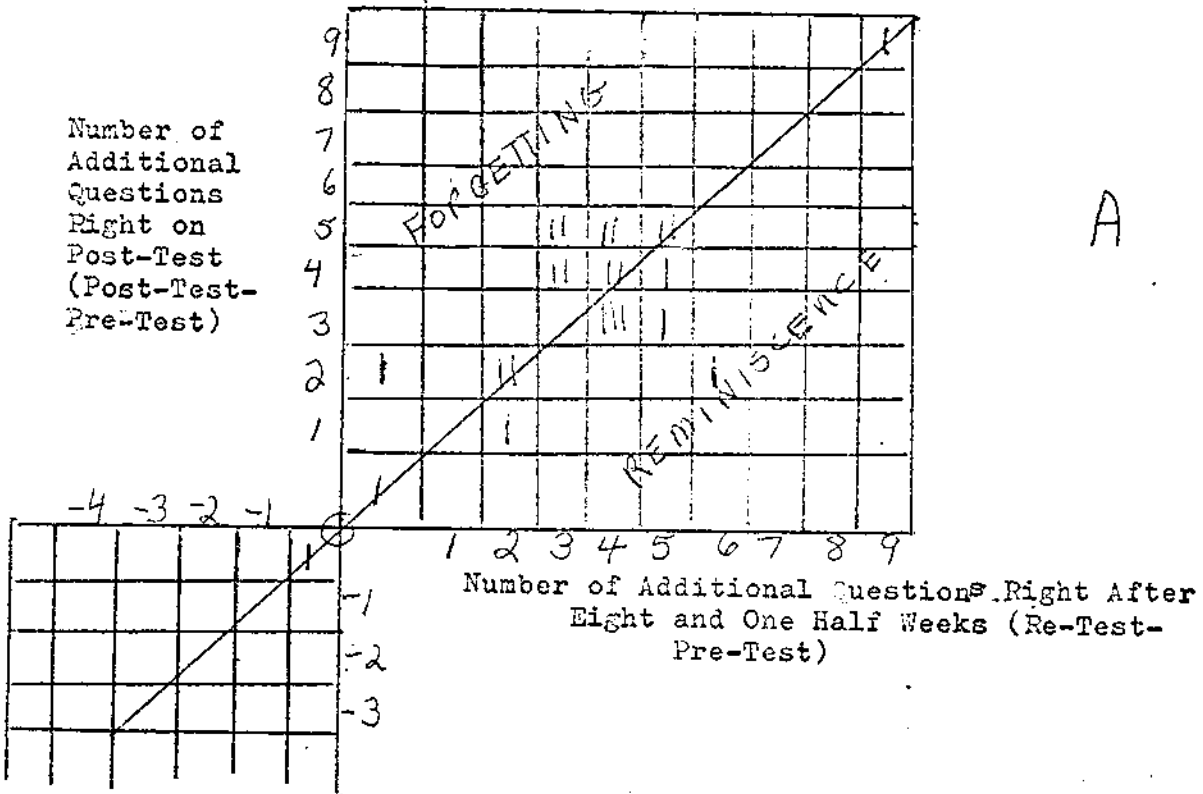
¹The children selected for this table were selected on the basis of their raw score rank on each test and sub-test. The top two, the middle two, and the lowest two scores were used. Because of duplication of position only twelve names appear.

TABLE IV

Comparison of Different Percentages of Retention
Computed Three Different Ways

	Method 1 Raw Scores		Method 2 Correction for Guessing		Method 3 Item Count	
	A	B	A	B	A	B
J.B.	50%	0%	0%	0%	100%	0%
L.C.	0%	0%	0%	0%	0%	0%
M.E.	100%	0%	100%	0%	100%	0%
D.F.	100%	100%	100%	77%	100%	80%
R.H.	80%	0%	66%	0%	50%	50%
B.L.	66%	0%	46%	0%	80%	100%
B.A.L	80%	140%	76%	140%	80%	100%
J.P.	150%	200%	190%	300%	100%	0%
J.R.	80%	200%	78%	220%	100%	100%
A.S.	80%	100%	86%	100%	88%	83%
P.S.	0%	0%	0%	0%	100%	0%
B.W.	83%	100%	74%	100%	83%	33%

FIGURE III
Scattergrams of Retention
Scores*



Interpretation of the Data

The Pearson r correlations brought out some rather interesting aspects of the test. Between test I_A and test I_B there is almost no correlation (.05) between the way the children answered on one section or the other. Since this was the first test and there may have been considerable guessing, a high correlation might not be expected. Also the brighter students might not necessarily do better than the slower ones at this stage. However, on test II_A and II_B the correlation has become quite marked (.56) and in tests III_A and III_B the correlation has increased even more (.66). It would seem that those who did well on sub-test A also did well on sub-test B.

Study of the correlations between the A sub-test of I, II, and III also repeat this trend. There is little or no correlation between I_A and II_A (.22) and little or no correlation between I_A and III_A (.10), but a very high relationship between II_A and III_A (.80). The children who did well on test II_A also seem to have done well on III_A .

Repeating this again are the correlations between I_B and II_B (.01) and II_B and III_B (.65). They seem to show that the children who did well on test II_B also did well on test III_B .

The t test helps to clear up an important question concerning the amount of retention for each method. Referring to the total number of answers correct for each sub-test (see Table I) we see that the raw test scores on I_A - II_A - III_A run 75-152-157 and the raw

test scores on I_B-II_B-III_B run 90-120-135. Observing these scores we see that there appears to have been no forgetting for the class as a whole. In fact, there appears to have been a slight gain on the last test where one would ordinarily expect a loss. It is necessary to examine the scores and ask if the differences between the means of I_A and II_A and I_B and II_B are significant, and if the differences between the means of II_A and III_A and II_B and III_B are also significant. The results of the t tests show that the differences between I_A and II_A and I_B and II_B were significant to the .05 level (actually beyond the .001 level), but that the differences between II_A and III_A and II_B and III_B were not significant at this level. In other words, the gain show between the post-test and re-test was very possibly due to chance. However it should be noted that a number of children could have made individual gains that were due to learning and not chance--especially by method B since the reading materials were still in the library for them to read if they wished.

Another factor that could have affected this increase between the post-test and the re-test is reminiscence--the opposite of forgetting as defined by Ballard.¹ He found that this phenomenon only occurred in children of approximately the same age as this group being studied. However, since his study was carried out over a period of several days and the present study was stretched out over several months, it is not possible to conclude, without further study, that this was the same phenomenon. A factor that might have helped in reminiscence in the present study was that the children were told

¹Klausmeier and Check. op. cit.

just before the administration of the re-test the nature of the study they were participating in. This may have caused them to exert more effort.

In trying to determine which of the three different sets of adjusted scores to use in computing the percentage of retention it was finally concluded that the third method (based on Beecher's item count) was the most valid. This method took into consideration only those questions which were learned within the framework of the unit--for those questions would be the only ones whose answers would be affected by the method of teaching use. According to this, then, it was found that twelve of the twenty-three children had a better percentage of retention by method A (the other methods of calculation also showed this trend), that four children had a better percentage of retention on their method B scores, and that seven children did equally as well on both sections. The raw score scattergrams of retention show approximately equal numbers gaining on each method, but also show wide differences between A and B on amounts of forgetting.

Since group A showed the largest gain in correct answers (fifty five questions between I_A and II_A) and group B gained only thirty questions between I and II, it was wondered if the children that learned the most gained the most. The Spearman rho test, using adjusted scores, showed little or no correlation between those who did well on the post-test and re-test of each sub-test. It might have been expected that the students would maintain their rank, but they did not. This implies that those who learn the most do not necessarily retain the most.

CHAPTER IV

Summary and Conclusions

A group of twenty-three fourth grade children studying a social studies unit on India were taught, with emphasis on basic concepts and understandings, by two methods--method A, teacher-lecture, and method B, committee research. The main purpose of the study was to find out if there was any significant difference in the amount of retention between the two methods. A secondary purpose was to discover that if better retention was shown by one group, was there also more learning for that group? Both methods were used on all of the children in the study. The testing device was a multiple choice test devised by the writer. The data thus obtained were studied through various statistical methods. On the whole there seems to have been little or no forgetting for either group.

The findings of this paper can be stated as follows:

1. The hypothesis has not been proved, for method A, "teacher-lecture" seems to have promoted better retention, rather than method B, "committee-research."
2. There seems to be an ambiguity over whether those who retained the most learned the most. In terms of raw scores it does seem that there is such a relationship, but in terms of adjusted scores there seems to be no such relationship.

Suggestions for Further Research

A study that would be most interesting would be to correlate reading levels with the ability to learn and remember either by

reading or by listening to lecture. Another aspect of retention would be to correlate IQ with how well the pupils learn and remember by different methods of teaching. It would also be interesting to note the effect of reinforcement, by means of discussions of basic understandings, on retention.

Other interesting unanswered question raised by the study are: Why did the subjects apparently learn more and retain more by the teacher-lecture method than by the committee research method? Was this because of the relative superiority of one method over another or because of the superiority in handling one method over the other method by this teacher? Did the superior retention percentages for Method A over Method B by the item count method result from individual or committee research which may have been inspired by the teacher-lecture and accomplished between the post-test and the re-test? (Research could have taken place between the post-test and the re-test, but teacher-lecture could not have taken place.)

Although the t test failed to show that the gains between II_A and III_A or II_B and III_B were significant, what interpretation can be placed upon the fact that they are gains--not losses--when forgetting rather than retention might have been expected?

APPENDIX

INDIA

Directions Circle the one answer you think is right. Do not guess wildly.

1. The country of India is located on the continent of _____. a) North America b) Australia c) Asia d) South America
2. The weather in India is _____. a) the same all over the country b) very different all over the country c) like north Florida
3. Most of the people of India live near the _____. a) large rivers b) high mountains c) desert d) seacoast
4. The history of India is _____. a) not very old b) very new c) one of the oldest in the world
5. When the Aryan people entered India in 1500 B.C., they found _____. a) no one there b) a highly developed way of life c) a poorly developed way of life
6. The south of India grew _____. a) differently from the rest of India b) the same as the rest of India
7. During the sixth century B.C. there were _____. a) great wars b) many floods c) religious changes
8. During the fifteenth, sixteenth, and seventeenth centuries many countries fought over India. The main ones were the Portuguese, the Dutch, and _____. a) the Spanish b) the French c) the English d) the Chinese
9. The Moslems came to India _____. a) before the Europeans b) at the same time as the Europeans c) after the Europeans
10. India was freed in _____. a) 1898 b) 1947 c) 1956 d) 1750
11. India is a _____. a) communist country b) dictatorship c) democratic country
12. India states are set up according to _____. a) rivers b) language differences c) farming differences
13. One out of every _____ people lives in India. a) 10 b) 3 c) 7 d) 15
14. The clothing of the Indians is _____. a) suited to the weather b) heavy and dark c) uncomfortable and hot

- " 15. Religion in India has _____. a) never been important
b) had some importance c) been the center of life
- " 16. The most important religions in India are Buddhism, Mohammedanism,
and _____. a) Christianity b) Hinduism c) Jain
- " 17. The culture of India is _____. a) not very important
b) different in different parts of the country c) the same all over
the country
18. The music of India sounds _____. a) just like our music
- b) just like South American music c) very strange to us
- " 19. India is still a country of _____. a) engineers b) sailors
c) farmers
- * 20. One of the important problems facing India is _____. a) too
much food b) poor land distribution, c) not enough people
21. It is harder to advance to a better job in India than it is in
- the United States. a) true b) false

KEY

* Sub-test A

" Sub-test B

_ Questions not used because of low discrimination

ANSWERS

- | | |
|-------|-------|
| 1. c | 11. c |
| 2. b | 12. b |
| 3. a | 13. c |
| 4. c | 14. a |
| 5. b | 15. c |
| 6. a | 16. b |
| 7. c | 17. b |
| 8. c | 18. c |
| 9. a | 19. c |
| 10. b | 20. b |
| | 21. a |

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