

EFFECTS OF TEST CORRECTION
METHOD UPON RETEST PERFORMANCE

by

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Chapter 1

INTRODUCTION

Context of the Problem

Teachers long have returned corrected examinations to their students in hopes of enabling students to profit from the feedback. Spitzer (1939) supported this practice, assuming that retention would be increased if students were allowed to look at their corrected tests. Research verifying the procedure was initially provided by Plowman and Stroud (1942) who confirmed the assumption that knowledge of results did increase learning. Further research concentrated upon replication, refinement, and elaboration of this early knowledge of results research (Sassenrath and Garverick, 1965; Berglund, 1969; Sassenrath and Yonge, 1968; Sturges, 1969, 1972).

However, the method by which students obtain this knowledge of results has been studied to a lesser extent. Most studies imitate the practice of teachers, simply providing the corrective feedback to the student. While effective in increasing subsequent performance, this may not be the ideal method. There is evidence that methods of providing feedback which release greater information to the student may be more effective in increasing retest performance (Sassenrath and Garverick, 1965), and the same effect has been shown for

methods which involve greater student participation and effort (Buenz and Merrill, 1967). Thus, methods by which a student actively provides his own feedback, to date only tangentially studied, may be of major consequence in increasing retest performance.

Significance of the Study

It was hoped that this study would clarify the relationship between the method of examination correction and retest performance. From an applied viewpoint, the study has implications for more effective educational practices. Educators need research upon which to base their classroom methods. Conditions under which maximal performance occurs need to be delineated since that is a major goal of education.

This study also has implications from a theoretical viewpoint. The condition of student provided feedback necessarily involves greater effort on the part of the learner. In traditional learning theory, though, effort has been treated negatively. It has been related to response inhibition and is often considered a detriment to learning (Hull, 1943). This study, however, attempted to relate additional learner effort to increased learning. This positive emphasis upon effort may be considered as giving support to cognitive dissonance theory, which contends that the greater the effort expended, the greater is the resistance to extinction (Festinger, 1961). This study may be significant in the broadest sense in questioning the current trend toward effortless

learning and supporting the belief that students should discover answers for themselves.

Statement of the Problem

The purpose of this study was to determine whether student provided corrective feedback was more effective in increasing retest performance than was teacher provided feedback. In effect, upon retesting, do students demonstrate a greater knowledge of examination material after they seek out correct answers for themselves?

Statement of Hypotheses

The following hypotheses were formulated.

1. Performance on retest examinations will be better under the condition of student provided feedback than under teacher provided feedback.

2. Retention of initially learned material will be greater under the condition of student provided feedback than under teacher provided feedback.

3. Forgetting of initially learned material will be less under the condition of student provided feedback than under teacher provided feedback.

4. Learning of previously unlearned material will be greater under the condition of student provided feedback than under teacher provided feedback.

These hypotheses are not independent of each other; however, they were formulated as separate hypotheses because each represents a specific dimension of retest performance.

An additional hypothesis was that no school differences were expected in the variables being measured.

Rationale

These hypotheses were justified on both logical and empirical grounds. The method of feedback which has subjects look up correct answers requires more learner effort and activity. It seemed reasonable that those subjects would experience a greater involvement, both physically and intellectually, with their task. Active participation in the learning process has been shown to increase learning (McConnell, 1934; Swenson, et al., 1954; Thiele, 1938). The greater effort required by the student provided feedback method also gives reason to hypothesize that retest performance will be higher for that group. Dissonance theory predicts that greater attractiveness will be placed on activity that requires more effort. This greater attractiveness may make the activity more important to the learner. Buenz and Merrill (1967) presented evidence to support this hypothesis; they found that subjects exerting more effort in a task will demonstrate greater retention than low effort subjects.

The student provided feedback method was hypothesized to be superior in increasing retest performance, including retention and new learning, and reducing forgetting because it provides more information to the subjects than does the teacher provided feedback method. When searching for correct answers, subjects in the student provided feedback group could possibly

pick up additional cues to the answer by reviewing the material in context. This in effect would provide subjects with supplemental information, which has been shown to be more effective than the answer alone (Bryan and Rigney, 1956). Stone (1955) also proposed that the value of feedback increases as the amount of information it contains increases. During the answer search, subjects could also undergo incidental review of initially learned material, thus reducing forgetting and aiding retention.

Definition of Terms

The following variables in the study were operationally defined.

Two basic conditions of receiving corrective feedback were distinguished. The condition of teacher provided corrective feedback was operationally defined as the state produced when subjects were provided with feedback by the grader of the examination. In this feedback method, frequently practiced by teachers, wrong examination questions are marked incorrect and the correct answer indicated.

The condition of student provided feedback was defined as the state produced when subjects had to search out their own feedback in the original study material. Under this condition wrong examination questions were marked incorrect but no correct answers were indicated.

Initial test performance was defined as the score obtained on the first administration of the multiple choice examination.

Retest performance was operationally defined as the score obtained by subjects on the second administration of the multiple choice examination.

Retention was operationally defined as the number of items correct on the retest which were also correct on the initial test.

Forgetting was operationally defined as the number of items incorrect on the retest which were correct on the initial test.

Learning of previously unlearned material was operationally defined as the number of items correct on the retest which were incorrect on the initial test.

Chapter 2

REVIEW OF THE LITERATURE

There is an abundance of research substantiating the hypothesis that knowledge of results increases retest performance. A small number of these studies has been selected and discussed below to illustrate this principle, especially as applicable to the present study. It is interesting to note that in these studies the word retention is used to refer to two states. First, it is used to denote remembering initially learned material, illustrated by little or no retest score decrease. It also refers to new learning, which is illustrated by retest score increase. This study treats these conditions separately, since it is impossible to retain something which was not known initially. In the discussion below, however, the word retention is used as those authors discussed used it.

Plowman and Stroud (1942) tested the assumption that knowledge of results increases retention. In that study, using a counterbalanced design, four groups of students were tested under two conditions. In condition 1, the students' results on an objective test were revealed to them; in condition 2, the students received no such information. All subjects were retested, and the knowledge of results group showed superior retention. Berglund (1969) duplicated this study with 195 Swedish children in the fifth grade, and again found

that knowledge of results produced superior retention. In both these studies, knowledge of results was defined as having the subjects go over the fully corrected examinations with the teacher.

Sturges (1972) also investigated knowledge of results, but with regard to the amount of information presented in the feedback. The study related amount of information presented to amount of retention and found that cues present in the feedback beyond a simple "right" or "wrong" increased the subjects' retention. The subjects, 468 undergraduates, received four different types of feedback. These types presented information ranging from only the right answer indicated to the whole problem presented again with the right answer indicated. Informational cues apparently were utilized by the subjects to help increase their learning. Sturges concluded "retention is facilitated when learning conditions are such that some exploration of the material occurs."

Stone (1955) investigated supplying students with information as to why incorrect answers were wrong and correct ones right. He, too, found that this additional information beyond simple knowledge of results increased retention.

Gilman (1969) designed a knowledge of results study to test the possibility that such knowledge increases retention due to its informational value, rather than to other factors, such as reinforcement value. His study provided 75 college students with a combination of feedback modes. He hypothesized that informative feedback would be the key to retention.

Utilizing computer assisted instruction, Gilman illustrated that as informational value of the feedback increased from (a) no feedback to (b) feedback consisting of right or wrong to (c) correct answer supplied to (d) response contingent feedback to (e) a combination of b, c, and d, retention also increased. Thus, the reinforcement value of the feedback was not the key factor in increasing retention. Instead, it was the informational value of the feedback. Bryan and Rigney (1956) also found that more detailed feedback was useful in increasing retention in a training situation.

Learner involvement in the feedback situation is also important for retention, and there have been numerous studies to show that active participation in the learning situation increases retention. Ray (1961) studied active, or student oriented, learning as compared to passive, or teacher oriented, learning with ninth grade students as subjects. He found no initial differences in learning with the two approaches but did find superior retention for the active learning group when all subjects were retested six weeks later. This study confirmed results offered by McConnell (1934) who found that active involvement of the learner reduced forgetting.

The effects of effort within the learning situation has also been related to retention (Buenz and Merrill, 1967). Using 66 nursing students as subjects, they hypothesized that the subjects expending greater effort during the learning process would retain more material. Two groups of subjects were used. One group had to write paragraph justifications of factual answers,

while the other group wrote only the factual answers. The paragraph group did judge the experiment to be significantly more effortful than did the other group. When retests were given 40 to 59 days later, the high effort group showed greater retention of initially learned material. An affective by-product of the effort required was that the high effort subjects reported greater enjoyment of the experiment, which again supports the dissonance theory.

Various examination correction methods have also been investigated. A study by Curtis and Woods (1929) compared common correction procedures with 286 subjects. Four methods were outlined. In method 1, the students corrected their own papers in addition to an item by item class discussion. In method 2, the teacher checked the answers but did not correct them; there was also an item by item class discussion. In method 3, the teacher checked the papers and wrote in all corrections and had an item by item class discussion. Method 4 followed the same procedure as method 3 but was followed by very limited class discussion of only certain items. When the subjects were retested 24 hours later for immediate recall, method 1 was the superior method with 2 and 3 only slightly less effective. When tested for delayed recall, again methods 1, 2, and 3 were superior in increasing retention. Apparently, the common practice of having the teacher write in corrections is an unnecessary waste of the teacher's time and does not increase retention. This study seems to illustrate that the information during class discussion influenced retention, and

the lack of isolation of the other correcting methods makes it difficult to draw any firm conclusions about their merits.

The study most relevant to the present one was conducted by Sassenrath and Garverick (1965). It was designed to test the hypothesis that greater amounts of information in feedback would produce greater retention. Over 400 college students served as subjects and were divided into four experimental groups. Each group received an increasing amount of information from (a) no feedback to (b) the subjects checking their own papers from correct answers on the blackboard to (c) class discussion of all answers to (d) subjects rereading textbook material after receiving corrected examinations. The researchers hypothesized that retention of the examination material would be increasingly greater for each group. Subjects were given multiple choice midsemester examinations and were retested on a sample of those questions at the end of the semester.

The results did confirm the hypothesis that any type of feedback is superior to no feedback at all, but the groups' magnitude of retention did not follow the order predicted by the researchers. The discussion method proved to be the most effective. Of the two other feedback methods, neither was significantly more effective than the other, although the group that checked their papers from the board received a higher retention score. The total scores for all three feedback groups were not widely disparate.

The authors presented several seemingly plausible explanations for the failure of the textbook rereading group

to retain more material, such as the fact that several of the students forgot their textbooks and had to share with other students. The most reasonable explanation seems to lie in the amount of the test reviewed by the other two feedback groups. The group that checked their own papers from answers on the blackboard reviewed every question on the test, those that they had gotten correct as well as those that were incorrect. The class discussion group also reviewed every question as the teacher talked briefly about each question. The textbook rereading group, though, received their papers back already marked as to the correctness of each answer. It is likely that those subjects focused their attention on the incorrect answers to the exclusion of the others, rereading only those sections of the textbook. The correct answers may not have been reviewed at all. Therefore, the differences in retention could have been due to the total review of the test by the self-correcting and class discussion groups and the partial review of the test by the textbook group. Hopefully, the current study eliminated this problem by isolating the variables more fully and focusing attention in both groups upon approximately the same amount of the examination; namely, the incorrect responses.

Chapter 3

METHOD

Subjects

Subjects were 95 students in two midwestern public elementary schools; at the time of the study, all were enrolled in one of four sixth grade classes. During the course of the study, 12 subjects were lost due to absenteeism for one or more phases of the study, reducing the final number to 83.

The Task

All subjects participated in the same task; they read and studied a prepared set of stimulus materials for 30 minutes. The materials consisted of 11 pages of narrative on the people and animals of Australia and New Zealand.¹ A 25 question multiple choice test was also administered to all subjects. It consisted of factual questions, the answers to which could be found directly in the stimulus material. Both the stimulus material and the examination were pretested on a small sample of 16 sixth graders at another elementary school to insure adequate time limits and difficulty level.

Independent Variables

1. Student provided feedback. The treatment variable

¹From Man and His Changing Culture by Kenneth D. Wann, Henry J. Warman, and James K. Canfield. Copyright 1967 by Allyn and Bacon, Inc. Used by permission of Allyn and Bacon, Inc.

was the examination correction method which forced subjects to look up the correct answers. The stimulus material and examinations were returned to students, with the incorrect answers marked and instructions issued to look up the correct answer in the stimulus material.

2. Teacher provided feedback. This variable was the examination correction method which provided subjects with the correct answer. Examinations were corrected with the wrong answers crossed out and the correct answer written in.

Dependent Variables

1. Initial learning. This was the score obtained on the first administration of the multiple choice test; the score was the number right out of 25.

2. Retest performance. This was the score obtained on the second administration of the test; the score was the number right out of 25.

3. Retention. This was the number of items correct on the retest which were also correct on the initial test.

4. Forgetting. This was the number of items incorrect on the retest which were correct on the initial test.

5. New learning. This was the number of items correct on the retest which were incorrect on the initial test.

Procedures

The study was conducted in the subjects' classrooms. All subjects were briefed that they were participating in an experiment to find out more about how people learn. One class

from each of the two schools was randomly assigned to the student provided feedback (treatment) group and the remaining two classes were assigned to the teacher provided feedback (comparison) group. All subjects read the stimulus material for 30 minutes, and then completed the multiple choice examination. Instructions were given to answer every question. There was no time limit on the examination but all students finished within 20 minutes.

Twenty-four hours after the initial testing the subjects received their examinations with their score indicated. Those in the treatment group were given the stimulus material and their examinations with the wrong answers indicated. They were given as much time as necessary to make the corrections. The investigator offered assistance in the form of pointing out the passage containing the answer when the subject was unable to find it. When all subjects had corrected their papers, the investigator read off the correct answers to insure that all students had the correct answers. Again, no time limit was set on the corrections but all subjects finished within 20 minutes. The subjects in the comparison group received their examinations back with the correct answers provided. They were instructed to look over their examinations carefully and to make sure they now knew the correct answer. No time limit was set but all subjects returned their examinations within 10 minutes.

No warning was given that subjects would have to take a retest. Six days after the initial testing all subjects took

the examination again without any review of the stimulus material. In all phases of the study the subjects were assured their examinations and results would be kept confidential and would in no way influence their classroom grades. After the final session all subjects were told about the feedback comparison purpose of the experiment.

Data Analysis

The retest performance data were analyzed by a two dimensional analysis of variance upon the difference scores. These scores were retest score minus initial score.

The retention, forgetting, and new learning data were analyzed by a two dimensional analysis of variance.

Chapter 4

RESULTS AND DISCUSSION

Reliability

The reliability of the multiple choice test was computed for initial testing and retesting. For the initial test, coefficient alpha was 0.75, and for the retest, 0.76.

Hypothesis 1

Cell means and standard deviations for initial test scores are reported in Table 1. Both treatment classes were initially lower due to the use of intact classrooms, and thus nonrandom assignment of subjects. However, mean scores were in the middle range (10.90 to 14.73 out of 25).

Cell means and standard deviations for retest scores are reported in Table 2. The differences between the two groups decreased, although a slight difference still existed. Again, the mean scores were in the middle range (14.27 to 15.82 out of 25).

Hypothesis 1 stated that student provided feedback would produce greater retest performance than teacher provided feedback. The differences between the methods in score increase are shown in Table 3. The analysis of variance data are presented in Table 4, and the differences were significant ($F = 6.53$; p less than .05).

Hypothesis 2

Cell means and standard deviations for retention scores are reported in Table 5. The initial differences of scores between groups make comparison difficult, as the treatment group had fewer answers to retain. Analysis of variance data, reported in Table 6, showed the differences between the groups to be significant ($F = 8.36$; p less than .01) with the comparison group being the superior group. However, this difference can be attributed to initial differences.

Hypothesis 3

Cell means and standard deviations for forgetting scores are reported in Table 7. The student provided feedback group forgot slightly fewer answers, but analysis of variance data, reported in Table 8, showed the differences were not significant ($F = 0.02$; $p = 0.88$).

Hypothesis 4

Cell means and standard deviations are reported for new learning scores in Table 9. The student provided feedback group had higher learning scores (6.71 as compared to 4.58). Analysis of variance data are reported in Table 10, and the differences were significant ($F = 11.52$; p less than .01).

School Differences

School differences were significant only for the forgetting scores ($F = 3.91$; p less than .05). This difference can probably be attributed to chance factors.

Discussion

To summarize, both methods of feedback increased retest performance. The superiority of the student provided feedback method in increasing retest scores is significant, and is due to its effect upon new learning. The knowledge of results offered by both methods produced approximately the same amount of retention and forgetting, but the method requiring subjects to search out the answers enabled the subjects to learn greater amounts of new material.

The study had one major limitation. Because this study was an applied study and sought to utilize actual school conditions, intact classrooms were used. Although classes were randomly assigned to treatment groups, nonrandom assignment of students to classes unfortunately resulted in the treatment and comparison groups being different at the time of initial testing. The groups did not exhibit this difference at the time of the retest. It was hypothesized that this change was due to the greater effectiveness of the student provided feedback method. The initial differences of the groups, however, weaken the strength of the statistical statement the researcher is able to make.

The analysis of variance of the difference scores seems justified in this case. Since the mean scores for all cells were in the middle range, the danger of differences being influenced by ceiling effect or regression was negligible. Using that procedure, the hypothesized feedback method was significantly better in increasing retest performance.

The effectiveness of these two methods is not clearly evident with regard to retention and forgetting. It may be possible that the incidental review of previously learned material is negligible with both methods. As mentioned in the introduction, the attention of both groups was focused on the incorrect items, and it is likely that neither group reviewed correct material.

The superiority of the student provided feedback method is most evident in increasing new learning. If the purpose of the testing process is to teach as well as to serve as an evaluation instrument, then a feedback method such as the one in this study should be used in place of teacher provided feedback. A substantial increase in amount of learning demonstrated is possible with student provided feedback.

In spite of the previously mentioned limitation, the findings do have significance for educational learning theory. As outlined in the introductory chapter, feedback methods which release greater information and involve greater effort and activity have been shown to increase retest performance. This method of student provided feedback had all of these characteristics. However, the superiority of this method is fully explained by increasing new learning, not by aiding retention. This finding supplements existing educational learning theory, which has concentrated upon the factors underlying retention, such as resistance to extinction.

Because of the applied nature of this study, recommendations for putting these findings into educational practice are

apparent. Again, any knowledge of results will aid retest performance. This has been demonstrated in numerous studies. However, this study indicates that teachers should utilize feedback procedures which are student oriented rather than teacher oriented. Although such procedures as the one in this study take more class time, they require less teacher time since it is not necessary to write in corrections. This study also serves as a reminder that tests are useful as teaching devices as well as evaluation instruments. Feedback given to the students through the use of an examination can actually increase the amount of learning. The increases in material learned even within this brief study suggest that tests and feedback systems are potentially valuable tools which have been overlooked through their use as grading instruments.

The results of this study suggest several avenues for further research. The factor or factors underlying the student provided feedback method need to be delineated, and their respective influences upon retest performance isolated. Such research may have potential usefulness in designing more effective feedback systems. In addition, the relationship of feedback method to achievement level and learning style should be studied to determine if there is an interaction between those variables. The ability to learn from one's mistakes should be a major goal of the educational process, and every step should be taken to increase that ability. The entire testing-feedback system should be studied more fully to maximize the usefulness of this educational tool.

Table 1
Cell Means and Standard Deviations
For Initial Test Scores

	Student Provided Feedback		Teacher Provided Feedback	
	Mean	S.D.	Mean	S.D.
School 1	10.89	4.56	14.73	3.81
School 2	11.36	4.37	13.60	4.39

Table 2
Cell Means and Standard Deviations
For Retest Scores

	Student Provided Feedback		Teacher Provided Feedback	
	Mean	S.D.	Mean	S.D.
School 1	15.00	5.68	15.82	4.49
School 2	14.27	4.44	15.00	4.23

Table 3
Mean Difference Scores

Student Provided Feedback	3.48
Teacher Provided Feedback	1.23
School 1	2.57
School 2	2.14

Table 4
Analysis of Variance for Score Increase

Source	d.f.	Sums of Squares	Mean Squares	F-Ratio	Probability
School	1	3.88	3.88	0.24	0.62
Treatment	1	104.79	104.79	6.53	0.01
Residual	80	1283.93	16.05		

Table 5
Cell Means and Standard Deviations
For Retention Scores

	Student Provided Feedback		Teacher Provided Feedback	
	Mean	S.D.	Mean	S.D.
School 1	8.47	5.36	11.55	4.44
School 2	7.36	3.93	10.10	4.64

Table 6
Analysis of Variance for Retention Scores

Source	d.f.	Sums of Squares	Mean Squares	F-Ratio	Probability
School	1	33.87	33.86	1.63	0.21
Treatment	1	174.06	174.06	8.36	0.00
Residual	80	1665.67	20.82		

Table 7
Cell Means and Standard Deviations
For Forgetting Scores

	Student Provided Feedback		Teacher Provided Feedback	
	Mean	S.D.	Mean	S.D.
School 1	2.53	1.93	3.18	1.53
School 2	4.00	2.48	3.50	2.06

Table 8
Analysis of Variance for Forgetting Scores

Source	d.f.	Squares	Squares	F-Ratio	Probability
School	1	16.30	16.30	3.91	0.05
Treatment	1	0.10	0.10	0.02	0.88
Residual	80	333.91	4.17		

Table 9
Cell Means and Standard Deviations
For Learning Scores

	Student Provided Feedback		Teacher Provided Feedback	
	Mean	S.D.	Mean	S.D.
School 1	6.53	3.56	4.27	2.16
School 2	6.91	3.41	4.90	2.05

Table 10
Analysis of Variance for Learning Scores

Source	d.f.	Sums of Squares	Mean Squares	F-Ratio	Probability
School	1	5.31	5.31	0.65	0.42
Treatment	1	93.76	93.76	11.52	0.00
Residual	80	651.03	8.14		

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INITIAL AND RETEST SCORES

<u>Student</u>	<u>Initial</u>	<u>Retest</u>	<u>Student</u>	<u>Initial</u>	<u>Retest</u>
1	05	15	43	10	19
2	08	15	44	17	18
3	07	10	45	06	08
4	18	12	46	15	18
5	14	12	47	11	14
6	19	17	48	19	21
7	05	21	49	14	18
8	14	05	50	07	16
9	14	20	51	17	21
10	11	14	52	05	13
11	10	12	53	18	22
12	07	13	54	03	10
13	09	14	55	13	11
14	09	06	56	09	17
15	11	16	57	09	23
16	16	17	58	16	23
17	14	16	59	17	21
18	16	19	60	15	16
19	16	19	61	08	09
20	15	13	62	11	16
21	16	17	63	05	03
22	06	08	64	14	07
23	11	16	65	07	11
24	16	14	66	09	12
25	15	14	67	10	16
26	12	14	68	10	12
27	10	14	69	16	13
28	19	20	70	20	20
29	19	19	71	15	13
30	13	10	72	07	10
31	08	07	73	14	12
32	20	24	74	19	20
33	15	19	75	05	13
34	16	21	76	07	11
35	15	18	77	15	16
36	18	16	78	20	20
37	18	22	79	15	16
38	16	19	80	10	08
39	16	17	81	07	07
40	16	16	82	17	16
41	10	10	83	17	22
42	11	14			

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EFFECTS OF TEST CORRECTION
METHOD UPON RETEST PERFORMANCE

by

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AN ABSTRACT OF A MASTER'S THESIS

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ABSTRACT

This study was aimed at determining whether an examination correction method in which subjects correct their mistakes increases subsequent performance on that same examination. A sample of 83 sixth grade students participated in the study. All subjects read prepared stimulus material and took a multiple choice test over that material. One group of subjects corrected their examination mistakes with the aid of the stimulus material. The other subjects reviewed their tests which the investigator had corrected. Six days after initial testing, all subjects were retested. The primary finding of the study was the superiority of the student correction method in increasing retest performance, not through aiding retention but through increasing new learning. This finding indicates that such feedback methods increase the effectiveness of testing as a teaching device.