

To determine the effect of a pausing procedure (three 2-minute pauses spaced at logical breaks during lecture presentations) on two dependent variables (free recall of facts and performance on objective tests), a separate 2 (class) × 2 (procedure) factorial analysis of variance was used. Seventy-two undergraduate students enrolled in either a course on educating the learning disabled or a course on educating the emotionally disturbed. Each semester, one class served as the control group and the second as the experimental group. Students in the experimental condition scored significantly higher on both dependent variables than did the control groups.

Generally, special education teacher educators are concerned with developing in prospective teachers the knowledge and skills associated with effective teaching practices. One way to facilitate the development of effective teachers while they are university students is to provide them with models of sound teaching; the university instructor should demonstrate best practices as a natural part of course presentations. Perhaps nowhere is this more difficult than when confronted with presenting material that, by its nature, must be covered primarily through lecture format (e.g., definition, theory, history). One technique that has shown promise for enhancing presentation style and thus demonstrating an effective teaching practice that may be applicable to secondary mainstreamed students (Hughes, Hendrickson, & Hudson, 1986) is the pause procedure (Rowe, 1976, 1980, 1983).

Rowe advocates the pause procedure for enhancing student understanding and recall of information presented through lecture. The pause procedure involves including a 2-minute period of discussion or note taking at least three times during each lecture. Rowe's advocacy of this strategy is based on the ideas that (a) mental lapses result when information gained through lecture enters student short-term memory at a rate exceeding the student's ability to efficiently organize and then store information in long-term memory, and (b) pausing permits students to clarify and assimilate the information, thus overcoming these lapses at least in part (Rowe, 1983).

Rowe expounded on the pause procedure in 1976, noting two pilot studies that supported its effectiveness and inviting further investigations. How-

Using the Pause Procedure to Enhance Lecture Recall

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ever, neither that paper nor two subsequent works (Rowe, 1980, 1983) provided sufficient design information to warrant wholesale acceptance of the procedure. Rowe provides the reader with the information only that studies exist and that subjects in all of these studies were freshmen enrolled in a variety of community college science classes.

The work of other researchers (DiVesta & Gray, 1973; DiVesta & Smith, 1979) engaged in similar lines of study does add to an understanding of the pause procedure and its value. DiVesta and Gray (1973) determined that the length of the listen-study interval (the periods of lecture between pauses) during a 30-minute lecture could be varied without any significant effect on student performance on an immediate, free-recall measure or on a true-false test taken 1 week after the lecture. This finding is important because it is improbable that individuals preparing lecture presentations would be willing to invest time in planning appropriate places to pause to match a fixed interval schedule. DiVesta and Smith (1979) investigated the effect on free-recall tests administered immediately after the lecture and on cued-recall tests 2 weeks later of the position of pauses in a 21-minute lecture (e.g., beginning, middle, end) and the type of activity during pauses. Their results indicate that interspersing pauses throughout the lecture, coupled with student-to-student discussion, is the most efficient procedure. Both of these studies used a single, taped lecture, and subjects were undergraduate students enrolled in introductory psychology courses.

Further investigation of the efficacy of the pause procedure seemed warranted due to the nature of the available, relevant articles. These have largely lacked empirical designs using longer, live-lecture presentations conducted over several class meetings, investigating the effect on student performance on objective, comprehensive tests. The purpose of the present study was therefore to address the following question: Do students participating in classes in which the instructor implements the pause procedure perform significantly better on short-term, free-recall measures, and on an objective, comprehensive test than do students in classes in which the pause procedure is not implemented?

METHOD

Subjects and Settings

The subjects in the study were 72 undergraduate students majoring in special education and enroll-

ed in either one of two (fall or spring term) introductory courses on educating the learning disabled (LD) ($n = 40$) or one of two (fall or spring term) introductory courses on educating the emotionally disturbed (ED) ($n = 32$). To be included in the study, students had to have attended the five lectures included in the study. All subjects had previously taken a general introductory course in special education that provided an overview of the classifications of exceptionality. The assumption of homogeneity for the four groups on demographic variables of semester course credit load and semester standing was tested by analysis of variance procedures. No significant differences were found between groups on these variables. Subjects were not informed that they were taking part in a study.

Both introductory courses are surveys, with course content during the first portion of the term covering topics such as history, definition, and etiological theories. The 45-minute class periods were taught through lecture rather than discussions or activities.

Independent Variable

The independent variable was the pause procedure as described by Rowe (1983) and presented earlier in this report. In the current study the procedure consisted of pausing for 2 minutes 3 times during each 45-minute lecture. During the pause, subjects formed dyads and discussed lecture content (e.g., asked each other for clarification of concepts or caught up on notes). No instructor-subject interaction occurred during the pauses. The interval between pauses for any given lecture was determined by the instructor prior to lecture and was based on "logical breaks," as after covering an historical period and before beginning discussion of the next period, thus permitting the students to encode information in meaningful units. Intervals between pauses ranged from 12 to 18 minutes. To insure consistency of presentation of content within any given lecture, the same detailed notes in outline form along with the same anecdotes, overhead transparencies, and breaks for pauses were used both semesters for each course, by the same instructor.

Dependent Variables

Two dependent variables were used, free-recall scores taken after each of the five lectures and a follow-up evaluation consisting of a 65-item multiple-choice test covering content included in the five lectures and administered 12 days after the fifth lecture. Both measures were taken for all four classes.

The free-recall measure used to assess factual retention was obtained at the end of each lecture. Students in each of the four classes were instructed to put all notes out of sight and write as many facts, ideas, or concepts presented in the lecture as they could during a 3-minute period. Student papers were then scored by the lecturer with 1 point given for each correct fact. A second scorer, provided with lecture notes and attending the lectures, randomly selected 10 student papers from each class and scored them in the same manner. Agreement was calculated by dividing the number of interscorer agreements by the number of agreements plus disagreements, and multiplying by 100. Agreements were defined as any item on which both scorers recorded the item as being a fact presented in the lecture. For example, if Scorer 1 found 22 facts on a sample subject's free recall paper and Scorer 2 found 21, the equation would be

$$\frac{21}{21 + 1} \times 100 = 95\%$$

Agreement ranged from 82% to 95% with a mean of 90%.

Twelve days after the fifth lecture, students took a comprehensive multiple-choice test on material covered in class lectures. Different tests were used for the ED and LD courses due to varying content. Answers were recorded on optical scanning sheets and scored by computer. Kuder-Richardson 20 (KR-20) test reliability scores for the four administrations of the two tests ranged from .80 to .84 with a mean of .82. KR-20 scores for the ED tests were .84 (fall) and .82 (spring). Scores for the LD class were .82 (fall) and .80 (spring).

Procedures

Prior to the beginning of the fall semester a coin was flipped to determine in which introductory class, LD or ED, the pause procedure would be implemented. At that time procedures for introducing the pause procedure to the experimental classes and administration and scoring of the free-recall tests to all four classes were standardized to ensure that all instructions and procedures would be identical. (Standardization procedures for scoring and administration are explained in the preceding section. To standardize introduction of the pause procedure, a brief script was developed for use in the experimental classes.) Through the coin toss it was decided the pause procedure would be implemented in the fall LD class rather than in the fall ED class. Therefore, during the spring semester the pause procedure

was used in the ED class and the LD class served as the control group.

The first day of each class (both experimental and control), use of free recall at the lecture's conclusion was explained. At this time the use of pauses during the lecture was also presented, but only to the experimental classes. Regarding the pauses, experimental classes were informed that periodically during the lecture the instructor would stop for 2 minutes, and students were to form dyads to discuss information about which they were unclear or to fill in gaps in their notes. They were also told that the instructor would not interact with students during the pauses. Regarding the 3-minute free recall, the students were told that, at the conclusion of each lecture, they would be asked to put away their notes and given 3 minutes to write, as rapidly as possible, as many facts (e.g., names, dates, places, definitions) from the lecture as they could, using a list or short-phrase format. They were informed that these would not be used to determine a grade, but were for the instructor's use in evaluating the effectiveness of presentations in teaching key points.

Two lectures a week were presented for 2½ weeks, and the comprehensive multiple-choice exam was administered a week and a half after the fifth lecture in each class.

RESULTS

A separate 2 (class) × 2 (procedure) completely randomized, factorial analysis of variance was used to test the two dependent variables. The results of these analyses will be reported separately.

Free-Recall Scores

The number of facts correctly recalled by each student was summed across the five lectures to produce a total lecture recall score. The highest mean score (109.50) was obtained by the LD-pause group. The second highest mean score (107.13) was obtained by the ED-pause group. The third highest mean score (82.00) was obtained by the LD-no pause group. Finally, the lowest mean score (77.81) was obtained by the ED-no pause group.

The analysis of variance summary table for lecture recall scores in Table 1 reveals no significant differences for the class and class-by-procedure interaction contrasts. A significant difference was obtained in favor of the LD and the ED groups using

TABLE 1

ANOVA summary table for lecture recall

Scores	df	SS	F	p
Class	1	191.41	.54	.46
Procedure	1	14421.68	40.86	.0001
Class x Procedure	1	14.60	.04	.84
Error	68	24003.19		

the pause procedure ($\bar{X} = 22.972$) when contrasted with the groups not using the pause procedure ($\bar{X} = 16.639$), $F(1, 68) = 40.86$, $p = .0001$.

Comprehensive Objective Test

A 65-item objective test covering the content from all five lectures was administered 12 days after their completion. The percentage correct for each student was reported as the follow-up evaluation score. The ED-pause group obtained the highest mean follow-up evaluation score, 89.38. The second highest score, 80.94, was obtained by the ED-no pause group. The third highest score, 80.40, was obtained by the LD-no pause group. The lowest score, 72.55, was obtained by the LD-no pause group.

The analysis of variance summary table for follow-up evaluation scores in Table 2 reveals a significant difference for the ED ($\bar{X} = 85.16$) and LD ($\bar{X} = 76.48$) contrast, $F(1, 68) = 5.03$, $p = .028$. A significant difference was also obtained in favor of groups using the pause procedure ($\bar{x} = 84.39$) over groups not using the pause procedure ($\bar{X} = 76.28$), $F(1, 68) = 4.44$, $p = .039$. The class-by-procedure interaction was not significant.

DISCUSSION

The results support the efficacy of the pause procedure in improving both immediate and free-recall scores of upper division undergraduates in introductory courses in special education. The study thus

expands on Rowe's (1976, 1980, 1983) contentions of the procedure's value. It further supports the findings of DiVesta and Smith (1979), in which 2-minute pauses for student discussion following each 7 minutes of lecture resulted in higher student performances on various outcome measures of student recall of the content of a single lecture. Results of the present study indicate that 2-minute pauses spaced at longer and varied intervals (12-18 minutes) during 45-minute lectures also result in higher levels of immediate and long-term recall.

This was true despite the differences in results on the objective measure across courses (i.e., ED groups scored higher than did LD groups). Differences across courses may be attributed to individual instructor style, as in detail of overheads, anecdotes, or rate of speech, or to variations in the tests for the two courses. Furthermore, it is possible that across the study instructor bias regarding the use of the pause procedure affected the outcome, and this is a limitation of the study. However, the standardization of procedures coupled with the counterbalancing effects of the design and the replication of positive results across the two courses within the pause groups indicate that implementation of the pause procedure does make a difference.

The improved student recall of information may have high functional value for students in terms of impact on student grades on comprehensive tests. For example, the differences in the means for the classes in which the pause procedure was implemented, compared with the means for those in which there were no pauses, indicated that in the ED course the pause group did better by an average of 8.4 points, and in the LD courses the pause group did better by an average of 7.9 points. Depending upon the cut-off points, these differences could be the determining factor between two letter grades, even between passing and failing.

DiVesta and Smith (1979) delineated several reasons substantiated in the professional literature as to why the pausing principle may be effective. Among these were theories that the procedure provides for (a) distributed versus massed practice, (b) consolidation of learning, (c) a discussion interval during which the student clarifies concepts, and (d) the opportunity to actively encode information to be remembered. It is also possible that an additional factor is involved, one which has not been noted by previous researchers interested in this area. It may be that in the natural classroom in which lectures are presented live, as opposed to taped lectures, the instructor may use the pauses to scan lecture

TABLE 2

ANOVA summary table for follow-up evaluation

Scores	df	SS	F	p
Class	1	1339.81	5.03	.028
Procedure	1	1184.22	4.44	.039
Class x Procedure	3	1.53	.01	.940
Error	68	18124.44		

notes and somehow improve the quality of his or her delivery, even though, as in the present study, the content remains the same. The effect of the use of the pause procedure on instructor delivery may be an area for future research.

Additionally, and another area for possible future research, the synthesis or review occurring in the process of the 3-minute free recall at the conclusion of the lecture may have some impact. It is, of course, impossible to determine within the current study what, if any, effect this activity had on student performance because free recall was held constant across all groups. One student, however, noted casually to an instructor that the 3-minute period of free recall helped her to synthesize the lecture material. Consequently, the use of a 3-minute period of free recall, or variations thereof, at the conclusion of lectures in order to enhance student absorption of content should be investigated as an additional or alternative procedure.

In summary, the results of the present study provide further substantiation that Rowe's procedure does have merit when implemented over several lectures presented live. It is a relatively simple technique, the use of which enhances student recall and performance on a comprehensive objective test. This may be the presentation strategy needed

to make a difference in the amount of material students can master through didactic presentations.

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