EFFECTS OF LEVEL OF OBJECTIVE AND LEVEL OF TASK ON OBJECTIVE-RELEVANT AND OBJECTIVE-INCIDENTAL LEARNING FROM PROSE TEXT

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE RESEARCH PROBLEM

Introduction

As Block (1971) has noted, the use of educational objectives as part of the instruction-learning process is not new. Washburn (1922) employed cognitive objectives as part of the Winnetka Plan, and Morrison (1926) developed cognitive, affective, and psychomotor objectives for instruction at the University of Chicago's Laboratory School. However, these programs were not long-lasting (Good and Teller, 1973). The current emphasis on behavioral objectives in educational programs probably stems from the work of Tyler (1934, 1942, 1951). More recently, the work of Bloom and his colleagues (1956, 1971), Mager (1962), and Gagne (1965) have served to firmly establish the concept of behavioral objectives at all levels of the educational process.

The specification of behavioral objectives has been postulated to provide a variety of benefits. Objectives are said to aid curriculum (Bloom et al, 1956), guide content selection and development of instructional strategies (Dick and Carey, 1978), and provide a basis for developing test items for gauging student achievement of objectives and thus instructional effectiveness (Bloom et al, 1956; Dick and Carey, 1978). However, the primary function of objectives is to facilitate student learning. Although some authors (e.g., Dick and Carey, 1978) state that objectives are important for the design of instruction whether or not

they are actually presented to learners, most proponents of objectives (e.g., Mager, 1962; Miles and Robinson, 1971) urge that objectives be provided for the learners. Objectives provide the learner with clear guidelines for what is to be learned and tested. As Mager (1962, preface) has somewhat humorously noted, ". . . if you're not sure where you're going, you're liable to end up someplace else."

Although a considerable body of research now exists on the effects of behavioral objectives on student learning in a variety of instructional situations (Duchastel and Merrill, 1973; Faw and Waller, 1976; Hartley and Davies, 1976; Melton, 1978), general conclusions are difficult to draw due to the inconsistent pattern of results from different studies. Additionally, it is difficult to compare and generalize across studies since different studies have employed objectives of varying degrees of precision, some studies have not defined the type(s) of objectives used, and still others have compared different types of objectives (Hartley and Davies, 1976). In any case the results are, at best, contradictory.

Critics of behavioral objectives (e.g., Eisner, 1967) have argued that specific objectives limit and inhibit comprehensive learning. This breadth of learning issue has been addressed most directly in studies on the effect of objectives on learning from prose text. Many of these studies have investigated breadth of learning by comparing the effects of objectives on two types of learning tasks: relevant and incidental, where relevant learning tasks concern the learning of material specified by the objectives, and incidental learning tasks concern the learning of material not specified by the objectives.

Although most studies have reported objectives to enhance relevant

learning (e.g., Rothkopf and Kaplan, 1972; Kaplan and Rothkopf, 1974; Kaplan and Simmons, 1974), eight studies reviewed by Melton (1978) reported no effect. However, five of those studies involved learning materials other than, or in addition to, strictly prose text. No studies to date have reported any decrement in relevant learning.

Partial support for critics of objectives is found in studies by Duchastel and Brown (1974), and Frase and Kreitzburg (1975), both of which found enhanced relevant learning but depressed incidental learning. However, other studies have reported enhancement or no effect for incidental learning (Kaplan, 1974, 1976a, 1976b; Kaplan and Rothkopf, 1974; Kaplan and Simmons, 1974). Thus, objectives apparently enhance relevant learning, while contradictory results have been reported for the effects of objectives on incidental learning.

Wittrock and Lumsdaine (1977) suggest that these results fit a selective attention model. This explanation of the effects of objectives on learning from prose is supported by the findings of Kaplan and Simmons (1974) that placing objectives after the prose passage increased incidental learning. Further support for the selective attention model was provided by Samuels and Dahl (1975) who found slower reading rates when learners were instructed to learn detailed rather than general information.

After reviewing a number of studies on objectives' effects, Melton (1978) concluded that both relevant and incidental learning can be expected to be improved by objectives presented after the reading passage. Melton's (1978) conclusion might imply that presentation of objectives is unnecessary, and they may instead be replaced with summary or review questions or statements. However, closer inspection of the research

indicates that Melton's conclusions and the implication may be premature.

Virtually all studies involving objectives and learning from prose text have concentrated on highly specific objectives and highly detailed, factual information. Additionally, the criterion tasks typically employed have called for recall of factual information. Indeed, the series of studies by Kaplan, Rothkopf, and their associates have employed training materials from Bell Labs (e.g., Kaplan and Simmons, 1974), and their objectives have been highly specific, referencing from one to five sentences of text. Thus, from studies examining the effects of objectives on learning from written prose, the effects of objectives on higher levels of learning are not known.

Other studies (Tieman, 1968; Conlon, 1970; Merrill, 1970; Stedman, 1970; Merrill and Towle, 1971, 1972) have employed, with little success, programmed text. Interestingly, although specification of objectives are clearly essential for designing programmed materials (Davis et al, 1974; Dick and Carey, 1978), the tight structure of programmed materials makes provision of these objectives to learners unnecessary (Sink, 1973). The conclusion of Sink (1973) seems a reasonable explanation for the failure of these studies to find enhancement of relevant learning.

In a reply to Ebel's (1970) criticism of behavioral objectives, Miles and Robinson (1971, p. 41) suggested the primary function of behavioral objectives is to "suggest that the student will engage in some kind of cognitive activity and that he will do something to expose this activity." Due to the highly factual nature of the texts and criterion measures, and the highly specific nature of objectives used in most studies, it is not possible to either verify or refute this claim. Although the results appear to support a selective attention model, with

objectives functioning as orienting stimuli, little more can be said concerning the effects of objectives on the cognitive activities of learners.

In addition to the problems concerning the rather narrow view of learning utilized in these studies, many of these studies have been criticized on other grounds. As noted previously, many studies of the effects of objectives, including those involving prose passages, have either failed to define what was meant by the term objective, provided ambiguous definitions of objectives, or have utilized more than one type of objective (Hartley and Davies, 1976). As a result, comparisons of studies, and implications from studies are difficult to accomplish. Faw and Waller (1976) noted that many studies have failed to include adequate control groups, and, even more damaging, have either failed to consider or have inadequately controlled inspection time (time spent reading/studying the text). Faw and Waller also noted that due to the large numbers of objectives and the highly factual and detailed nature of the prose texts, many studies have presented unrealistic learning situations, and urged that future research be made more "practical."

To date, no studies have dealt with the issue of item or test difficulty. Test difficulty would appear to be an important consideration when comparing relevant and incidental learning. Items of differing levels of difficulty could easily contribute to unequal criterion measures and thus could obscure effects of objectives. Since no information has been provided on item or test difficulty, the impact on the results of published investigations is impossible to estimate.

Many of the inadequacies of previous research on objectives and learning from prose are probably at least an indirect result of the lack

of a theoretical base. The variety of types of objectives noted previously, and the narrow scope of many studies reflect an overall lack of direction and continuity in the research to date, which is unfortunate in view of the availability of several theoretical frameworks (Bloom et al, 1956; Ebel, 1965; Gagne, 1965; Walbesser, 1965; Merrill, 1971).

The Taxonomy of Educational Objectives for the Cognitive Domain (hereinafter referred to as the Taxonomy, Bloom et al, 1956), seems well-suited for investigations of learning from prose text. The Taxonomy was constructed according to several criteria. The categories were derived to represent cognitive or thinking behaviors in a logical and internally consistent manner so that more complex behavior would include simpler behaviors. In a recent review of research on the properties of the Taxonomy, Seddon (1978, p. 321) concludes that although the hierarchical nature of the overall taxonomy has not been confirmed or disconfirmed, strong supportive evidence exists for a ". . . cumulative hierarchical relationship between the categories Knowledge, Comprehension, Application, and Analysis." Thus, the Taxonomy appears to provide a viable framework for investigating the effects of different level objectives on higher levels of relevant and incidental learning from prose text.

Statement of the Problem

Although many studies have investigated the effects of providing learners with behavioral objectives for prose segments, most of these studies employed either highly factual, detailed material or highly organized programmed materials. Additionally, these studies have typically employed a large number of quite specific objectives, each relating to

only a few sentences of text. Further, measures of learning have typically employed items at only the factual or knowledge level. Unfortunately, many of these studies have failed to control essential variables, thus limiting their generalizability. Thus, little is known concerning the effect of providing learners with behavioral objectives for prose segments which are more representative of general reading tasks. Also, the effects of objectives on higher levels of learning are not clear. Information regarding the effectiveness of objectives to enhance higher levels of learning for more general prose reading tasks is needed. Without this information, there is no research evidence indicating that classroom teachers can enhance their students' learning by providing objectives prior to general reading tasks.

The Taxonomy (Bloom et al, 1956; Seddon, 1978) appears to be a workable framework for investigating the effectiveness of objectives in enhancing higher levels of learning. Thus, from the framework provided by the Taxonomy, the present study will provide information regarding the effectiveness of providing higher levels of objectives for reading tasks similar to those found in secondary education.

Purpose of the Study

The purpose of this study is to examine the effects of providing learners with written objectives for a segment of prose text. Specifically, this study will examine the effects of:

1. Objectives stated at successive levels of the Taxonomy on objective-relevant and objective-incidental learning tasks at successive levels of the Taxonomy; and

2. Objectives stated at successive levels of the Taxonomy on inspection time and learning efficiency.

Research Questions

The specific questions asked in this study are:

Research Question One: Does presentation of objectives stated at different levels enhance learning on objective-relevant and objective-incidental tasks at the corresponding levels?

Research Question Two: Does presentation of objectives stated at different levels enhance learning on objective-relevant and objective-incidental tasks at higher and lower levels?

Research Question Three: Does presentation of objectives stated at different levels increase inspection time?

Research Question Four: Does presentation of objectives stated at different levels affect learning efficiency?

Definition of Terms

For the purpose of this investigation, the following terms and definitions will be employed:

1. Objective: A statement specifying a task to be performed. This statement includes a definition of the task (e.g., correctly answering test questions) and non-behavioral action verbs (e.g., recognize, summarize, specify).

2. Level of Objective: The category (level) of an objective accorning to Bloom's Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. Levels employed in this study are Knowledge, Comprehension, and Application.

   a. Knowledge: The recognition/recall of factual information.

   b. Comprehension: Translating, interpreting, or restating information using different terms or concepts.

c. Application: The use of information in other particular situations.

3. Level of Task: The category (level) of a set of test items according to Bloom's Taxonomy of Educational Objectives, Handbook I: Cognitive Domain.

4. Objective-Relevant Task: A set of test items covering material specified in an objective. Performance on an objective-relevant task is referred to as relevant learning.

5. Objective-Incidental Task: A set of test items covering material not specified in an objective. Performance on an objective-incidental task is referred to as incidental learning.

6. Inspection Time: The amount of time spent reading the stimulus materials.

7. Learning Efficiency: The performance per unit of time of a treatment group relative to the performance per unit of time of the appropriate control group. Learning efficiency is indicated by the efficiency index (EI).

$$EI = \frac{\bar{X}_j/\text{Time}_j}{\bar{X}_1/\text{Time}_1} \qquad j = 1, \ldots, 8$$

where j = the number of treatment groups; j = 1 is the control group; and Time is inspection time.

8. Comprehensive Learning: The sum of relevant and incidental learning.

Assumptions Underlying the Study

The first assumption underlying this study was that the students participating would not have prior knowledge of the content of the read-

ing passage to be presented. As noted by Stanley and Bolton (1957) and Seddon (1978) the condition of no prior knowledge is necessary for the classification of objectives and test items to hold for all subjects. This assumption is tenable due to the obscure nature of the reading passage employed in this study.

An assumption was made that students would follow instructions and try to do the best that they could.

Limitations of the Study

Several factors limit the generalizability of the findings of this study. First, the findings are generalizable only to the extent that the assumptions were met. It must be noted that competition with another school, and cooperation with the experimenter were the motivating factors, and not course grades. To the extent that these conditions prompted students to do their best, the findings are generalizable to other groups of students who similarly try their best.

Additionally, the results are generalizable only to similar student groups (e.g., white, upper-middle class high school students of similar reading ability and cultural background). Further, the findings of this study are generalizable only to similar groups using materials which meet the following criteria:

1. Participants do not have prior knowledge of the content of the reading passage;
2. The test items have been shown to meet the requirements of a cumulative, hierarchical relationship of taxonomic categories (levels).

CHAPTER II

REVIEW OF LITERATURE

Introduction

A variety of techniques aimed at enhancing learning from written prose, and understanding the processes involved in such learning have been developed in the last two decades (Faw and Waller, 1976). Most research has focused on four techniques: Advance Organizers (Ausubel, 1960, 1963); Response Modes (Idstein and Jenkins, 1971; Todd and Kessler, 1971; DiVesta and Gray, 1972); Behavioral Objectives (Rothkopf and Kaplan, 1972); and Inserted Questions (Hershberger, 1964; Rothkopf, 1966). Although the research literature for each of these areas contains conflicting and contradictory findings, Faw and Waller (1976) conclude that advance organizers and objectives operate on the attentional and learning set of learners, while response modes and inserted questions influence ongoing cognitive processes. Although other authors (Duell, 1974; Wittrock and Lumsdaine, 1977) have reached similar conclusions regarding the attentional and orienting effects of objectives, proponents of behavioral objectives have maintained that objectives not only direct attention to important material, but also provide cues for more effective organization of learning efforts by learners (Mager, 1962), and more appropriate cognitive activities during the learning process (Miles and Robinson, 1971).

The use of behavioral objectives has not met with unanimous

approval by educators (Eisner, 1967; Ebel, 1970; Raths, 1971). Although the critics of behavioral objectives have offered a variety of criticisms on philosophical and pragmatic grounds, in view of the claims mady by proponents, two arguments appear particularly relevant. Ebel (1970) has criticized the emphasis on behaviorally stated objectives on the grounds that behaviors are not the true objectives of instruction. Rather, he asserts that cognitive resources are the real objectives of instruction. Apparently, the crux of this issue lies in what is meant by the term behavior. Although specification of specific, overt behavior may inform learners of what they must do on the criterion test (e.g., write, point to, circle), whether or not the behavior suggests more appropriate cognitive activity in the learning process depends on the learner's knowledge of alternative cognitive activities and ability to select the most appropriate activity. As Miles and Robinson (1971) have noted, the use of non-behavioral action verbs (e.g., define, identify, describe, classify) in conjunction with overt criterion behaviors provides a solution to this problem. It would seem though, that the learner's knowledge of alternative activities, and ability to select those most appropriate, would influence the effectiveness of objectives in suggesting appropriate cognitive activities. This issue has been addressed by studies in which learners received instruction and training in the use of behavioral objectives (Morse and Tillman, 1972; Sink, 1973). Interestingly, training in use of objectives did not result in increased learning.

The second important criticism has been that provision of behavioral objectives serve to limit and inhibit comprehensive learning (Eisner, 1967; Ebel, 1970). This criticism, of course, is the other side of the

argument by proponents that objectives serve to direct learners' attention to the material to be learned. The question here concerns the effect of objectives on material not specified in the objectives. This issue would apparently be less important where highly structured materials (e.g., programmed or computer-assisted instruction), where all or most material is typically specified. Indeed, in studies involving these type materials, objectives have rarely had an effect on learning (Stedman, 1970; Merrill and Towle, 1971, 1972; Sink, 1973). However, much of the research on the effect of objectives on learning from prose text has addressed the breadth of learning issue by examining the effects of objectives on objective-relevant and objective-incidental learning. This research will be reviewed below.

Objectives and Learning from Prose

Most of the studies of the effects of objectives on learning from prose text have been conducted by Rothkopf, Kaplan and their associates. These and other authors have defined relevant learning to be the learning of material specified in the objectives, and incidental learning to be the learning of material not specified in the objective. The studies by Rothkopf and Kaplan will be reviewed first.

Rothkopf and Kaplan (1972) investigated the effects of density (proportion of text sentences relating to objectives) and specificity (explicit reference [name] to what is to be learned) of objectives on relevant and incidental learning. Relevant learning was greater than incidental; relevant, but not incidental, learning was greater for specific objectives than for general objectives; and higher densities reduced relevant, but not incidental, learning. Relevant learning for

all treatment groups, and incidental learning for some treatment groups, exceeded that of control groups, who received instructions to learn as much as possible. Kaplan and Rothkopf (1974), using the same materials found similar results, except that no effects were found for incidental learning. Relevant learning was found to decrease as the number of objective-relevant text sentences increased. Also, inspection time increased for subjects provided objectives, and was greater for specific than for general conditions.

Placement of objectives was investigated in two studies by Kaplan (1974, 1976a), who varied the presentation of objectives. Presentation methods included all objectives presented before text (whole), clusters of two to five objectives placed within the text before relevant material (grouped), and interspersing single objectives throughout the text. For relevant learning, grouped presentation of objectives resulted in greater learning than either whole or interspersed presentation. Incidental learning was greater for grouped than for interspersed presentation for general, but not specific objectives. No other effects on incidental learning were observed. Inspection time was greater for grouped presentation and specific objectives. Enhanced relevant learning and increased inspection time have also been noted in other studies (Kaplan and Simmons, 1974; Kaplan, 1976b).

Several comments regarding these studies seem appropriate. First, the prose texts, objectives, and criterion tests employed were highly factual in nature. Second, specific objectives referred to single facts in single sentences, resulting in large numbers of objectives for relatively short passages (e.g., 22 to 48 objectives for a 56 sentence passage). Even general objectives were quite specific, referencing from

two to five text sentences. Third, inspection time was recorded in some studies, but ignored in others. In no study was learning efficiency examined. Fourth, objectives were merely instructions to "learn about" facts. Fifth, difficulty of tests of relevant and incidental learning was not examined.

Given the large number of objectives and their specific factual nature, it is reasonable to postulate that enhanced relevant learning was due to a practice effect, that is, being exposed to the fact to be learned twice. This would also account for increased inspection time. Additionally, the number of objectives employed would seem to severely limit both the generalizability of the results and the practicality of the technique. With no estimation of learning efficiency the practicality of the technique is certainly questionable.

Duchastel (1972) and Duchastel and Brown (1974) developed 24 specific, knowledge level objectives and 24 corresponding test items for a 2400 word text. Twelve objectives were employed for relevant learning, while the other twelve formed incidental material. In contrast to the findings reported in other studies, (e.g., Kaplan, 1972), both Duchastel studies found objectives to enhance relevant learning, but decrease incidental learning. No differences were found in inspection time. Duchastel (1977) concluded that learners highly familiar with objectives and their purpose experience decrements in incidental learning. In another similar study, Morse and Tillman (1972) reported enhanced relevant learning with objectives, but no effect on incidental learning.

The decrement in incidental learning reported by Duchastel (1972, 1977) has been confirmed in several studies (Frase and Kreitzburg, 1975; Gagne and Rothkopf, 1975; Rothkopf and Billington, 1975). However,

these studies have also employed highly factual materials and thus the effects of objectives on higher levels of learning is not known.

Two studies have examined higher levels of learning in connection with objectives and written materials. Oswald and Fletcher (1970) found no effects of objectives on Knowledge and Comprehension test items. Stedman (1970) similarly found no differences in performance on Knowledge, Comprehension, Application, and Analysis items in a programmed unit of genetics. However, as noted previously, the highly structured nature of programmed materials may obscure the effect of objectives.

A few recent studies investigating the effects on higher level questions inserted into text appear relevant. Several studies (Watts and Anderson, 1971; Mayer, 1975; Rickards, 1976) have shown that insertion of higher level questions has facilitated learning. This result is particularly noteworthy since these studies used meaningful textbook type materials. Hunkins (1969) found learning at the Knowledge, Comprehension, and Application levels to be enhanced by inserted questions. Using a reading passage entitled "The Lisbon Earthquake" and test items developed by Kropp et al (1966), Shavelson et al (1974) found that both higher-order (Comprehension, Application, and Analysis), and lower-order (Knowledge) questions facilitated learning from text. Thus, although little is known regarding the influence of objectives on higher levels of learning, evidence from studies of inserted questions indicate that such research could be worthwhile.

Several reviewers (Carver, 1972; Faw and Waller, 1976; Hartley and Davies, 1976) have noted the inadequacies present in much of the research. These inadequacies, as previously noted, include extreme emphasis on lower-order learning, failure to examine the critical variable

of test difficulty, failure to control inspection time and study behaviors, and failure to examine learning efficiency. Faw and Waller (1976) constructed indices for learning efficiency, and found that, as a general rule, provision of objectives increases learning, but the increase in inspection time results in no increase in learning efficiency.

Perhaps the most important failing of the research to date is the lack of continuity. This is probably due to the absence of any consistent theoretical framework (Hartley and Davies, 1976), and the emphasis on factual information. As evidenced by the studies on inserted questions, the use of Bloom's Taxonomy (Bloom et al, 1956) appears to hold promise for investigating the effects of objectives on learning from prose text.

A Theoretical Framework

Bloom and his colleagues (Bloom et al, 1956, p. 10) developed the Taxonomy as a means to "facilitate communication" regarding the classification of objectives and test items. As noted by Seddon (1978), and Stanley and Bolton (1957), agreement on classification, especially test items, is difficult to obtain, primarily due to difficulties in determining the prior experiences of learners. Thus, based on different backgrounds, a test item may be at the knowledge level for one learner, but at a higher level for another.

Investigations by Stoker and Kropp (1964, 1971), Kropp, Stoker, and Bashaw (1966), Kropp and Stoker (1966), and Stedman (1973) have attempted to verify the cumulative hierarchical relationship of the categories developed by Bloom et al (1956). Employing complex analyses, simplex analysis (Guttman, 1953) and Guttman-Lingoes smallest space analysis

(Lingoes, 1965; Guttman, 1968), these researchers have failed to provide confirmation of the existence of the necessary relationship for the entire taxonomy. However, for one reading passage, "The Lisbon Earthquake," results indicated a cumulative hierarchical relationship for the first four categories of Knowledge, Comprehension, Application, and Analysis.

Other authors (Smith, 1968, 1970; Poole, 1971, 1972) have claimed to demonstrate support for the taxonomy, but, as detailed by Seddon (1978) their analyses have been inappropriate. Supportive evidence has been obtained, however, for the lower four categories in some cases.

Summary

Proponents of objectives have claimed that objectives direct learners' attention to important material and provide cues as to appropriate cognitive strategies for learning. Critics have countered by charging that objectives limit and inhibit comprehensive learning. Research on the effect of objectives on relevant and incidental learning from prose text have supported the claim that objectives direct learners' attention to relevant material, but results for incidental learning have been inconclusive. Additionally, the focus of the research on factual learning, the lack of a theoretical framework, and methodological flaws in the research, have limited the generalizability of the findings.

The success of several studies on the effect of inserted questions based on Bloom's Taxonomy, combined with the partial support of Bloom's Taxonomy indicate that the Taxonomy does provide a useful framework for investigating the effects of objectives on higher-level learning.

CHAPTER III

METHOD AND PROCEDURE

Subjects

Subjects for this study were 266 tenth and eleventh grade, male and female students from two high schools in a predominantly white, upper-middle class suburban school district in central Oklahoma. One hundred and eighty-four subjects were randomly assigned to eight treatment groups (n = 23). The remaining eighty-two subjects served as a no-treatment norm group for standardizing subtest scores.

Procedures

Stimulus Materials

The stimulus materials consisted of a page of general directions, a page of specific instructions, a 1500 word reading passage and 42 test items (see Appendix). The prose passage employed was entitled "The Lisbon Earthquake." This passage was developed by Kropp and Stoker (1966), who also developed and extensively analyzed a large number of test items at each level of the Taxonomy. Further research (Kropp et al, 1966; Stoker and Kropp, 1971) verified a cumulative, hierarchical relationship for test items from the first four taxonomic categories (Knowledge, Comprehension, Application, and Analysis). This passage was also chosen due to the obscure nature of the topic, which allows for control of subjects' prior knowledge.

Two content areas were defined for the material contained in the reading passage. From the 20 items for each of the three taxonomic levels of Knowledge, Comprehension, and Application, seven items were selected for each content area at each level. One content area concerned 18th Century philosophers and their debate following the earthquake and the other content area concerned the actual events and happenings surrounding the earthquake.

From the items chosen, Knowledge, Comprehension, and Application level objectives were constructed for the content area concerning the philosophers and their debate. Thus, objective-relevant and objective-incidental material were defined and instruments for measuring relevant and incidental learning were constructed for each of the three successive levels of the taxonomy.

Although the shortness of these tests could pose a reliability problem, estimated reliabilities using the Spearman-Brown Prophecy Formula (Ferguson, 1971) from the KR-20 reliabilities reported by Kropp and Stoker (1966) indicated that acceptable reliabilities could be expected. However, as can be seen in Table I, the actual reliabilities obtained from the norm group were considerably less than expected. The extremely low reliabilities for Comprehension and Application tests are clearly unacceptable and constitute another limitation to the study.

The following three objectives were constructed:

1. Knowledge (K) level objective: Recognize the names of the philosophers and political leaders who reacted to the earthquake, and recognize their arguments about the earthquake.

2. Comprehension (C) level objective: Define and summarize the arguments of the learned spokesmen of the time.

3. Application (A) level objective: Specify relationships among the arguments of the learned spokesmen of the time and apply them to current situations.

There were eight sets of specific instructions. Control and norm groups received instructions to read carefully and answer the questions as best they could. The seven treatment groups received either one, two, or all three of the preceeding objectives. Immediately following the objectives was a sample reading passage and a sample test item for each objective presented (see Appendix).

TABLE I

MEANS, STANDARD DEVIATIONS, AND KR-20 RELIABILITIES OF THE SIX TESTS FOR THE NORM GROUP

TEST	Number of Items	$\bar{X}$	s.d.	Predicted Reliability	Obtained Reliability
Relevant Knowledge	7	4.518	1.648	.729	.505
Relevant Comprehension	7	3.241	1.543	.686	.428
Relevant Application	7	3.169	1.421	.637	.322
Incidental Knowledge	7	5.651	1.469	.729	.605
Incidental Comprehension	7	4.964	1.444	.686	.382
Incidental Application	7	3.735	1.466	.637	.208

N = 82

General directions preceeded the specific instructions and were presented as follows:

> I am interested in your ability to apply skills and understandings which you have been learning since you entered school, and I appreciate your participation in my study. Specifically, I am studying how students like you learn from things you read, and how different instructions affect how you learn from things you read. I am conducting this study in several schools, including other schools in Putnam City, and will compare how well you do with how well students in Putnam City West (North) do, so try to do the best you can.
>
> The following pages are divided into three parts: (1) Instructions; (2) A reading passage; and (3) A test over the reading passage. When I tell you, turn the page and read your specific instructions. Then, follow those instructions as you read the passage. While reading the passage, you may refer back to the instructions if you wish, but you may not take notes or make any marks in the reading passage (for example, underlining).
>
> As soon as you finish reading, RECORD THE TIME in the box at the end of the passage. When you have done this, begin answering the test questions. For each question, circle the number of the answer you think is correct. After you begin the test, you may not refer back to the reading passage. Answer as many questions as you can, but do not spend a lot of time on any one question. If you are not sure about the answer to a question, choose the answer you think is best, and go on to the next question. Answer the questions as quickly as possible.

Data Collection

Data were collected through group administration of the stimulus materials in a classroom setting. Within each classroom subjects were randomly assigned to either the norm group, the control group, or one of the seven treatment groups. Each subject received a stimulus packet containing the stimulus materials. After all subjects received their packets, they were instructed to turn to the first page and read the general directions while the examiner read them aloud. Following presentation of the general directions, and answering of any questions for clarification, subjects were instructed to turn the page and read their

specific instructions. At the end of the reading passage, subjects were instructed to record the time.

Hypotheses

Based on the findings of Kaplan and his associates (Kaplan, 1974, 1976a, 1976b; Kaplan and Rothkopf, 1974; Kaplan and Simmons, 1974), the following hypothesis was formulated:

Hypothesis One: Incidental learning will not be affected by presentation of objectives.

From the above cited research and from the findings reported by Duchastel (1972 and 1977), Duchastel and Brown (1974) and Morse and Tillman (1972), the following hypothesis was formulated:

Hypothesis Two: Relevant learning will be enhanced by presentation of objectives stated at corresponding levels.

From studies of adjunct questions and learning from prose text (e.g., Shavelson et al, 1974), the following two hypotheses were formulated:

Hypothesis Three: Relevant learning at higher levels will be enhanced by presentation of objectives stated at lower levels.

Hypothesis Four: Relevant learning at lower levels will not be enhanced by presentation of objectives stated at higher levels.

From the above cited research on objectives and learning from prose text, hypothesis five was formulated:

Hypothesis Five: Inspection time will be increased by presentation of objectives.

Analysis of the Data

Hypotheses one through four were investigated using a four-way repeated measures analysis of variance (Treatment by School by Level of Task by Type of Task) with repeated measures on two factors (Level and Type of Task). There were eight levels of the Treatment factor, two levels of the School factor, three levels of Level of Task, and two levels of Type of Task. To control for unequal test difficulties, standard scores ($z = \frac{X - \bar{X}}{sd}$), using the means and standard deviations of the norm group, were computed for each subject on each test, and constituted the dependent variable. Computationally, this design is equivalent to the Split-Plot Factorial Design (SPF-pr·qu) as outlined by Kirk (1968). This design was chosen because it controls for subject heterogeneity which often obscures treatment effects, permits the use of smaller sample sizes, and generates substantial error degrees of freedom (Kirk, 1968). Computations were done using SAS (Barr and Goodnight, 1976). The minimum requirement for significance was set as an experimentwise error rate of $p < .05$.

Hypothesis five was investigated using a one-way analysis of variance on inspection time, using SPSS (Nie et al, 1975). Additionally, Research Question Four was examined by inspecting efficiency indices (Faw and Waller, 1976). Indices greater than 1.0 indicate superior efficiency of treatment groups in comparison to the control group. Faw and Waller (1976) present no statistical test of these indices.

CHAPTER IV

RESULTS

Introduction

The purpose of this chapter is to present the results of the statistical analysis for the four research questions formulated in the present study. The major emphasis of the study is to examine the effects of objectives stated at different levels of the Taxonomy on objective-relevant and objective-incidental learning from prose text, similar to that encountered in secondary education. Additionally, inspection time is examined to determine the effect of presenting objectives on the amount of time spent reading the prose text. The results provide information regarding the efficacy of providing higher level objectives for relatively brief reading tasks such as those commonly encountered by high school students. Further, the concept of learning efficiency, as presented by Faw and Waller (1976) is examined.

The effects of objectives on different levels of learning, relevant and incidental, were examined by way of the four-way analysis of variance (Objectives by School by Type of Task by Level of Task) with repeated measures on two of the factors (Type and Level of Task). The effect of objectives on inspection time was examined by way of a one-way analysis of variance. Learning efficiency indices were computed. Although appropriate statistical techniques for analyzing these indices are not available, the indices do provide a somewhat crude measure of

the time efficiency of presenting objectives for reading tasks.

Tests of Research Questions

The research questions will be discussed in terms of the statistical results of the data.

Research Question One: Does presentation of objectives, stated at different levels, enhance learning on objective-relevant and objective-incidental tasks at the corresponding levels? Referencing Table II, the Objectives by Type of Task by Level of Task interaction was not significant ($F_{14,336} = .98$, $p = .47$), indicating that presentation of objectives did not affect relevant learning at corresponding levels. Specifically, the predictions of Hypotheses One and Two would have been shown by the presence of an Objective by Level of Task interaction at the first level of Type of Task (relevant learning), and no such interaction at the second level of Type of Task (incidental learning). This situation would have resulted in a significant three-way interaction (Objective by Type of Level). Since this three-way interaction was not present, the presence of the two-way interaction for relevant learning but not incidental learning was not indicated. Thus, Research Question One was answered in the negative. More specifically, Hypothesis One cannot be rejected while Hypothesis Two is rejected.

Research Question Two: Does presentation of objectives, stated at different levels, enhance learning on objective-relevant and objective-incidental tasks at higher and lower levels? Again referencing Table II, the Objective by Type of Level interaction was not significant, indicating that presentation of higher levels of objectives did not affect relevant learning at lower levels, nor did presentation of objectives at

lower levels effect relevant learning at higher levels. Specifically, the predictions of Hypotheses Three and Four would have been shown by the presence of an Objective by Level interaction for relevant learning but not incidental learning. Since the three-way interaction was not present, the two-way interaction for relevant learning, but not incidental learning, was not indicated. Thus, Research Question Two was answered in the negative. Hypothesis Three is rejected while Hypothesis Four cannot be rejected.

TABLE II

SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:
READING PERFORMANCE

Source	SS	df	MS	F	p
Between Subjects	467.462	183			
A (Objective)	20.784	7	2.969	1.16	.329
C (School)	2.874	1	2.874	1.12	.291
A x C	13.231	7	1.890	.74	.642
Subj. W. Groups	430.573	168	2.563		
Within Subjects	654.007	920			
B (Type)	0.039	1	.039	.05	.824
A x B	5.811	7	.830	1.05	.399
B x C	0.704	1	.704	.89	.347
A x B x C	4.619	7	.660	.83	.561
B x Subj. W. Groups	132.811	168	.791		
D (Level)	1.930	2	.965	1.35	.260
A x D	10.534	14	.752	1.05	.399
C x D	2.733	2	1.367	1.91	.149
A x C x D	6.784	14	.485	.68	.795
D x Subj. W. Groups	239.840	336	.714		
B x D	0.843	2	.422	.63	.535
A x B x D	9.242	14	.660	.98	.470
B x C x D	0.700	2	.350	.52	.594
A x B x C x D	11.845	14	.846	1.26	.231
B x D x Subj. W. Gr.	225.572	336	.671		
TOTAL	1121.469	1103			

Mean standard scores and standard deviations for each treatment group on the six tasks representing the three levels of relevant and incidental learning are presented in Table III. As can be seen in Table III, mean scores are minimally distributed about the norm group mean score of zero.

TABLE III

MEAN STANDARD READING PERFORMANCE SCORES BY TREATMENT CONDITIONS BY TYPE OF TASK BY LEVEL OF TASK

	RELEVANT TASK						INCIDENTAL TASK					
	Knowledge		Comprehension		Application		Knowledge		Comprehension		Application	
OBJECTIVE	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd
Control	.319	.976	-.100	1.203	-.517	.991	.149	.902	.025	.957	-.175	.845
K	.187	.962	.013	1.192	.126	.940	.060	.687	.175	.691	.175	1.214
C	-.130	1.009	-.128	1.114	.364	1.193	.030	.972	-.246	1.080	.003	.902
A	.424	.950	.295	1.163	.432	.971	.237	.649	.236	.989	.270	.971
KC	.055	1.094	.154	1.013	.126	.963	-.177	1.244	.025	.910	-.027	1.258
KA	.266	.993	.126	1.102	.340	1.095	.060	.876	.236	.793	.003	.947
CA	.134	.937	.097	1.029	.248	1.015	.445	.560	.145	1.058	-.234	1.023
KCA	-.341	.941	-.241	1.144	.034	1.358	.090	.767	.025	.886	.092	1.205
TOTAL	.114	.993	.027	1.113	.053	1.099	.112	.857	.078	.923	-.031	1.047

* n = 23 for all 8 treatment groups

Research Question Three: Does presentation of objectives, stated at different levels, increase inspection time? The analysis of variance performed on inspection time is presented in Table IV. The non-significant F indicates no differences among the treatment groups on inspection time. Thus, Research Question Three is answered in the negative and Hypothesis Five is rejected.

TABLE IV

SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:
INSPECTION TIME

Source	SS	df	MS	F	p
Between Groups	89.560	7	12.794	1.250	n.s.
Within Groups	1801.217	176	10.234		
Total	1890.777	183			

Mean inspection times for the eight treatment groups are presented in Table V. Although observed times for groups receiving two or three objectives appeared slightly larger than inspection times of the control group and groups receiving one objective, these observed differences were well within differences expected by chance.

TABLE V

MEAN INSPECTION TIMES FOR TREATMENT GROUPS
IN MINUTES

Treatment Group	N	$\bar{X}$	sd
Control	23	11.043	2.804
K Objective	23	10.478	2.466
C Objective	23	11.696	2.915
A Objective	23	11.348	3.200
KC Objective	23	12.435	3.259
KA Objective	23	12.130	3.224
CA Objective	23	11.478	3.260
KCA Objective	23	12.739	4.191
Total	184	11.668	3.214

Research Question Four: Does presentation of objectives stated at different levels affect learning efficiency? From the mean inspection time presented in Table V and the mean raw scores presented in Table VI, efficiency indices were computed for each treatment group using the formula presented in Chapter I. These indices are presented in Table VII. As can be seen in Table VII, nine of the indices were numerically larger than one, while eleven were numerically less than one. For those groups whose indices were less than that of the control group, the deviations ranged from .01 to .18. For those groups whose indices were greater, the deviations ranged from .02 to .21. There did not appear to be a discernible pattern among the indices. Apparently, the presentation of objectives did not affect learning efficiency as measured by the efficiency index.

TABLE VI

MEAN READING PERFORMANCE RAW SCORES BY TREATMENT CONDITION BY TYPE OF TASK BY LEVEL OF TASK

	RELEVANT TASK						INCIDENTAL TASK					
	Knowledge		Comprehension		Application		Knowledge		Comprehension		Application	
TREATMENT GROUP	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd	$\bar{X}$	sd
Norm Group*	4.518	1.648	3.241	1.543	3.169	1.421	5.651	1.469	4.964	1.444	3.735	1.466
Control	5.044	1.608	3.087	1.856	2.434	1.408	5.870	1.325	5.000	1.382	3.478	1.239
K	4.826	1.586	3.261	1.839	3.348	1.335	5.739	1.010	5.217	.998	3.478	1.780
C	4.304	1.663	3.044	1.718	2.652	1.695	5.696	1.428	4.609	1.559	3.739	1.424
A	5.217	1.565	3.696	1.795	3.783	1.380	6.000	.954	5.304	1.428	4.130	1.424
KC	4.609	1.803	3.478	1.563	3.348	1.369	5.391	1.828	5.000	1.314	3.696	1.845
KA	4.957	1.637	3.435	1.701	3.652	1.555	5.739	1.287	5.304	1.146	3.739	1.389
CA	4.739	1.544	3.391	1.588	3.522	1.442	6.304	.822	5.174	1.527	3.391	1.500
KCA	3.957	1.552	2.870	1.766	3.217	1.930	5.783	1.126	5.000	1.279	3.870	1.766
TOTAL	4.654	1.639	3.274	1.663	3.229	1.514	5.774	1.318	5.056	1.346	3.707	1.514

* n = 82, all others n = 23

TABLE VII

EFFICIENCY INDICES* FOR TREATMENT GROUPS
ON RELEVANT, INCIDENTAL, AND
COMPREHENSIVE LEARNING

GROUP	RELEVANT	INCIDENTAL	COMPREHENSIVE
Control	1.0	1.0	1.0
K Objective	1.14	1.21	1.09
C Objective	.89	.92	.91
A Objective	1.17	1.05	1.10
KC Objective	.96	.87	.91
KA Objective	1.04	.94	.98
CA Objective	1.06	.99	1.02
KCA Objective	.82	.89	.86

*Efficiency Index $= \dfrac{\bar{X}_j/\text{Time}_j}{\bar{X}_1/\text{Time}_1}$ $\quad j = 1, \ldots, 8$

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary of the Investigation

The present study examined the effects of presenting objectives on three levels of relevant and incidental learning from a brief prose text. The study was undertaken to provide information concerning the effects of objectives on higher levels of learning, information not currently found in the research literature. Additionally, most of the existing research is not generalizable to school situations due to the types of materials used, the subjects employed, and the types of tests used to measure learning. Further, many of these studies have failed to control for the amount of time spent on the reading task and some have failed to include appropriate control groups in their research designs. Although a theoretical framework may not be needed when investigations involve only recall or recognition tasks, such a framework becomes necessary when higher levels of learning are involved. The Taxonomy of Educational Objectives (Bloom et al, 1956) was chosen as a theoretical framework for this study. This choice was made on the basis of research (Stoker and Kropp, 1964, 1971; Kropp and Stoker, 1966; Kropp, Stoker, and Bashaw, 1966; Stedman, 1973) which has verified the cumulative hierarchical relationship of the first four categories (levels) of Bloom's (1956) Taxonomy.

Although a considerable amount of research has demonstrated the

effectiveness of objectives in increasing knowledge level learning of material specified by the objectives, critics (Eisner, 1967; Ebel, 1970; Carver, 1972) have claimed that these increments in learning occur at the expense of material not specified by the objectives. The research literature does not provide a conclusive answer to this charge. Although the research of Kaplan and his associates has demonstrated either enhancement or no change in learning of material incidental to the objectives, other research (Duchastel and Brown, 1974; Frase and Kreitzburg, 1975) has found decrements in incidental learning. However, the research literature provides no information concerning the effects of objectives on higher levels of incidental learning.

Thus, for enhancing higher levels of learning from prose text, the effectiveness of providing objectives at higher levels has not been demonstrated, particularly with prose texts of the type found in secondary schools. In order to provide information not currently found in the research literature, five research questions and five hypotheses were formulated.

Data were obtained from 266 tenth and eleventh grade students from two predominantly upper-middle class, suburban schools. Analysis of variance procedures were used to analyze the data, answer the research questions, and test the typotheses.

Conclusions

Within the limits and findings of the present study, the following conclusions are suggested.

Hypothesis One: Incidental learning was not effected by the presentation of objectives.

Hypothesis Two: Relevant learning was not enhanced by the presentation of objectives stated at corresponding levels. Thus, the presentation of objectives stated at different levels did not enhance learning on either objective-relevant or objective-incidental tasks at the corresponding levels.

Hypothesis Three: Relevant learning at higher levels was not enhanced by presentation of objectives stated at lower levels.

Hypothesis Four: Relevant learning at lower levels was not enhanced by presentation of objectives stated at higher levels. Thus, presentation of objectives stated at different levels did not enhance learning on objective-relevant tasks at either higher or lower levels.

Hypothesis Five: The presentation of objectives did not increase inspection time.

Limitations

As noted in Chapter III, the instruments used to measure learning were quite unreliable. As a result, these instruments did not discriminate between subjects who learned the material and those who did not. The unreliability may be attributed to two factors. As demonstrated by Gulliksen (1950) reliability is a function of test length. The short tests, seven items, used in the present study were thus unreliable due to the small number of items. Additionally, mean scores were near the maximum possible for many of the treatment groups, resulting in a possible ceiling effect, which restricted the variability of scores.

Given the unreliability of criterion scores, the results of the Analysis of Variance was neither surprising nor conclusive. The finding of no differences, given unreliable measurement, cannot be construed as

evidence against the effectiveness of objectives for enhancing learning.

Under the null hypothesis, all expected cell means are zero. Given sampling errors, obtained means should distribute normally about zero, with half the observed values less than zero and half greater than zero. However, inspection of Table III reveals that only 11 of the 48 cell means are less than zero. Using the normal approximation to the Binomial Test (Siegel, 1956), this result was found to be significantly different than chance ($z = 3.608$, $p < .001$). Thus, the number of means larger than the expected mean of zero was greater than would be expected from the chance distribution under the null hypothesis.

Mean scores for each of the eight treatment groups were analyzed using the Binomial Test. Results are presented in Table VIII. As can be seen in Table VIII, the numbers of means larger than zero are significant for the group receiving the Knowledge objective ($p = .016$), the Application objective ($p = .016$), and both Knowledge and Application objectives ($p = .016$). No group receiving a Comprehension objective had more mean scores greater than zero than would be expected by chance.

The results of the above re-analysis apparently contradict the results of the Analysis of Variance. However, the Binomial Analysis is not without limitations. Means as small as .003 are treated the same as means as large as .424. Information used in the Analysis of Variance was lost in the Binomial, which operates on only nominal level data. Additionally, several means could have fallen into different categories given changes in the number correct of only one point for only one or two students. Given the unreliable measurement reported above, the categorization of means into the two groups is not totally reliable. The total pattern (e.g., 36 of 48 means greater than zero) is quite

strong however, and may indicate a weak effect of objectives on learning from prose text.

TABLE VIII

FREQUENCIES OF MEANS LESS THAN AND GREATER THAN ZERO

Group	f-*	f+**	Binomial Probability
Control	3	3	.656
K Objective	0	6	.016
C Objective	3	3	.656
A Objective	0	6	.016
KC Objective	2	4	.344
KA Objective	0	6	.016
CA Objective	1	5	.109
KCA Objective	2	4	.344

*f-: frequency of cell means less than zero
**f+: frequency of cell means greater than zero

Recommendations

The present study has not provided strong support for the position that presentation of written objectives enhances learning from prose text. However, due to the limitations and findings of this study, the following recommendations are made.

1. Care should be taken in future research to employ criterion tests of sufficient length to provide adequate reliability. The items should also satisfy the requirements of the theoretical framework employed. Thus, future research should employ either test items which have been validated according to the require-

ments provided by Guttman (1953, 1968), or test items specifically developed and validated prior to use in studies of the effects of objectives on learning from prose materials. The number of items should be large enough to ensure adequate reliability.

Additionally, increased attention should be devoted to procedures employed for motivation of experimental subjects. The present study emphasized competition between two schools having a rather intense rivalry. Subjects may have been motivated enough to produce the possible ceiling effect noted previously.

2. Future research should also include training in the use of behavioral objectives. Specifically, this training should include the hierarchical nature of objectives, and should include instruction in the use of mnemonic strategies (e.g., rehearsal, elaboration, visual imagery, keywords, linking methods).

3. Although this study found no effects of objectives on higher level learning tasks, the similar finding of no effects on knowledge level learning might cast some doubt on the validity of these findings. The research literature clearly shows objectives to enhance knowledge level learning from prose text. However, this study differed from those reported in the literature in several important ways.

First, most of the studies reported in the literature employed highly factual and information laden prose text. The prose text employed in this study was more representative of, and similar in structure and form to, the type of prose found in high school texts. Although the results found in this study appear to support the criticism (Eisner, 1967; Ebel, 1970) that objectives do not aid comprehensive learning, as noted previously, this conclusion cannot be drawn due to the limitations imposed by the unreliable measurement.

Second, most studies in the literature have employed relatively large numbers of highly specific knowledge level objectives. Many of these objectives have contained the exact information to be learned and the ratio of objectives to number of sentences in the text has often ranged from 1:5 to 1:1. Essentially these procedures have presented the learner with the specific information to be learned twice, with the reading of the prose text serving as a second practice trial on the information to be learned. It is, therefore, not surprising that the learning of that information was enhanced or that the amount of inspection time increased. In this study the objectives did not contain the specific information to be learned but rather directed the learner toward types of information and how it should be processed. The number of objectives was relatively small. Thus, it may be that the effects reported for objectives, in terms of increased learning and increased inspection time, are more a function of having more than one practice trial on specific information than a function of directing the learner's attention to different points in the material to be learned.

The practice hypothesis should be tested. Providing objectives with a prose segment could be compared with the effects of providing the sentences referenced by objectives following and/or preceding the prose segment. Equivalent performance would indicate support for a practice effect rather than a selective attention effect.

4. Given the failure of the groups receiving objectives to spend more time inspecting the reading passage, it seems plausible that the subjects did not attend to the objectives. More specifically, the non-behavioral action verbs (e.g., recognize, summarize, specify and apply) may not have resulted in cognitive processing changes. Although as

noted by Miles and Robinson (1971), the purpose of non-behavioral action verbs is to suggest to the learner certain cognitive processing activities (e.g., rehearsal, elaboration), it is possible that the subjects in this study either were not aware of alternate processing activities or chose not to employ them. It is interesting to note that two previous studies (Morse and Tillman, 1972; Sink, 1973) attempted to train students in the use of behavioral objectives but found such training to be ineffective in producing changes in learning. However, the training emphasized in these two studies did not focus on specific memory strategies. Training in the use of objectives and specific cognitive strategies appears to be a potentially important issue for future studies of the effects of objectives on learning from prose text.

5. The failure to find any discernible pattern among the efficiency indices, while not surprising given the lack of difference in both learning and inspection time, is still noteworthy. Treatment group indices deviated by as much as .21 from the control group efficiency index of 1.0. Faw and Waller (1976) devote considerable space to discussing efficiency indices computed for treatments which did produce significant differences in learning as a result of the presentation of objectives. However, the indices which they found for these treatment groups generally showed deviations of the same general magnitude as those found in the present study. If treatments which do not produce learning differences can result in efficiency indices which deviate from control group indices by the same amount as is found for treatments which have produced learning differences, the validity and usefulness of the efficiency index must be seriously questioned.

Thus, it is recommended that the efficiency index not be used for

assessing the effects of interventions on learning. This recommendation is made on the basis of the findings of this study, which included efficiency indices of the magnitude reported for studies which found differences in learning. Thus, the efficiency index does not discriminate between studies which: (1) find no differences in learning and no differences in inspection time; (2) studies which find differences in learning but no differences in inspection time; (3) studies which find differences in both learning and inspection time. The weakness of the efficiency index is exacerbated by the lack of a statistical test for testing the chance occurrence of indices deviating from 1.0.

6. Future research in the area of objectives and prose learning should address itself to the issue of individual differences among learners. Specifically, variables indicating specific abilities and prior achievement in reading should be included. It is conceivable that learners possessing particular skills and achievements may be differentially affected by the presentation of objectives. The present design, which assigned subjects to treatments randomly, was not sensitive to this potentiality. Other variables which might add clarification to the effects of objectives include cognitive style variables, particularly field independence-dependence and reflectivity-impulsivity.

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APPENDIX

STIMULUS MATERIALS

The stimulus materials are presented in the following order: Directions; The instructions for the eight treatment conditions; The reading passage; Test instructions; The test. Test items are keyed as to their level (K - Knowledge, C - Comprehension, A - Application) and type (R - Relevant, I - Incidental).

DIRECTIONS

I am interested in your ability to apply skills and understandings which you have been learning since you entered school, and I appreciate your participation in my study. Specifically, I am studying how students like you learn from things you read, and how different instructions affect how you learn from things you read. I am conducting this study in several schools, including other schools in Putnam City, and will compare how well you do with how well students in P. C. North do, so try to do the best you can. After I have scored your tests and analyzed your scores, I will report back with information about how well your class and your school did in relation to P. C. North.

The following pages are divided into three parts: (1) Instructions; (2) A reading passage; and (3) A test over the reading passage. When I tell you, turn the page and read your specific instructions. Then, follow those instructions as you read the passage. While reading the passage, you may refer back to the instructions if you wish, but you may not take notes or make any marks in the reading passage (for example, underlining).

As soon as you finish reading, RECORD THE TIME in the box at the end of the passage. When you have done this, begin answering the test questions. For each question, circle the number of the answer you think is correct. After you begin the test, you may not refer back to the reading passage. Answer as many questions as you can, but do not spend a lot of time on any one question. If you are not sure about the answer to a question, choose the answer you think is best, and go on to the next question. Answer the questions as quickly as possible.

DO NOT TURN THE PAGE UNTIL TOLD TO DO SO

SPECIFIC INSTRUCTIONS

A passage titled "The Lisbon Earthquake" begins on the next page. After you finish reading, there are questions which will test your understanding of what you have read. Read the passage carefully and do your best.

TURN THE PAGE AND BEGIN READING

SPECIFIC INSTRUCTIONS

A passage titled "The Lisbon Earthquake" begins on the next page. After you finish reading, you should be able to correctly answer questions which require you to:

-Recognize the names of the philosophers and political leaders who reacted to the earthquake, and recognize their arguments about the earthquake.

EXAMPLE: Read and answer the question.

Although Paine admired Burke, and considered him to be a "friend to mankind," Burke's Reflections on the French Revolution, in which he defended the Monarchy of France, prompted a reply by Paine in The Rights of Man. In this book, Paine, who was supported by Thomas Jefferson, complained about both young children and old people having to beg in order to survive, and put the blame on government for failing to provide for the people.

--Test item for "RECOGNIZE" instruction:
The Rights of Man was written by
1. Jefferson
2. Burke
3. Paine
4. Franklin

The correct answer is 3. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test.

TURN THE PAGE AND BEGIN READING

SPECIFIC INSTRUCTIONS

A passage titled "The Lisbon Earthquake" begins on the next page. After you finish reading, you should be able to correctly answer questions which require you to:

-Define and summarize the arguments of the learned spokesmen of the time.

EXAMPLE: Read and answer the question.

Although Paine admired Burke, and considered him to be a "friend to mankind," Burke's Reflections on the French Revolution, in which he defended the Monarchy of France, prompted a reply by Paine in The Rights of Man. In this book, Paine, who was supported by Thomas Jefferson, complained about both young children and old people having to beg in order to survive, and put the blame on government for failing to provide for the people.

--Test item for "DEFINE AND SUMMARIZE" instruction:
Given Paine's political philosophy, "friend to mankind" probably means that
1. Burke made large contributions to charity
2. Burke supported more individual freedom
3. Burke supported Paine's political writings
4. Burke favored revolution by the common people

The correct answer is 2. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test.

TURN THE PAGE AND BEGIN READING

SPECIFIC INSTRUCTIONS

A passage titled "The Lisbon Earthquake" begins on the next page. After you finish reading, you should be able to correctly answer questions which require you to:

-Specify relationships among the arguments of the learned spokesmen of the time and apply them to current situations.

EXAMPLE: Read and answer the question.

Although Paine admired Burke, and considered him to be a "friend to mankind," Burke's Reflections on the French Revolution, in which he defended the Monarchy of France, prompted a reply by Paine in The Rights of Man. In this book, Paine, who was supported by Thomas Jefferson, complained about both young children and old people having to beg in order to survive, and put the blame on government for failing to provide for the people.

--Test item for "SPECIFY AND APPLY" instruction:

What is the relationship between the following statements?

A. Paine wrote The Rights of Man
B. Burke wrote Reflections on the French Revolution

1. A caused B
2. B caused A
3. A and B are related, but one did not cause the other
4. A and B are unrelated

The correct answer is 2. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test.

TURN THE PAGE AND BEGIN READING

SPECIFIC INSTRUCTIONS

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-Recognize the names of the philosophers and political leaders who reacted to the earthquake, and recognize their arguments about the earthquake.

-Define and summarize the arguments of the learned spokesmen of the time.

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The correct answers are 3, 2. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test.

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The correct answers are 2, 2. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test.

TURN THE PAGE AND BEGIN READING

SPECIFIC INSTRUCTIONS

A passage titled "The Lisbon Earthquake" begins on the next page. After you finish reading, you should be able to correctly answer questions which require you to:

-Recognize the names of the philosophers and political leaders who reacted to the earthquake, and recognize their arguments about the earthquake.

-Define and summarize the arguments of the learned spokesmen of the time.

-Specify relationships among the arguments of the learned spokesmen of the time and apply them to current situations.

EXAMPLE: Read and answer the questions.

Although Paine admired Burke, and considered him to be a "friend to mankind," Burke's Reflections on the French Revolution, in which he defended the Monarchy of France, prompted a reply by Paine in The Rights of Man. In this book, Paine, who was supported by Thomas Jefferson, complained about both young children and old people having to beg in order to survive, and put the blame on government for failing to provide for the people.

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1. A caused B
2. B caused A
3. A and B are related, but one did not cause the other
4. A and B are unrelated

The correct answers are 3, 2, 2. Check to make sure you understand why.

Remember, you may refer back to the instructions while reading the passage, but not after you begin the test. TURN THE PAGE AND BEGIN READING

THE LISBON EARTHQUAKE

Some catastrophes demand of man far more than relief and rehabilitation: they literally call for rethinking on a universal scale. This was so with the man-made disaster of Hiroshima. Similarly, the great earthquake at Lisbon on November 1, 1755, shook the minds of men.

While controversy surrounds most statistics dealing with the Lisbon earthquake, there is little doubt that it is one of the most severe recorded. Voltaire's classic description in the story, Candide, vividly paints the tragic scene after the earth started to tremble under the feet of the people of Lisbon: "The sea rose in foaming masses in the port and smashed the ships which rode at anchor. Whirlwinds of flame and ashes covered the streets and squares; the houses collapsed, the roofs were thrown upon the foundations, and the foundations were scattered; thirty-thousand inhabitants of every age and both sexes were crushed under the ruins."

In all, there were three shocks. The first, which lasted two minutes, shook the earth so slightly that an eyewitness recalled that he thought it had been caused by a passing vehicle. Two minutes later, a second quake was felt, and this time its violence left no doubt as to what it was. During its ten minute visitation of terror, the dust from falling buildings was so great it obscured the sun. Next came another awful tremor, and the buildings which still remained standing now came tumbling down, bringing added dust, and plunging the city into total darkness. After twenty minutes of death-spelling noises, all became quiet. Then, to quote an eyewitness, "a very boisterous (stormy) wind" suddenly arose, fanning the flames of the candle-fed fires which had broken out all over the city.

Unfortunately, a combination of circumstances made the disaster greater than it might otherwise have been. For one thing, the quake occurred on All Saint's Day, which meant that candles had been burning since early morning in homes and churches. Then, to make matters worse, the earthquake struck at a bad time: shortly before ten in the morning -- an hour when most of the people were at church. The violent movements of the earth caused the roofs of heavy stone to topple on the congregants, who, if they were not crushed to death, died in the flames.

The people experienced all the possible elements of horror. To the falling stones and fires must be added the forty foot tidal wave which engulfed those who rushed to the quays after having escaped the earlier shocks. Furthermore, man, or at least a lower species, contributed looting and murder to the scene of dispair. Valuable records, irreplaceable documents were lost, and, since there exists no inventory of Lisbon's art treasures of that time, we cannot even guess what the world has lost.

The older, medieval section of Europe's westernmost capital was completely destroyed. So, for that matter, were the towns within a distance of 20 leagues "I write to you from the depths of the country," complained a survivor, "for there is not a habitable house left. Lisbon

has vanished!" Built on a more substantial foundation of basalt, the newer section of Lisbon survived the earthquake.

The Lisbon earthquake, whose tremors were reportedly felt as far north as Norway, and as far south as North Africa, made a profound impression on Europe. Great Britain was the first to offer help. Parliament voted the then tremendous sum of one hundred thousand pounds to aid the victims, in addition to gifts of food and clothing. Spain changed her tariff laws to favor Portugal's recovery. Also, large sums of money and provisions from all over Europe were generously offered by sympathetic nations and individuals.

Like today's moral and intellectual repercussions from man-made disastrous weapons, Lisbon's disaster registered severely on the mental siesmographs of some of the outstanding thinkers of the eighteenth century. A noted historian of Portugal declares that to the little country on the Iberian Peninsula, the earthquake was "more than a cataclysm (disaster) of nature; it was a moral revolution."

So shattered was the moral and material structure of Lisbon society that it was seriously proposed that the government be transferred to Rio de Janeiro, the capital of its great colony! Fortunately, the crisis brought to complete power a ruthless, but exceedingly capable dictator, Pombal.

He was appointed Minister of Foreign Affairs and War by King Jose I in 1750 and quickly established himself as a dominant figure in Portuguese politics. The earthquake provided an opportunity for him to obtain complete power. On the day after the earthquake, he told the Chief Justice to appoint a special magistrate for each of the twelve wards of the city. These magistrates were given authority to carry out the government's emergency directives. Troops were rushed to Lisbon in order to maintain law and order, and to assist in clearing up the ruins. Pombal's immediate concern was to prevent a plague; steps were taken to remove the bodies of men and animals from the ruins as quickly as possible, pools of stagnant waters were drained and contaminated food was destroyed. A most urgent matter was providing food and shelter for the survivors. Food centers were established and field kitchens were built. Prices of food and building materials were strictly controlled to prevent profiteering. Steps were taken to prevent looting. On November 4, immediate public execution after a summary trial was ordered for those caught looting the ruins.

Although many of Pombal's reforms were short lived, his great schemes and actual reforms shook Portuguese society loose from its medieval foundations. Starting with physical reconstruction while Lisbon was still smouldering, he built a new and more modern city. Temporary wooden structures were constructed outside the city to provide emergency housing and governmental offices. In early 1756, Pombal ordered unauthorized building in stone or brick stopped and the city was rebuilt according to a master plan. Taxation, civil law, and public administration were reformed, new industries were set up, communications were improved, colonial relationships were re-evaluated, and education was revamped. Above all, by his ensuing power conflicts with the nobil-

ity and the clergy, Pombal helped Portugal advance on the road to a more modern society.

Meanwhile, elsewhere in Europe numerous accounts of the great earthquake were being published in virtually all languages. More than 20 reports, not including magazine articles, were published in 1755 in England alone! The great philosopher Immanuel Kant took time out from his studies to write a great book on the theory of earthquakes. But the intellectual crisis in which Eurpoe was embroiled for almost all the rest of the century took place mainly in France. Basically, the great quarrel of the age concerned the validity of the popular optimistic philosophy (hopeful outlook) of Leibniz, who believed that "What is, is Right," and that this is the "best of all possible worlds."

Leibniz stated that man could have no free will in a perfect world, and that "Our world is suited to our desires and appetites." He believed that the world was built on a plan which harmonizes with the moral government of its inhabitants and theorized that the past, present, and future have already been set with as much order and harmony as possible. Leibniz surmised that "the world must be destroyed and repaired by natural means, at such times as the government of spirits may demand it for the punishment of some and the reward of others." He felt that evil tends to evoke a greater good in the long run and maintained, "It is impossible to make the world better than it is, not only as a whole and in general, but also for ourselves in particular."

Voltaire, in his long poem, "The Lisbon Earthquake," vigorously attacked the Leibniz philosophy. He regarded it as unprogressive in that "physical evil deserved man's attention." It was also a cruel dogma, he believed, in that it implied that "your particular misfortune is nothing; it contributes to the universal good." Voltaire expressed faith in progress which, he said, depended upon the good sense of mankind.

Leibniz, however, held that we should be content with the order of the past because it is in conformity with the absolute will of God. Although Leibniz suggested that we should make the future in conformity with the presumed will of God, he cautioned against becoming upset if we were unsuccessful.

Rousseau, in an impassioned refutation (answer), maintained an "all is good" theme. Man must be patient and recognize evil as the consequences of his own nature. Furthermore, Rousseau claimed that civilization had corrupted man. Although Rousseau looked to the past and said progress was an illusion, he was later to expound, in his Social Contract, a theory of rule by the consent of the governed and actually advocated revolt by the people if they were unfairly ruled.

In Candide Voltaire, as we know, returned to the fray with slashing attacks on Rousseau and Leibniz for their views concerning human progress. Practically all the philosophers of the eighteenth century took sides in what has been called the "theology of earthquakes." Such was the exchange of arguments, in fact, that the wordy Dr. Johnson complained that he was weary of hearing about the subject.

While no such clear-cut philosophical discussion fills our twentieth century air, we scarcely need be reminded that, once again, recent catastrophes have sent man to meditate on life's eternal questions. Obviously, man is worried about possible misuse of fission and fusion.

In addition, Nature, with her unlady-like hurricanes of recent years, and the devastating floods of the past summer, has intruded into what had begun to seem to many like a man-manipulated world. While we are, today, better equipped for relief and rehabilitation than the Portuguese were two hundred years ago, it is well to remember that as in the case of the Lisbon disaster, the Northeast floods were not even predicted, much less staved off.

Nature's calamities and their aftermath of re-evaluation are still very much with us.

BE SURE TO RECORD

TIME _____

THE TIME HERE _____

The following questions will test your understanding of the passage "The Lisbon Earthquake."

Circle the answer you think is correct.

Do not refer back to the reading passage.

Do not spend too much time on any one question. If you are not sure about an answer, pick the one you think is best and go on to the next questions. Answer the questions as quickly as possible.

1. Who was the author of Candide?

KR
1) Kant
2) Leibniz
3) Rousseau
4) Voltaire

2. The disasters at Hiroshima and Lisbon were alike in that both:

KR
1) happened in the spring.
2) were man-made.
3) called for universal re-thinking.
4) were earthquakes.

3. How many earth shocks were felt in the Lisbon earthquake?

KI
1) Two
2) Three
3) Four
4) Five

4. What was Voltaire's profession?

KR
1) Orator
2) Writer
3) Painter
4) Physician

5. How long was the first earthquake shock at Lisbon?

KI
1) Two minutes
2) Ten minutes
3) Twenty minutes
4) Thirty-two minutes

6. On which of the following days did the Lisbon earthquake occur?

KI
1) All Saint's Day
2) Christmas
3) Easter
4) Good Friday

7. Which of the following <u>was</u> <u>not</u> true of the Lisbon Earthquake?

KI
1) It happened during evening services.
2) A tidal wave also struck.
3) The sun was obscured part of the time.
4) It occurred about 10 o'clock in the morning.

8. The newest section of Lisbon survived the earthquake because:

KI
1) it was the most westerly part of the city.
2) there was only one tremor in that section.
3) it was built on a basalt foundation.
4) there was no fire in that section.

9. Immediately following the earthquake, Pombal's major concern was to:

KR
1) rebuild the city.
2) prevent looting.
3) provide shelter.
4) prevent a plague.

10. Prices of food and building material were strictly controlled after the earthquake to prevent:

KI
1) inflation.
2) profiteering.
3) shortages.
4) waste.

11. Persons caught looting the ruins were punished of execution:

KI
1) without a fair trial.
2) by the soldiers who caught them.
3) after a summary trial.
4) after a long delay.

12. Voltaire's poem, "The Lisbon Earthquake," was an attack on:

KR
1) Pombal's emergency directives.
2) Leibniz's philosophy.
3) Kant's philosophy.
4) King Jose I's lack of action.

13. Rousseau considered that the misfortunes resulting from the earthquake were nothing compared with the good which ultimately resulted from it. Which one of the following agreed with him?

KR
1) Johnson
2) Kant
3) Leibniz
4) Voltaire

14. Order the following statements according to the time of occurrence.

A) Countries offered goods or concessions to aid Portugal's recovery.
B) A severe earthquake destroyed much of the capital of Portugal in 1755.
C) A great deal of moral and intellectual discussion took place concerning the earthquake.
D) The rebuilding of Portugal, especially of the city of Lisbon, went hand in hand with a reform movement.

The correct order is:
KR
1) B, A, D, C
2) B, D, A, C
3) B, C, D, A
4) B, D, C, A

15. Dr. Johnson said that he was "weary of hearing about the subject." He was dissatisfied with the:

CR
1) lack of interest in the Lisbon problem.
2) overly optimistic viewpoint of others.
3) lack of interest in philosophical arguments.
4) amount of material written about the subject.

16. Of the statements below, the one which means the opposite of "This is the best of all possible worlds" is:

CR
1) "Progress is our most important goal."
2) "Let sleeping dogs lie."
3) "Better safe than sorry."
4) "Moderation in all things is to be desired."

17. The article states that the tremors of the Lisbon earthquake were felt over a wide area. In which of the following countries were these tremors most violent?

CI
1) England
2) Germany
3) Italy
4) Spain

18. "Man or at least a lower species contributed looting and murder to the scene of despair." In this sentence, "lower species" most nearly means:

CR
1) non-noblemen and working men
2) looters and robbers
3) animals of high order
4) morally inferior men

19. Which of the following conditions would have resulted in the reduction of damage to the older section of Lisbon?

CI
1) The existence of a basalt foundation under all of Lisbon.
2) The occurrence of the earthquake on a nonreligious holiday.
3) The use of wooden roofs for buildings.
4) The location of the center of the earthquake ten leagues away.

20. The number of persons killed in the earthquake was undoubtedly increased because stones were used for:

CI
1) sea walls.
2) streets and sidewalks.
3) sidewalls of buildings.
4) roofs of buildings.

21. A viewpoint which cannot be found in the reading passage is that of:

CR
1) an observer.
2) a scientist.
3) a philosopher.
4) an historian.

22. "What is, is right," is most nearly equivalent to:

CR
1) "What is to be, will be."
2) "The end justified the means."
3) "Might makes right."
4) "The sky is the limit."

23. Why were most of the discussions of the Lisbon earthquake philosophical?

CR
1) Few written accounts were available.
2) There were few survivors.
3) There was no accurate means of describing the disaster.
4) Philosophers were the spokesmen of the time.

24. A "mental seismograph" is a:

CR
1) Scientific device for detecting ideas.
2) Figure of speech for the mind.
3) Mental record.
4) Mechanical device for recording earthquakes.

25. How could you best describe the statement that "Lisbon has vanished?"

CI
1) Absurd.
2) Accurate.
3) Exaggerated.
4) Unsubstantiated.

26. The greatest damage to articles such as books, tapestries, and paintings was probably caused by:

CI
1) fire.
2) tremors.
3) water.
4) wind.

27. The article states that there were four primary causes of death in the Lisbon earthquake. Which one probably took the fewest lives?

CI
1) Falling objects
2) Fire
3) Murder
4) Tidal wave

28. If the Lisbon earthquake had happened after Thomas Edison invented the light bulb, which of the following would have been most likely?

CI
1) The tidal wave could have been averted.
2) There would have been fewer fires.
3) There would have been a minimum amount of dust.
4) The "boisterous," stormy wind would not have arisen.

29. What is the relationship between the following statements?

A. Charging of unreasonable prices for rent.
B. Rent control following the earthquake.

AI
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

30. What is the relationship between the following statements?

A. Many ships were destroyed during the earthquake.
B. Tariff regulations were changed following the earthquake.

AI
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

31. Which of the following philosophers would have most likely supported Pombal's policies?

AR
1) Kant
2) Leibniz
3) Rousseau
4) Voltaire

32. What is the relationship between the following statements?

A. Voltaire's poem "The Lisbon Earthquake."
B. Leibniz's philosophy.

AR
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

33. What is the relationship between the following statements?

A. Scarcity of food.
B. Scarcity of building materials.

AI
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

34. In what way were the results of the destruction of Hiroshima similar to those of the Lisbon earthquake?

AR
1) What Pombal did for Lisbon, the U.S. military government did for Hiroshima.
2) The disaster led to philosophical arguments around the world.
3) Hirohito strengthened his position in Japanese government and used dictatorial powers to help his people.
4) The large nations of the world came to the aid of the citizens of Hiroshima.

35. If you lived in a country where most of the citizens were poor and lived in slums and the rulers were rich and lived in palaces, what would you do if you believed in the later teachings of Rousseau?

AR
1) Urge the people to revolt against the rulers.
2) Urge your fellow citizens to let well enough alone.
3) Urge the government to build schools for the poor.
4) Remind your fellow citizens that progress is bound to occur.

36. Which of the following statements best represents Pombal's philosophy of life?

AI
1) What is to be, will be.
2) Might makes right.
3) God punishes guilty and innocent alike.
4) Bury the dead and feed the living.

37. If an earthquake of the same magnitude as the Lisbon earthquake were to occur today in a large U.S. city,

AI
1) aid would be needed from foreign countries.
2) the city would be self-supporting, and outside aid would be unnecessary.
3) a philosophical argument similar to Lisbon's would begin.
4) it would make headlines for a few weeks, then it would be forgotten.

38. Which of the following statements is best supported by the philosophy of Voltaire?

AR
1) Social welfare programs should be curtailed.
2) The American foreign aid program should be eliminated.
3) People with children in school should pay a tax to support education.
4) Big cities should start slum clearance projects.

39. What is the relationship between the following statements?

A. There were many fires in Lisbon after the earthquake.
B. Most of the inhabitants of Lisbon observed religious holidays.

AI
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

40. What is the relationship between the following statements?

A. An earthquake.
B. The rise of a dictator.

AI
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

41. What is the relationship between the following statements?

A. A philosophical controversy which lasted the better part of a century.
B. The Lisbon earthquake.

AR
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

42. What is the relationship between the following statements?

A. Voltaire, Rousseau, and other prominent philosophers were Frenchmen.
B. The center of controversy regarding the "Theology of Earthquakes" was in France.

AR
1) A caused B.
2) B caused A.
3) A and B are related, but one did not cause the other.
4) A and B are unrelated.

VITA

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