ABSTRACT
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falsify the necessary association between the objectives and their use that
results when AOs are used. Students (n=684) aged 12 to 19 in 17 classes in 8
schools were shown different lists of 4 objectives for 10 minutes of a
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used. In all, 234 students correctly recalled all 4 objectives. Of these, 70
(29.6%) could not identify the unused objective. These 70 cases falsify the
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rankings of these students from previous class tests indicated that an
emphasis on memory and a de-emphasis on structuring learning may have
discouraged the use of LIOs as AOs. (Contains 3 figures, 3 tables, and 48
references.) (Author/SLD)

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A Test of the Instructional Strategy of Using Advance Organizers

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Abstract

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Introduction

This research uses an alternative design to determine whether students use Lists of Instructional Objectives (LIOs) as Advance Organisers (AOs) to aid learning. The traditional design of lesson plans, and of workshop presentations, includes an initial presentation of a small set of instructional objectives for the lesson or presentation. These instructional objectives are thought to aid the learners in their organisation of the subsequently presented material which thus make learning more effective. Used in this way, these initially presented instructional objectives are referred to as Advance Organisers (AOs). This supposition seems plausible from the perspective of the teacher or presenter because these objectives have been chosen by the teacher or presenter as being those that best categorise the material to be presented. However, if we question this supposition from the perspective of a naive student it seems unlikely that objectives that are not initially understood could be used to categorise or otherwise structure the material subsequently presented. This is simply because the meaning of categories is derived from prior knowledge of commonalities among their contents. The teachers or presenters have this knowledge and can hence use the instructional objectives as categories to meaningfully structure the content that they know, but the students do not have this knowledge and so can not use the objectives to structure the content that is yet to be presented.

The purpose of the present study is to use an alternative research design to determine whether students do use the LIOs presented at the beginning of a lesson as AOs to organise the content that is presented subsequently in the lesson. 'Advance Organiser' is a term coined by Ausubel as part of his Subsumption Theory of learning (Ausubel, 1963, 1968, Ausubel, Novak, & Hanesian, 1978).

> "These organizers are introduced in advance of learning itself, and are also presented at a higher level of abstraction, generality, and inclusiveness; and since the substantive content of a given organizer or series of organizers is selected on the basis of its suitability for explaining, integrating, and interrelating the material they precede, this strategy simultaneously satisfies the substantive as well as the programming criteria for enhancing the organization strength of cognitive structure." (Ausubel, 1963 , p. 81).

"Advance Organizers present information before a lesson to make the lesson content more meaningful and easier to understand. The information in the Advance Organizer is presented at a higher level of abstraction and generality than the lesson content to aid the learner in subsuming or integrating the new material." (Dembo, 1991. p. 291).

Traditionally, research designs testing AOs have considered the 'fine grain' of how instructional objectives may have interacted with the learning process in relation to the specific subject content, student variables, level of content complexity, styles of learning and teaching, materials used and types of learning outcome. These research designs have been unable to control for all these variables and their complex interactions. Consequently, some research has determined that instructional objectives do aid learning whilst other research has determined that instructional objectives do not aid learning. Yet other research has determined that instructional objectives have varying degrees of success which depend upon attributes present in the research contexts reported. To resolve these contradictions, this study uses an alternative design that seeks to falsify a necessary assumption in the generic process of using instructional objectives.

The set of objectives given at the start of a lesson are here defined as the instructional objectives intended as AOs for the lesson. This definition is in keeping with the definition of AOs and with teachers intentions to inform students of these objectives at the start of their lessons so as to help them learn more effectively by structuring the material to be presented. In this study four objectives were presented for the first ten minutes of a thirty minute lesson. However, one randomly chosen objective was not used during the lesson. At the end of the lesson students were asked to list the four objectives and tick the one that was not used. It was hypothesised that, if a student could remember the four objectives and needed three of them to structure the content then he or she would be able to recognise the one objective he or she did not need to use. This is because a minimum necessary assumption in presenting the instructional objectives for use is that the recognition of the objectives will be associated with their use. The hypothesis for this study tests the existence of this necessary association. Whereas the traditional designs depend on the later measurements of the success with which the objectives are used, this design is independent of these subsequent conditions and thus intends to circumvent previous problems. The design was replicated over 17 lessons in 9 content areas in 8 schools with 684 students. The data were analysed by first identifying students who correctly remembered all four objectives. Secondly, finding if there are any cases of these students who could not identify the unused objective. These cases are evidence against the use of AOs.

Literature review

Contradictory research findings

Although there are few studies that directly compare the effects of different types of advance organizers (Story, 1998) many researchers have studied the affects of advance organizers in different content areas, ranging from languages to science, and with subjects ranging in age from pre-schoolers to older adults (Chiquito, 1995; Corkill, 1988a, 1988b; Dame, 1995; Groller, 1991; Harvey & Jahns, 1988; Healy, 1989; Kooy, 1992; LeSourd, 1988; Maier, 1993; Relan, 1991; Tajika, 1988). Some researchers have found that advance organizers improve aspects of learning such as recall, comprehension or transfer; yet others have found that advance organizers make no significant difference.

Multimedia advance organizers have been widely used in language teaching (Chung, 1996). For example, Julia Hanley (1995) compared the results of using 'video' with 'pictures' and with 'teachers' narrative' as advance organizers in language classes as did Carol Herron (1995) for teaching French. Advance Organizers have been found to improve content memory. Advance organizers had been successfully used in learning computing. Sook-Hi Kang (1997) found advance organizers made a significant difference in facilitating learning in a computer simulation environment and Loretta Cardinale (1991) found advance organizers facilitated learning for pre-service teachers in an introductory microcomputer class. Advance organizers seem to have been most successfully used to improve the recall of textual material, again, mainly in foreign language teaching. For example, Carol Herron, (1994) found that advance organizers consisting of several short sentences, written in

French, that summarised chronologically the events in the video, facilitated student listening comprehension, and Herman Teichert (1996) found that the use of advance organizers (with video- and audiotapes) developed superior listening skills in German classes. Steven Rinehart working with Mary Alice Barksdale-Ladd in 1991 found advance organizers worked to improve text recall by 30 seventh grade students who had reading problems. The following year Steven Rinehart, then working with William Welker (Rinehart & Welker, 1992) again reported that advance organizers did improve text recall by seventh grade students. Dennis Thompson (Thompson, 1998), working with adults (2 x n=40) found advanced organizers were useful only in the limited circumstances of helping those with low ability to comprehend textual detail. In a study of 35 middle school students Jim Snapp and John Glover (Snapp & Glover, 1990) also found that advance organizers helped recall. They found that students who read and paraphrased an advance organizer prior to study, correctly answered significantly more lower-order study questions than did students not encountering the advance organizer.

In contradiction to the above findings, many researchers have found that advance organizers make no significant difference. For example in science education, Elizabeth Bricker (1989) found advance organizers had no significant effect in her comparative study of students results in second, third, and fourth grader science programs. Similarly, in an experiment by Kirkland (1995) four teachers developed 15 lessons plans, each covering a different science topic in eighth grade science. These were presented to 317 students. Post-presentation tests showed that the presence or absence of advance organizers had no affect and that the comprehension of 68 special education students in the group was actually adversely affected by the presence of advance organizers. Houshmand Saidi (1994) found that advance organizers did not improve students' achievement in computer-assisted video instruction. Similarly, Moon K. Chang (1992) used advance organizers to aid students' learning by watching a film, yet found that the advance organizers had no significant effect. Joseph Lawton and Ann Johnson, (Lawton & Johnson 1992) used advance organizers to teach music to pre-schoolers and also found that found they had no significant effect upon the children's learning. Again, in two separate studies (n=33 and n=66) David Lane (1988) found advance organizers had no significant effect on the test performance of undergraduate students.

Counter indicative theoretical considerations

With so much evidence for and against we might ask if advance organizers work or not. It is obvious that presenters, trainers and teachers use instructional objectives to post-organise their knowledge. However, it does not seem plausible that an instructional objective that is not understood could be used to categorise information as it is presented by a teacher. This dependence of the advance organiser on prior knowledge was supported in reviews of the topic by Thomas Williams and Earl Butterfield, (Williams & Butterfield, 1992a , 1992 b) which showed that the effects of advance organizers on comprehension depend on the subject's previous knowledge. For example, verbal advance organizers assisted text comprehension of children with strong prior knowledge, while the addition of a pictorial component aids comprehension of children with weak prior knowledge (Townsend & Clarihew, 1989).

Classical memory experiments on the 'recency effect' by Herman Ebbinghaus, replicated by Mary Calkins in the 1890's and many researchers since (Bolhuis & Van Kampen, 1988; Madigan & O'Hara, 1992; Murray, 1976) have shown that the traditional sequencing of advance organizers before the learning to which they apply can be expected to reduce their effect. Experiments by John Glover (Glover, 1990) support this 'recency effect' expectation: Namely, that (a) the presentation of the later objectives that intervene between the first objectives and the content to which they apply and (b) the initial content that intervenes between the presentation of the last objectives and the content to which they apply, is unlikely to enhance the effects of these instructional objectives as advance organizers.

Methodological problems in trying to test Advance Organizers

In 1990 a review by John E. McEneany of four studies conducted by the originator of the concept, Ausubel, raised serious doubts about the efficacy of advance organizers under a variety of circumstances. In addition, this review questioned the adequacy of the definition of 'advance organizer'. These doubts introduced many problems in designing fundamental research on the concept of advance organizers that may have inhibited study,

but not use, of the concept since 1990. For example, the learning product that would be assessed as resulting from the way the advance organizer was used might depend on other variables that could be even more complex to control and assess - prior learning, learner motivation, complexity of the topic, quality of teaching, learning/ teaching style, etc. Even, equating criterion standards of learning products across content areas and age of learners and linking them to use of the advance organiser is a daunting task for research designers..

Method

Eight secondary school teachers were randomly selected from an in-service teacher training course in the Fiji islands to conduct this experiment in their own schools each with two different intact classes. One teacher enthusiastically used three different classes, giving 17 replications of the experiment in the nine content areas of Basic Science, Biology, Chemistry, English Language, English Literature, Geography, History, Mathematics and Physics. In total 704 Pacific Island students took part in the experiment, 388 males and 316 females, but after some loss of data due to missing values and spoilt returns only 684 were included in the analysis, 382 males and 302 females of which 568 attended urban schools and 116 attended rural schools. Class sizes ranged from 13 to 43 with a median of 33. The two main ethnic groups were 249 Native Fijians and 363 Indo-Fijians. The other 72 students derived from other pure and part South Pacific ethnicities. Their ages ranged from 12 to 19 with the mean at 16 years 1 week. These categories are given only to describe the sample. Results are not reported according to these categories because such results would not be relevant to the hypothesis being tested.

The teachers did not initially know the true purpose of this experiment and believed that the purpose was to observe differences in how students in their two classes made use of Instructional Objectives. The teachers were given a feedback form asking them 'What do you think happened in practice?', 'How do you account for your results?' and 'What differences were there between the two classes?' Content analysis of this feedback indicated that the teachers were not aware of the true purpose of the experiment before their debriefing. The teachers were each given an instruction sheet that contained the following aims and instructions.

Aims of this experiment

As teachers we often tell the students the lesson objectives at the beginning of our lesson. This is done because it is thought that they act as 'advance organizers' helping our students to better organize the information of the lesson. However, recent research suggests that this may not be the case. We would like you to collect some data <u>from two different classes</u> to help determine what actually happens in practice.

Please do the following in one of your normal single period lessons and then <u>repeat it with a different class</u>.
1. Choose 4 suitable objectives for your lesson and write them in alphabetical order on the board.
2. Tell your students not to copy them down and that "these 4 things are for this lesson", then carry on your lesson as normal.
3. Leave the 4 objectives on view for 10 minutes and then rub them off, carrying on your lesson as normal

BUT DELIBERATELY <u>DO NOT</u> COVER ONE OF THE OBJECTIVES

4. 10 minutes from the end of the lesson hand out the student assessment forms to be filled in. *(You may need to make some extra copies of the student assessment forms, and cut them up before your lesson, so that your students can have one form each to fill in)*
5. Give instructions to help the students fill in the forms *(see the Instructions to help your students fill in the assessment forms).*
6. When the forms have been completed collect them in and mark them.
7. Transfer the marks to the summary mark sheet.

It should be noted that the intended effect of listing the objectives in alphabetical order was to randomise the objectives. Some objectives needed to be taught sequentially and so objectives did not have to be taught in the order listed. The teaching time for a single lesson in these schools was 40 minutes. This was partitioned into 30 minutes for normal teaching including 10 minutes for students' responses. The objectives were on view for the first 10 minutes of the 30 minute teaching period which gave a generous 10:20 or 1:2 exposure/recall ratio of 0.5.

The format of the student assessment forms is shown in Figure 1.

Figure 1: Student feedback form

Name _____ __ __ ___ _____
Class ____ ___ **Teacher** _____ __ __ ___
Age |____| | **Sex m/f** | **F,I,PE,etc**

Write the 4 things
- •
- •
- •
- •

Tick the one that was not covered

The teacher's instruction sheet also gave the following instructions in order to standardise the administration of the students' forms

Instructions to help your students fill in the assessment forms

1. Tell your students to write their name on their forms and write in their other details (age, male or female; cultural group F, I, PE, etc. just the initials).
2. Remind them that, at the beginning of the lesson, you wrote 4 things on the board and said "these 4 things are for this lesson" and that you left them on the board for a long time.
3. Then ask them to remember these 4 things and write them on their forms.
4. When the students have remembered and written the 4 things, tell them that one of the 4 was not covered in the lesson and to tick the one (the only one) that was not covered.
5. Then collect in the assessment forms.

The following instructions and scoring example were also given to standardise scoring:

Instructions for marking the assessment forms

Read each of the 4 responses and give it a mark from 1 to 8 according to the following (they do not have to be in the right order or word-for-word correctly written): If the student did not write in a box then mark that box 0.

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ords in uppercase and underlined such as <u>COMPUTE</u> are the names of SPSS sub-programs.

Figure 2: Scoring instructions

Was it one of the 4 objectives?	yes				no			
Was it covered in the lesson?	yes		no		yes		no	
Did the student tick it?	y	n	y	n	y	n	y	n
Mark	1	2	3	4	5	6	7	(8)

Examples: no no n leads to the mark (8), yes yes y leads to the mark **1**,
yes no y leads to the mark **3**, and no yes y leads to the mark **5**.
In this example, the student's marks **8**, **1**, **3** and **5** would then be transferred to the summary sheet.

In addition teachers were also asked to record the student's rank in class for their last class test in the subject taught, if it was available. Instructions 6 and 7 resulted in summary sheets of data similar to the part sheet shown in Figure 3.

Figure 3: part of a summary data sheet for a class

Summary Sheet

No.	4 objectives (marked 0-8)				Age	Sex	F,I,etc	Rank
1	2	2	2	7	17	M	F	2
2	2	2	2	7	16	M	F	9
3	2	2	7	0	17	F	F	23
4	2	2	2	7	17	F	F	13
5	8	2	2	8	17	M	F	29
6	2	0	2	7	17	M	F	19
7	2	2	2	7	16	M	Sam	12
8	2	2	7	2	17	F	I	32
9	2	2	7	2	17	M	F	18
10	2	2	2	7	17	F	F	7

Details of the school, number in class, subject taught, teacher's particulars, objectives used and omitted were written on the back of these summary sheets to ensure these data would not get separated.

Principles of 'rigour' in the experimental designed were followed to:
  i) Bias the experimental conditions against the falsifying requirement (tipping the odds <u>against</u> the experimenter) as follows:
  a) Subjects were told that the 4 'things' are for this lesson. This was intended to encourage the respondents to use the objectives "to make the lesson content more meaningful and easier to understand". Note that the technical term 'objectives' was avoided.
  b) The 4 objectives were left in full view for 10 minutes to encourage their use as advance organisers.
  c) No correction for 'multiple choice guessing' was applied in the analysis. Hence, a respondent could identify, by chance, the objective that was unused. This chance of 1 in 4 (25%) was another bias against the falsifying requirement and favoured the interpretation that the respondent was using the objectives as advanced organisers.

d) In the main analysis, the respondents who were selected for comparison were those whose abilities most favour the assumptions that they used the objectives as advance organisers i.e. the respondents who had a perfect memory for the objectives.

ii) Psychologically optimise the respondents' ability to fulfil this falsifying requirement as follows

a) The experimental situation was designed so as to minimise its interaction with the responses by making the experiment part of a normal subject lesson, with a normal subject teacher, so students could respond in their normal way - minimising any possible experimental stress. Instructions were in an appropriate language register for the same purpose.

b) Only 4 objectives were used so as to minimise 'cognitive overload' while mitigating - at 1 to 4 against, possible multiple choice guessing when the respondent was asked to mark which of the 4 was not covered. A 1 in 3 choice (having only 3 objectives) would have introduced a possibly unacceptably high guessing error.

The data was then entered into SPSS for validity checking and analysis. The *COMPUTE sub-program was used to COUNT the frequency of each of the 9 possible responses for each respondent. These frequencies were then used for validity checking and for calculating the indices for hypotheses testing. Validity checking included the following:

a) Exactly one response should have been ticked. Ticked responses were marked 1, 3, 5 or 7. Hence, frequencies of these marks should total 1 for valid response sets. The coding forms of respondents whose odd categories did not sum to 1 were checked for data entry errors and corrected if possible. If not, the data from these respondents was deleted from the data base.

b) The rank order of any respondent should be not have been greater that the number of students in that respondent's class. Similarly, all marks should be less than 9. These conditions were also used to identify and correct errors.

Calculating the indices for hypotheses testing

Two indices were needed for hypothesis testing, a Memory Index (MI) ranging from 0 to 4 indicating the number of objectives each student correctly memorised, and an Indicator (I) to show whether the student identified the unused objective correctly. The correct identification of a stated objective that was not used in the lesson was indicated by a response scored 3. The 'I' variable was equal to the number of 3s in the respondent's scores. After, validity checking which discarded cases with I>1 the resulting values for I were 1 or 0, I = 1 or 0. It will be noticed that the scoring scheme allows for the identification of different sources of objectives. For example scores 5 and 6 identify written objectives that were derived from lesson content. However, only scores 1, 2, 3 and 4 indicate correctly remembered objectives from the LIOs so the MI is the COUNT of these scores. The SPSS coding for this, where the scores were entered into variables o1, o2, o3 and o4 respectively and n1 through n4 held the COUNT of how many ones, twos, threes and fours the student scored was as follows:

```
COUNT  n1 = o1 o2 o3 o4 (1)   .
COUNT  n2 = o1 o2 o3 o4 (2)   .
COUNT  n3 = o1 o2 o3 o4 (3)   .
COUNT  n4 = o1 o2 o3 o4 (4)   .
COMPUTE MI = n1 + n2 +n3 + n4    .
VARIABLE LABELS MI 'Memory Index' .
EXECUTE .
```

The value of n3, that is the number of threes the student scored, is the Identification index. Using the number of students in the class, the student's rank was converted to a percentile as an indicator of a student's academic standing in the class for the subject taught. This was done so that comparisons could be made between classes. In particular, so that it would be possible to compare the mean academic standing of students with an Identification Index of 0 and 1 for different values of MI.

Hypothesis testing

The minimum necessary outcome of the use of an AO is an association between recognition of the objective and action taken be the learner. This is true independently of the success of the action. Subjects are asked to recall the objectives and the actions in order to test the existence of this association. The recall of the objectives is explicit in instruction 3. The recall of the actions is implicit in instruction 4, 'to identify which objective was unused'.

If the test of Advance Organisers rested on Boolean logic, with events being either completely true or completely false, then only one counter example would suffice to disprove the use of AOs. Just one example would be needed of a student who could recall all the objectives but not recognise which had not been used. Similarly, to disprove that all birds can fly, one need not start collecting confirming evidence of birds that do fly. A scientist would follow Popper's falsifying principle and produce just one bird that cannot fly. Conversely, the human responses on which educational experiments depend follow a fuzzy probability logic not a Boolean logic. The theory of Advance Organisers associates the recognition of an objective with the use of that objective through the learner's action in using the objective. However, if this is done, that is the association exists, then the use of the objective would be easier to recall than the recognition of the objective. This is because the greater involvement in using the objective facilitates memory for using the objective more than it facilitates recognition of the objective. The use of self-action in learning has been shown to increase recall, and psychological research indicates that self-action is more readily recalled than verbal stimuli (Heil, Rolke, Engelkamp, Roesler, Oezcan, & Hennighausen, 1999; Kormi-Nouri, & Nilsson, 1998; Mimura, Komatsu, Kato, Yashimasu, Wakamatsu, & Kashima, 1998; Oliver, & Oliver, 1997; Potter, 1999). Hence, if the AO has worked, it is unlikely, but not impossible, that the objective will be recognised and its use not recalled. If an objective is recalled but not its use, then a more likely explanation, but not a deduced conclusion, is that the association has not been formed, that is the AOs have not worked. This fuzzy logic of human responses implies that one falsifying event is not conclusive and that we therefore need to collect sufficient falsifying events to infer that the use of AOs is extremely improbable.

Results

The following are some actual LIOs examples chosen as AOs by the teachers in different content areas, complete with English errors

ENGLISH
   complete the exercises.
   get most of the work correct.
   say what justice is.
   state two kinds of justice.

BASIC SCIENCE
   Classify organisms as producers, herbivores, carrrivores, ormnivores *(sic)* and decomposers.
   Describe the effects of decomposers on the plant materials.
   Make a food chain using a named organism.
   Observe that animals have different food preferences.

BASIC SCIENCE
   Differences between shadows and images.
   To be able to identify transparent, translucent and opaque substances.
   To show how light travels.
   What causes day and night.

ENGLISH
   Students should be able to identify at least 3 figures of speech used in the poem.
   Students should be able to make own interpretation about the poem.
   Students should have a general understanding of the poem.
   Students should relate the story in the poem to any stories they know which portrays the same meaning.

ENGLISH
    To be able to correct and isolate errors from the
    exercise in Mastering English.
    To be able to write out a bio-data of oneself.
    To discuss the language of 'legalise' *(sic)* from
    Target 6.
    To understand some common errors (grammatical)
    made by students in Essay Writing at the FSLC
    level.

ENGLISH
    How to write a biodata.
    Morality!! Is it needed in the classroom situation?
    To be able to evaluate a lesson and the
    performance of a teacher.
    To understand and discuss the exercises from unit
    8 in Target 5.

ENGLISH
    To be able to answer questions based on a legal
    document.
    To familiarise students with a legal document.
    To see similarities between a legal document and a
    religious text.
    To see some general characteristics of a legal
    document.

BIOLOGY
    Blood clotting and its significances.
    Blood groups in humans.
    The 4 different blood types (components of
    blood).
    The function of each blood component.

CHEMISTRY
    Be able to know what are the reactants used to
    produce oxygen.
    To identify the boiling points of oxygen.
    What colour of *(sic)* oxygen.
    What test for oxygen.

CHEMISTRY
    The meaning of combustions.
    The properties of carbon dioxide.
    To know the differences between complete and
    incomplete combustion.
    What are the products of combustions.

BIOLOGY
    Describe how mammals respond to stimuli.
    List the different stimuli that affect the organism.
    List the need for sensitivity and co-ordination.
    To differentiate the sensory systems of different
    organisms.

The distribution of correctly remembered objectives is shown in Table 1. The MI distribution ranged from 0 to 4 with a mean of 2.844 correct.

Table 1: Frequency distribution for the Memory Index

Memory Index	Frequency	Percent	Cum Percent
0	43	6.3	6.3
1	56	8.2	14.5
2	101	14.8	29.2
3	249	36.4	65.6
4	235	34.4	100
Total	684	100	

The two frequencies of the Identification Index were that 450 students (65.8%) could not correctly identify the unused objective, I=0, but 234 students (34.2%) were able to correctly identify the unused objective, I=1. The difference between the mean MIs of those who did identify the missing object and those who did not, 3.6581-2.4200=1.2381, was statistically significant at $p<0.001$. However the variation in the MI scores of those who did not identify the unused objective were considerable more varied than those you did, F=124.019, P< .001.

The cross-tabulation of the Memory Index with Identification is given in Table 2.

Table 2: Cross-tabulation of the Memory Index with Identification

| | Number of objectives correctly remembered | | | | | Row totals |
	0	1	2	3	4	
Students who <u>did not</u> identify unused objective						
Number	43	54	94	189	70	450
Column percentage	100.0%	96.4%	93.1%	75.9%	29.8%	65.8%
Students who <u>did</u> identify unused objective						
Number	0	2	7	60	165	234
Column percentage	0.0%	3.6%	6.9%	24.1%	70.2%	34.2%
Column totals	43	56	101	249	235	648

Table 2 shows that (450) 65.8% could not identify the unused objective and the main result that of the 235 students who correctly remembered all four of their lesson objectives 70 (29.8%) of them could <u>not</u> identify the unused objective.

Table 3 shows the mean percentile class position for those who did, and did not, identify the unused objective in the top two memory groups in which students correctly remembering 3 and 4 objectives.

Table 3: Mean percentile class positions of students in the top two memory groups who were able, and unable, to identify the unused objective

Memory Index (MI)		Mean Percentile	Std Dev	Cases
MI=3		52.48	28.88	167
N3=0	Not identified	54.16	28.05	121
N3=1	Was Identified	48.07	30.85	46
MI=4		62.32	26.97	160
N3=0	Not identified	67.92	31.16	38
N3=1	Was Identified	60.57	25.41	122

It will be noticed from Table 3 that students with higher MI have higher academic standing 62.32 v 52.48 and interestingly, it is the students who did not identify the unused objective that have the higher academic standing in both MI groups. ANOVA showed that the difference in mean percentiles between MI levels was statistically significant with $F_{1,321}=13.97$, p<0.001 whereas for the differences between those who did and did not identify the unused objective $F_{1,321}= 3.52$ at p=0.062. The MI x N3 interaction was not statistically significant at the p<0.05 level ($F_{1,321}=0.03$, p=0.866)

Discussion
This study has sought to test the assumption that students use instructional objectives, commonly listed at the start of a lesson, as Advance Organisers. Although there are many formats of Advance Organisers (AOs), the use of Lists of Instructional Objectives (LIOs) presented before instruction are the most common and so were chosen for testing. Previous Research designs have considered how AOs might have mediated between contextual variables and learning outcomes. The inability of these designs to sufficiently account for interactions between contextual variables and the complexities of learning have resulted in contradictory results being reported in the literature and this suggested the use of an alternative design.

The alternative design used in this study attempted to falsify the existence of the association between the presentation of the objectives and their use by the learner. The existence of this association is a minimum

necessary outcome of AO use. The existence of this association was tested by recall of the two aspects being associated - the objective and its use. If this association exists then, because of the greater involvement in using the objective, recall of use is more likely than recall of objectives. All non-recall of use mitigates against the assumption that the objectives have been used. However, evidence of non-recall of use which has been controlled for low recall ability is compelling evidence against the assumption that the objectives have been used. Hence, if a student should recall the objectives but not recall having used them, then the existence of the association was placed in considerable doubt. This was tested by presenting four objectives, one of which was not used in the subsequent lesson. Students were then asked to recall the four objectives and to identify which one was not used.

Any occurrence of not being able to identify the unused objective puts the use of AOs in doubt and the 450 (65.8%) of students who could not identify the unused objective is evidence against the LIOs having been used as AOs. However, an occurrence in which all four objectives are remembered but the unused objective cannot be identified throws considerable doubt on AO use. The main result of this study was that of 235 students who remembered all four objectives, 70 (29.8%) could not identify which objective was unused. This is very strong evidence against the assumption that all students use the LIOs as Advance Organisers.

The percentile positions of the students on their last class test in the subject taught was used as an indicator of the students' academic standing in their class - that is, the in-class recognition of their academic success. The statistically significant higher academic standing of the group who remembered most objectives ($p < 0.001$) indicated that memory was likely to have been well rewarded in these classes. Further, within both of the top memory groups it is interesting to note that those students who were <u>unable</u> to identify the unused objective had higher academic standing. That is, those who did not use AOs receive more academic regognition. This may further indicate that not only is memory well rewarded in these classes, but to the extent that the use of AO indicates students' attempts to structure their learning, this structuring of learning is less rewarded by academic recognition.

The in-service teachers who took part in this experiment were not all experienced in setting lesson objectives and it was noticeable from the LIOs chosen that, although the LIOs were suitable as AOs, such inexperienced teachers naturally wrote their objectives from the teacher's perspective. This supported the view that the cognitive source of LIOs was the teacher's structuring of the lesson and that they were initially produced as a teaching aid and then utilised as a learning aid. Experienced teachers first considered how they wanted to structure the lesson and then converted these teacher objectives into student centred objectives.

The compelling evidence against the assumption that all students use LIOs as AOs could have resulted from the higher emphases on memory and the lower emphasis on structuring learning that was indicated in by the relative academic standing of the MI x I groups in these classes. Because this falsifying design circumvents control problems associated with traditional designs that assume AO use and compare success of learning outcomes, it is recommended that this same falsifying design be used to test the effect of these different emphases on the students' assumed use of LIOs as AOs.

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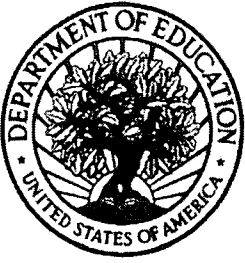
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