Teaching Students to Analyze Examples of Classical Conditioning

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Our experience with students enrolled in introductory courses such as general psychology suggests that many of them have difficulty analyzing examples of classical conditioning. Test-item files for the texts used in these courses often contain application questions that typically give an example of classical conditioning and either ask the pairing method used (trace, delay, simultaneous, or backward) or require students to identify the various initializations (US, NS/CS, UR, and CR).

The purpose of this paper is to share a technique we developed and used successfully to teach students to analyze examples of classical conditioning. Two task analyses were conducted which resulted in a series of questions that produce correct answers for both the initializations (see Figure 1), and the pairing techniques (see Figure 2) employed in most classical conditioning examples.

USING THE APPROACH

Introductory textbooks normally provide a description of respondent condi-

tioning along with a simple diagram of the model using the ubiquitous example of Pavlov's dog (below). Narrative for the diagram almost universally discusses the importance of repeatedly pairing the two stimuli (i.e., US and NS) to develop an association between them that transforms the neutral stimulus into a conditioned/conditional stimulus that, when presented alone, elicits an involuntary response, the CR.

After describing and diagramming the conditioning process, an example or two may be presented that identifies the various initializations in the example. Unfortunately, many introductory texts do not provide readers with: (a) definitions of the initializations, (b) a listing or commentary on the common pairing methods used in respondent research, or (c) information on how one can systematically analyze examples of classical conditioning.

In our introductory classes, before students are trained to analyze simple respondent examples they are presented content on respondent learning that includes a description of the four pairing methods and definitions of the various initializations. The training requires that students: (a) answer three questions used to identify the various initializations, and

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Data from initial field tests of the technique were presented at the annual meeting of the Association for Behavior Analysis, May, 1988, Philadelphia, PA. Copies of this paper, and a report on earlier field trials are available from the first author.

An earlier version of this paper was presented at the annual meeting of the National Social Sciences Association, October, 1989, Dallas, TX.

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Figure 1. Flow chart used by students to identify the various initializations in examples of classical conditioning.

(b) use their answers in another set of questions to identify the pairing method illustrated in the example.

We have successfully taught these two steps to students with a short in-class verbal presentation accompanied by hand-

outs (either Figures 1 and 2 or Figures 3 and 4). When presenting the analysis technique we first cover the basics of classical conditioning, including the pairing methods. Next, we tell the students that they will be required to analyze examples

Figure 2. Flow chart used by students to identify the pairing method being used in examples of classical conditioning.

of the model. They are then told that the analysis requires one to follow two steps. At this point we use either an overhead transparency or a handout that depicts an example of classical conditioning and the three questions that must be answered in step one of the process (see Figure 3). The three questions are:

1. "What involuntary response was elicited in the example?"

The answer is both the UR and CR.

2. "What originally elicited the involuntary response in the example?"

The answer is the US.

3. "What stimulus/event was paired with the US?"

The answer is the NS before it is paired with the US, and it is the CS after it has been paired with the US.

The students are encouraged to sub-

John is a practical joker. On their anniversary, John bought a bouquet of roses for his spouse and sprinkled them with pepper. Holding them in front of him he handed them to his wife who exclaimed, "Oh, what lovely flowers!" She then sniffed the roses to experience their fragrance and immediately began to sneeze violently. Since then, whenever John's wife sees roses, she sneezes.

Figure 3. An example of how students could use the generic flow chart (Figure 1) to identify initializations.

stitute the actual stimulus event or response identified in the example for the initializations in questions 2 and 3 above, and in the questions presented to identify the pairing method. For example, if we were using the classic case of Pavlov's dog that was diagrammed earlier, in question 2 we would tell the students to substitute salivation for involuntary response.

The second step in the analysis process is used to identify the pairing method

illustrated in the example. Using either an overhead transparency or a handout similar to Figure 4, we demonstrate how to answer the following:

1. "Was the NS/CS presented before the US?"
If the answer is yes, go to question 2.
If the answer is no, go to question 3.
2. "Was the NS/CS removed before the US was presented?"
If the answer is yes, the pairing meth-

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Figure 4. An example of how students could use the generic flow chart (Figure 2) to identify which pairing method is employed. The actual events and responses from the example are used instead of their initializations. The answer to question number 1 is *yes*. The answer to question number 2 is *no*, so the example illustrates the *delay* pairing method.

- od is TRACE. If the answer is no, the pairing method is DELAY.
3. "Were the NS/CS & US presented at the same time?"
If the answer is yes, the pairing method is SIMULTANEOUS. If the answer is no, the pairing method is BACKWARD.

IS IT EFFECTIVE?

We have conducted several field tests on this instructional technique. In each of these trials students who were trained to identify the initializations and pairing method scored higher on a test that required them to analyze examples of clas-

sical conditioning than they did during their baseline or when compared to control subjects.

Interestingly, in one of the field trials a group that originally received a verbal explanation on how to analyze the examples but no handouts, scored lowest on the analysis test. This suggests that merely telling students how to analyze examples of classical conditioning may be confusing since even the control group, which did not receive either the handout or a verbal explanation, performed higher than did the group receiving only the verbal explanation. However, after receiving the set of generic handouts (e.g., Figures 1 and 2), this group's mean per-

formance on a second analysis test was higher than the level achieved by any of the groups on the first analysis test. Of course, their performance gain over the two tests could have been a result of their additional practice, or due to the possibility that the examples in the second analysis test were less difficult than those used in the first.

CONCLUSIONS

Given sufficient repetition, most introductory students can become quite pro-

ficient at solving examples of classical conditioning. Unfortunately, without our instructional algorithm this approach is too time consuming for practical application in most introductory classes. Using the approach presented in this paper to train students to analyze the examples produces faster and greater performance improvements than repetition alone. More important, the approach also demonstrates, at a relatively simple level, that analysis skills can be caught directly once the concept itself is reduced to manageable components using a task analysis.