METHODS AND TECHNIQUES

Active Learning Within a Lecture: Assessing the Impact of Short, In-Class Writing Exercises

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Students in 2 large sections of an introduction to psychology course responded in writing during class to questions regarding material recently presented in lecture. After writing, they shared and discussed their responses with others. The exercises motivated attendance, and students generally reacted positively to the technique. There was some evidence that completing the exercises facilitated learning, although the exercises did not appear to stimulate intellectual activity outside of class. The technique is an easy and effective way to enhance a lecture and stimulate active learning during class.

The traditional lecture format is a remarkably efficient method to present course material to large classes (Bonwell & Eison, 1991; Cashin, 1985). However, the effectiveness of the lecture is limited by several factors, including a lack of feedback about student learning, promotion of passive listening by students, poor suitability for teaching higher order thinking, and unreasonable demands on student attention (Cashin, 1985). Fortunately, many of these limitations can be ameliorated by intermingling active learning exercises within the lecture format (Bonwell, 1996). We describe one such exercise in this article and report the effects of the exercise on student learning and reactions.

The short, in-class writing exercise we developed is an amalgam of two widely used active learning exercises: minute papers (Angelo & Cross, 1993) and think–pair–share (Johnson & Johnson, 1999). Minute papers are a classroom-assessment technique in which students provide written responses to short, general questions such as, "What is the most important thing you learned in class?" (Angelo & Cross, 1993). Although minute papers are commonly used at the beginning or end of a class period, they can also be interspersed through the period to provide a different learning activity and break up a lecture (Bonwell, 1996).

Think–pair–share is a collaborative learning exercise in which students discuss a question in pairs and then share their ideas with the larger class. The advantages of think–pair–share over more traditional discussion methods are that more students are involved in the discussion, embarrassment is minimized because students share ideas among smaller groups, and students have the opportunity to meet other students (Bonwell, 1996; McKeachie, 1999). As with minute papers, think–pair–share can effectively be used to break up a lecture.

We named the exercise described in this article CARDS because students responded on index cards. After the instructor presented a concept in lecture, students responded to a question in writing on a 4 × 6 index card. Unlike the more general questions commonly posed for minute papers, we directed the card questions at specific psychological concepts (see Table 1). We used cards when we believed a concept was important or when we found interesting questions to ask. When students finished writing their responses, they exchanged cards with other students and discussed their answers in groups of two or three. During the card exchange and discussion, the instructor and teaching assistants circulated around the large lecture hall, discussing the question and possible answers with small groups of students. At the conclusion of the exercise, the instructor reported to the class interesting answers that students generated or the correct answer if there was one. The exercise took approximately 5 min to complete. Approximately once a week, students turned in their cards at the end of the class period, and we recorded the cards as complete or incomplete or evaluated and rated the cards before recording. The cards accounted for 25% of students' final course grades. We rated the cards only to increase between-subject variability for the purpose of grading. For the assessment reported in this study, we scored the cards only as complete or incomplete. We predicted that students would have positive reactions to the card technique and that it would enhance learning.

Method

Participants

Students enrolled in two sections of introduction to psychology taught by the first author at a Midwestern state university participated in this study. The larger section (n = 125) met three mornings a week for 50-min periods, and the smaller section (n = 79) met one night a week for 2 ½ hr.

Procedure

Over the course of a semester, students responded to approximately 50 card questions. On 12 occasions, we pre-

Table 1. An Example of a Card Question and Corresponding Exam Question

Card Question	Exam Question
The famous behaviorist John Watson conditioned a fear of white rats in Little Albert. Later, Little Albert also showed the fear response to a Santa Claus mask. Why?	A little girl has learned to avoid a furry, black cat. When her grandmother tries to put black ear-muffs on her, the girl cries and pulls away. Her response demonstrates a. approximation b. generalization c. sensitization d. simplification

Note. This example corresponds to A45 in Table 2.

Table 2. Binomial Tests of Correct Responses to Exam Questions by Students Completing the Learning Exercise

	Section 1		Section 2		
Question	*n*	% Correct	*n*	% Correct	*p*
A38	97	74.2[a]	78	71.8	.338
A45	108	84.3[a]	78	65.4	< .001
A47	128	61.7	71	73.2[a]	.030
B8	105	92.4[a]	78	87.2	.075
B10	128	80.5	65	84.6[a]	.248
B12	128	27.3	54	48.1[a]	.001
B18	128	72.7	65	78.4[a]	.183
B22	107	57.0[a]	78	53.8	.285
B33	128	57.8	62	48.3[a]	.085
B34	91	57.1[a]	78	29.5	< .001
B43	102	90.2[a]	78	94.8	.031[b]
B45	128	53.1	72	54.2[a]	.475

[a]Indicates the section completing the learning exercise. The percentage of correct responses in the section not completing the exercise was the test proportion. [b]Indicates significance in the direction opposite of the hypothesis.

sented a card question to one class but not the other and then linked these card questions to multiple-choice questions on the exam. Even when we did not present a card question to a section, we discussed the same material in class, and students received identical study guides for exams. To assess the effect of the differentially presented cards on learning, we compared the percentage of correct responses on the linked exam questions across the two sections. Table 1 presents a sample card question and corresponding exam question.

Measures

Student learning. We linked 12 card questions, 6 presented to each of the two sections, to questions on the exams. We measured learning by examining the percentage of students who answered the corresponding exam question correctly.

Student reactions. We assessed student reactions with a questionnaire at the end of the semester and by compiling statements made about the exercise on the official university course evaluations. The questionnaire contained 5-point Likert scales measuring attendance motivation, perceived learning, exercise enjoyment, and intellectual stimulation. The anchors for the first two scales ranged from 1 (*strongly disagree*) to 5 (*strongly agree*), and the anchors for the last two scales ranged from 1 (*never*) to 5 (*very often*).

Results

Student Learning

To assess student learning, we conducted binomial tests of the percentage of students answering each exam question correctly. We included only those students who turned in a card corresponding to the exam question. The test value was the percentage of students from the control group (i.e., the section that did not see the card question) who answered the exam question correctly. The results, presented in Table 2, show that 4 of the 12 tests were significant in the predicted direction. One of the 12 tests was significant in the opposite direction, and 7 tests showed no significant differences. A cursory inspection suggested that the exam questions showing a significant difference were quite similar to the card questions, as in Table 1, whereas the exam questions that did not show a significant difference tended to diverge more from the card questions to which they were linked.

Student Reactions

Descriptive statistics and scale intercorrelations for the reaction measures appear in Table 3. The mean rating for the attendance motivation scale was above the scale midpoint, indicating that the prospect of having to turn in a card was a motivator for attendance. This finding may have occurred

Table 3. Scale Means, Standard Deviations, and Correlations for Exercise Evaluation Questions

Scales	*M*	*SD*	1	2	3	4
1. Attendance motivation	3.68	1.03	.73			
2. Perceived learning	3.45	0.89	–.11	.82		
3. Exercise enjoyment	2.92	0.71	–.23*	.49*	.76	
4. Intellectual stimulation	1.55	0.64	–.04	.22*	.32*	.67

Note. Ratings were made on a 5-point scale ranging from 1 (*strongly disagree/never*) to 5 (*strongly agree/always*). Cronbach's alpha reliability coefficients are on the diagonal of the correlation matrix.
*$p < .01$.

because the cards counted for 25% of the total points available in the class. The mean rating for the perceived learning scale was also high, indicating that students believed the cards facilitated their learning. This belief was also reflected in student comments on the course evaluations. Although the mean rating on the enjoyment scale was only at the scale midpoint, comments on the course evaluations indicated that some students found the cards interesting and stimulating. There was a significant negative correlation between attendance motivation and exercise enjoyment, indicating that students who attended class merely to turn in a card tended to enjoy the exercise less. It does not appear that the cards inspired students to seek information or discuss material outside of class, as the mean rating on the intellectual stimulation scale was relatively low.

Discussion

Our evaluation of CARDS indicates several positive effects on student reactions and provides some evidence that the exercise facilitated student learning. The exercise motivated students to attend class—an issue that is often a problem in large sections, although this effect may not have occurred if the cards did not contribute to the students' grades. Students also believed that the exercise was engaging and that it helped them learn the material. We did not find evidence that the cards stimulated intellectual activities outside of class. Perhaps the best indicator of student reactions is that over two semesters, three course sections, and approximately 400 students, no one ever made a negative comment about CARDS on the course evaluations.

We found that the CARDS improved exam performance on one third of the questions we tested. Although this finding is not overwhelming evidence that the exercises facilitated learning, it is important to note that both sections received the same course content as well as detailed study guides describing the content of the exams. Given that we did not return the cards to the students, it is unlikely that the improved exam performance was due merely to memorizing the card question and answer. Instead, the beneficial effect on learning may have occurred because the card questions provided an opportunity to practice recalling material and to receive immediate feedback about the answer.

A principal benefit of the card exercise is its flexibility for use within a variety of classroom contexts, for a variety of purposes (e.g., attendance checks), or for virtually any subject area in psychology. The exercise is easy to administer because it requires little time to prepare and evaluate and involves no technology beyond pencil and paper. Instructors of large classes would need to monitor the amount of noise generated by the discussion. However, given the benefits of CARDS, psychology instructors should react as favorably to the technique as their students do.

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Notes

1. The first author developed the idea for this technique while he was a University of Wisconsin Teaching Fellow.

2. We thank Helen Harton for her comments on a previous draft of the article.

3. Send correspondence and requests for a complete list of card and exam questions or criteria for rating cards to Adam Butler, Department of Psychology, University of Northern Iowa, Cedar Falls, IA 50614–0505; e-mail: adam.butler@uni.edu.