
Benefits of Prelecture Quizzes

Rodger Narloch
College of St. Benedict/St. John's University

Calvin P. Garbin and Kimberly D. Turnage
University of Nebraska–Lincoln

We investigated the use of quizzes administered prior to lecture (i.e., prelecture quizzes) and compared them to no-quiz control groups. In previous research, the success of administering quizzes after covering a topic (i.e., postlecture quizzes) was contingent on the quizzes and the subsequent exams being of similar level and content. However, our study revealed that such contingencies were not true of prelecture quizzes. Students who received either matching or fill-in-the-blank prelecture quizzes, as compared to no quiz, performed better on both multiple-choice and essay exam questions. They also rated the lectures as a better preparation for exams and as more clear and organized. Finally, the quizzed students asked more high-level questions.

Frequent quizzing is a well-established method of increasing student learning and retention of information (see McKenzie, 1973, for a review). Many instructors give students quizzes after covering small units of material to give students an indication of their proficiency before giving them larger, more inclusive course examinations. The success of such quizzes has been mixed (Burns & Vinchur, 1992). Because students use quiz questions to guide their study for larger examinations, McKenzie (1973) suggested that teachers write quiz questions that are of similar difficulty level as the questions of the larger exam. Burns and Vinchur (1992) found that quizzes were effective when the quiz and exam

content were similar. For instance, when quizzes focus on textbook material and examinations emphasize lecture material, quizzes are of limited usefulness and may even be detrimental. Therefore, when students complete quizzes after receiving the information during class time, they can be a useful guide for students' studying. However, the quizzes should match the level and content of the larger examinations for maximum effectiveness of this pedagogical tool.

An alternative way of using quizzes is to administer them prior to in-class lecture or discussion of course material (e.g., Graham, 1999). The purpose of prelecture quizzes is not to give students an indication if they are studying the correct material at an appropriate level. Rather, it is to increase the likelihood that students read the assigned material and have some knowledge of the day's topic. Geiger and Bostow (1976) randomly assigned half of one class to prelecture quizzes and the other half to no quizzes. They found that the quiz group performed approximately one letter grade higher on the midterm and final exams. After comparing sections of an educational psychology course, which received different types of quizzes (fill-in-the-blank, define-and-elaborate, or no quiz), Tuckman (1996) found students who completed the quizzes (even the more simplistic fill-in) performed significantly better on the larger multiple-choice examinations than those who did not receive quizzes. Tuckman concluded that using quizzes to provide incentive for students to read in a timely fashion can be an effective technique for improving exam performance, especially among students with lower cumulative grade-point averages (GPAs).

We conducted this study to provide additional evidence for the effectiveness of prelecture quizzes by comparing exam performance of sections that received quizzes to sections that did not. Furthermore, in light of the research on postlecture quizzes that found specific conditions under which such quizzes were more and less effective (e.g., Burns & Vinchur, 1992; McKenzie, 1973), we also attempted to identify some of the contingencies that may limit the effectiveness of prelecture quizzes. Specifically, we did not focus on multiple-choice examination performance as the dependent measure (as did all of the research cited earlier); instead we compared students' performance on multiple-choice and essay questions. Furthermore, we included students' course evaluation responses and estimates of how long they spent preparing for class meetings and exams. Finally, we tape-recorded classes to reveal the types of questions students asked during class. These additional dependent measures can help determine why student performance has tended to be higher when they have received prelecture quizzes.

Method

Participants

We collected data from an upper division sensation and perception course over five consecutive semesters ($N = 109$

women, 53 men) at a large Midwest state university. Although we did not collect demographic data for age and ethnicity, students in this course typically average 20 years of age and are almost exclusively White. There were no significant differences across the sections in regard to students' year in college, $\chi^2(2, N = 162) = .70, p > .05$; gender, $\chi^2(2, N = 162) = .26, p > .05$; or GPA, $F(2, 159) = 1.32, p > .05$. Furthermore, the instructor, text, lecture content, and exam questions did not vary across the five semesters. As agreed on by the institutional review board at the university at which this study occurred, we did not ask for students' informed consent.

Measures

Quizzes. The quizzes tested initial proficiency of basic terms and concepts contained in the assigned reading. Students knew through the syllabus and instructor reminders that quizzes comprised 10% of their course grade and that they would occur immediately at the start of the class period on days when the class began a new textbook chapter. The instructor explained to students that the quizzes were meant to promote an initial understanding of course material, which we as a class would then more thoroughly describe and discuss during class time. The instructor did not invite questions or provide explanations of quiz content prior to the quiz.

We used two quiz types throughout this study. The matching quizzes each contained 20 definitions with 25 to 30 terms as possible response options. The fill-in-the-blank quizzes contained the same definitions with a corresponding blank line on which students wrote their answers. Students took 7 to 10 min to complete the quizzes. The instructor or teaching assistant scored the quizzes and returned them at the following meeting.

Exams. As a dependent measure of performance, we calculated students' average percentages on multiple-choice items written at higher levels (10 items written at the analysis level, 10 at synthesis, and 10 at evaluation) of Bloom's (1956) taxonomy. As a second indication of performance, we graded students' exam essay responses to questions written at higher levels of Bloom's taxonomy. After the fifth semester, the instructor and a research assistant each graded the student essay responses ($\kappa = .87$). Both were blind to each student's identity and quiz condition.

Course evaluations. We used student course evaluations to indicate students' perceptions of the quality and value of time spent in class. The questions used were (a) Were lectures clear and organized? and (b) Did lectures prepare you for exams? The questions contained a 7-point response scale ranging from 1 (*not at all*) to 7 (*very or very much*). We also asked students to estimate the time they spent, in hours, preparing for class meetings and exams.

The type of quiz (matching, fill-in-the-blank, and no quiz control) served as the independent variable. With the order based on flipping a coin, we administered no quiz during the first and fourth semesters and matching quizzes during the second and third semesters. After the four semesters, we decided to include fill-in-the-blank quizzes during the fifth semester as an interesting comparison. For analysis, we combined the data from each semester of the same quiz type.

We also compared the frequency of different types of questions students asked during class. To obtain these values, the instructor made audio recordings of each class and informed each section that we were using the recordings to evaluate the teaching methods used in the course. The instructor listened to the recordings and counted the number of questions students asked about the definitions of basic terms and concepts (i.e., Bloom's knowledge level) as compared to the number of questions asked at any level higher than the knowledge level. We did not have additional raters listen to the recordings because the distinction between knowledge-level questions (e.g., "Please define ...") and questions at any of the higher levels (e.g., "Since there's only one kind of nerve ending on the eye's surface, but we can perceive multiple sensations there, that makes it hard to claim one-to-one correspondence between type of receptor and stimulus, correct?") was simple and objective. The instructor erased each tape immediately after coding.

Results

We used a series of between-groups ANOVAs with Tukey's honestly significant difference post-hoc tests to examine the mean differences across the quiz-type conditions for each dependent measure. As shown in Table 1, both

quiz groups outperformed the control on exam performance, but there was no difference between the matching and fill-in-the-blank quiz groups. This pattern occurred for both the multiple-choice questions, $F(2, 159) = 4.42, p < .05, \eta^2 = .05$, and the essay questions, $F(2, 159) = 12.14, p < .001, \eta^2 = .13$.

The same pattern emerged for the student perception variables. As compared to the control group, both quiz groups perceived that the lectures were clearer, $F(2, 159) = 23.85, p < .001, \eta^2 = .23$, and better prepared them for the exams, $F(2, 159) = 13.49, p < .001, \eta^2 = .15$.

Based on students' self-reported study time, the fill-in-the-blank students prepared the most for class, followed by the matching students, and finally the control students, $F(2, 159) = 90.79, p < .001, \eta^2 = .53$. However, the groups showed the opposite pattern for self-reported time spent preparing for the exams, $F(2, 159) = 202.06, p < .001, \eta^2 = .72$. Taken together, these two results show that the quiz students distributed their studying throughout each content unit rather than just prior to the unit exams.

Finally, we compared the types of questions students asked in each of the conditions. The quiz groups asked fewer definitional questions, $F(2, 159) = 165.60, p < .001, \eta^2 = .68$, and more high-level questions than did the control group, $F(2, 159) = 124.07, p < .001, \eta^2 = .61$.

Discussion

Our results consistently indicated that prelecture quizzes may be useful in improving students' performance and satisfaction. Furthermore, the benefits of prelecture quizzes did not appear to be contingent on factors that limit the usefulness of postlecture quizzes. First, contrary to McKenzie's (1973) recommendations regarding postlecture quizzes, our data indicated that prelecture quiz questions need not be of similar level to exam questions. Whereas our quizzes were at

Table 1. Mean Differences Across the Quiz Conditions

Dependent Measures	Matching Quiz		Fill-in-Blanks Quiz		No Quiz	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Performance variables (% correct)						
Multiple-choice exam questions	77.32 _a	9.25	76.06 _a	9.91	72.26 _b	7.85
Essay exam questions	81.17 _a	6.57	80.10 _a	5.93	75.60 _b	6.26
Student perception variables (1 = <i>not at all</i> , 7 = <i>very</i>)						
Lecture clarity/organization rating	6.50 _a	0.62	6.32 _a	0.62	5.61 _b	0.80
Lecture preparation for exam rating	6.38 _a	0.74	6.27 _a	0.78	5.65 _b	0.85
Preparation time questions (hr)						
Preparation for class meetings	1.01 _a	0.42	1.54 _b	0.36	0.34 _c	0.41
Preparation for exams	6.37 _a	0.87	5.32 _b	0.62	8.97 _c	0.91
Classroom questions (no. per session)						
Definitional questions	4.24 _a	1.12	3.99 _a	0.95	8.21 _b	1.10
Higher order questions	10.50 _a	0.98	9.92 _a	1.01	6.83 _b	1.18

Note. For each dependent measure, means with different subscript numbers were significantly different ($p < .05$) based on the Tukey's honestly significant difference.

lower levels of Bloom's taxonomy, student performance on both higher level multiple-choice and essay questions was higher for the quiz groups. Second, unlike Burns and Vinchur's (1992) postlecture quiz findings, prelecture quizzes were beneficial despite inconsistencies in the source of the material. We based our quizzes solely on textbook information, whereas the exams covered a combination of text and lecture material.

In addition to addressing the warnings of previous work on postlecture quizzes, we also investigated the consistency of question format as a possible contingency of prelecture quiz effectiveness. Although our quizzes contained only objective question types (i.e., fill-in-the-blank, matching), the groups who received the quizzes not only showed superior performance on objective questions (i.e., multiple choice), but also on essay-type questions. Thus, our findings provide evidence that the benefits of prelecture quizzes are robust with regard to many pedagogical concerns. Such results help to demonstrate the potential usefulness of this technique. Prelecture quizzes need not require time-intensive construction or extensive course restructuring to be a useful tool in increasing student learning and retention.

Future research could examine more specifically the mechanisms that underlie the effectiveness of prelecture quizzes. Three explanations seem consistent with our data as well as other empirical studies. First, in accord with cognitive research indicating that prior knowledge of a topic improves learning and retention of new knowledge on the same topic (e.g., Anderson, 1981), prelecture quizzes may increase the likelihood of students beginning each class with a rudimentary understanding of the day's topic. Such initial knowledge should increase the amount and depth of students' understanding of the information being presented during the lecture. Indeed, our data lent some evidence to this explanation as students who received quizzes perceived lectures as clearer, more organized, and better preparation for exams despite the content of the lectures being consistent across the quiz and no-quiz groups. Second, consistent with Tuckman's (1996) conclusions, prelecture quizzes may enhance learning by providing more incentive to keep up with assigned reading. Finally, prelecture quizzes may encourage distributed

rather than massed practice (e.g., Ausubel & Youssef, 1965; Bjork, 1979).

Although the exact mechanism underlying the success of prelecture quizzes as a pedagogical tool has yet to be empirically established, their use appears to be consistently associated with increased performance. Furthermore, the small amount of in-class time needed for prelecture quizzes, the relative ease with which instructors could incorporate them into a course, and the increased efficiency of students' time make this technique an attractive tool for increasing students' learning.

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Note

Send correspondence to Rodger Narloch, Department of Psychology, St. John's University, Collegeville, MN 56321; e-mail: RNarloch@csbsju.edu.