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Published in final edited form as:

Teach Psychol. 2009 January 1; 36(1): 33–37. doi:10.1080/00986280802528972.

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The Effect of Online Chapter Quizzes on Exam Performance in an Undergraduate Social Psychology Course

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Abstract

Assigned textbook readings are a common requirement in undergraduate courses, but students often do not complete reading assignments or do not do so until immediately before an exam. This may have detrimental effects on learning and course performance. Regularly scheduled quizzes on reading material may increase completion of reading assignments and therefore course performance. This study examined the effectiveness of compulsory, mastery-based, weekly reading quizzes as a means of improving exam and course performance. Completion of reading quizzes was related to both better exam and course performance. The discussion includes recommendations for the use of quizzes in undergraduate courses.

Undergraduate instructors assign textbook readings for a variety of reasons, most commonly because it is often impossible to present all necessary course material during class time (Ryan, 2006). Completion of assigned textbook readings before a topic is covered in class allows better understanding of the material and increases in-class participation (Gurung, 2003; Narloch, Garbin, & Turnage, 2006; Ryan, 2006). Unfortunately, student compliance with reading assignments in college courses has steadily declined over time (Burchfield & Sappington, 2000; Clump, Bauer, & Bradley, 2004; Sappington, Kinsey, & Munsayac, 2002).

Given this decline, instructors need techniques to increase reading and understanding of assigned course materials. One such technique involves quizzing students on reading assignments (Narloch et al., 2006). Reading quizzes can encourage students to pay closer attention to the assigned material, which can improve their understanding not only of the reading material, but also of related material presented in class (Brothen & Wambach, 2004; Graham, 1999; Narloch et al., 2006). In addition, regular reading quizzes may lead students to spread their studying out more evenly over the semester (Clump et al., 2004; Graham, 1999; Narloch et al., 2006). Although scheduled or surprise in-class quizzes can motivate students to complete the assigned reading, students tend to view such quizzes as punishment (Graham, 1999; Sappington et al., 2002), and evidence suggests that quizzes are more beneficial if presented before presentation of related class material (Gurung, 2003; Narloch et al., 2006).

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A variety of ways to administer reading quizzes exist, and different methods may vary in effectiveness. For example, use of randomly administered quizzes (i.e., neither completely surprise nor scheduled for a particular date) results in higher levels of reading compliance (Ruscio, 2001), and selection of subsets of questions from large question banks reduces the likelihood that students will simply memorize response options without learning the material (Daniel & Broida, 2004). Furthermore, research has suggested presenting feedback separately after the student answers each question, including both information about accuracy and a source of additional information (Brothen & Wambach, 2001; Ryan, 2006).

Ultimately, however, there is disagreement about whether and how quizzes affect student performance. Grimstad and Grabe (2004) found that students who completed voluntary chapter quizzes significantly improved their exam performances. However, their conclusions could be alternately explained by good students being both motivated to take voluntary quizzes and likely to do well on exams. Brothen and Wambach (2001) cautioned that compulsory quizzes only improve exam performance if students employ an efficient strategy of using the quizzes to test their own knowledge of the material, rather than attempting to use the quiz to learn the material. Given the mixed conclusions concerning the impact of quizzes on exam performance, we examined the effectiveness of preclass reading quizzes as a tool for improving performance on exams. We included mastery-based reading quizzes as a course component in a midlevel undergraduate introduction to social psychology course. We examined the relation among successful completion of the quizzes, exam performance, and class performance.

Method

Participants

Undergraduate students ($N = 159$, 57% women) in an introductory social psychology course at a large Mid-western state university participated in the study. The class generally reflected the school's ethnic (typically White) and age (average about 20 years old) composition. Most (74%) were not psychology majors. The class included 35 first-year students, 62 sophomores, 37 juniors, and 17 seniors (8 students did not specify their grade level).

Reading Quizzes

We assigned students a chapter from the course textbook to read each week. We instructed them to complete the reading before taking the online quiz. We posted the quizzes at least a week in advance of the deadline. We required students to pass the quiz outside of class prior to the beginning of the first class session of the week to obtain credit for the quiz. During the semester, credit for quiz completion accounted for 6% of the course grade.

The quizzes were mastery based, and we defined passing as correctly answering 10 questions about the chapter. There was no limit imposed on the number of attempts or time allotted to complete the quizzes. To discourage students from merely memorizing the questions or response options, we created a bank of 25 multiple-choice questions for each chapter. This item bank size allowed students who answered questions incorrectly or those who retook the quiz to encounter similar but slightly different questions on subsequent trials. We chose questions to cover material across the entire chapter and to reflect the type, breadth, and format of exam questions about the reading assignments.

We administered quizzes using a Web-based testing system. We configured the system to present questions in random order each time the student attempted the quiz, and to randomize answer choices each time a question appeared. After answering each question, students received feedback, including the correct answer and a comment containing the page numbers

in the textbook covering the relevant concepts. The Web-based testing system did not provide data for the number of attempts required to pass the quiz successfully.

Exams

There were three noncumulative exams in the course, each covering about a third of the course material. Each exam consisted of 50 multiple-choice questions that covered basic identification of concepts and terms, knowledge of theoretical concepts, and application of theories and concepts to specific examples. Half of each exam covered lecture material, and half covered textbook readings. Although the topics were the same, specific concepts covered in class typically did not overlap with those from the textbook. Of the textbook questions, each exam generally included four to six questions from each chapter. The concepts assessed in the reading quizzes were also assessed on the exam, although no quiz questions appeared verbatim on the exam. Exam grades contributed 60% of the final course grade.

Final Course Grade

We based the students' overall final course grade on their performance on the three exams, two short writing assignments, in-class activities, and the quiz assignments. Exam grades contributed 60% of the final course grade, writing assignments contributed 30%, reading quizzes contributed 6%, and in-class activities contributed 4% to the final course grade. Because reading quiz completion was a component of the final course grade, for analyses examining the influence of quiz completion on final grades, we subtracted the portion of the grade from quiz completion from the total final score.

Results

Quiz Compliance Rates

We assigned eight reading quizzes during the semester. The average number of quizzes completed was 5.88 ($SD = 2.04$). We did not record incomplete attempted quizzes; we considered the quiz completed only if the student passed (i.e., answered 10 questions correctly). On average, 64% of the students completed each quiz (range = 40%–88%). Sixty-eight percent of the students completed at least six of the eight quizzes. Twenty percent of the students completed all of the quizzes; only 2% of the students completed none of the quiz assignments. Quiz compliance rates did not differ based on major or year in school.

Effect of Quiz Completion on Performance on Reading-Based Questions

The first and most straightforward question is whether the quiz assignments aided student learning of the material covered by the quizzes. To examine this question, we categorized each book-based exam question as either coming from a chapter that was covered by a quiz assignment, or from a chapter that did not have a corresponding quiz (because of the way the quiz assignments were integrated over the course of the semester, 8 of the 13 assigned chapters had a reading quiz). We then compared the proportion of correct responses to those questions covered by a quiz versus those not covered by a quiz. Overall, performance was better for those questions that had been covered by a reading quiz ($M = 70\%$, $SD = 9\%$) versus those not covered by a quiz ($M = 65\%$, $SD = 14\%$); paired $t(157) = 5.03$, $p < .001$, $d = .45$.

Effect of Quiz Completion on Overall Exam and Course Performance

Second, we examined the relation between quiz completion and overall exam performance. Table 1 reports average exam scores by the number of quizzes completed. As the number of quizzes students completed increased, their average score on the three exams also increased, $r = .18$, $p = .02$.

Third, we examined the influence of quiz completion on overall course performance. Increasing numbers of completed reading quizzes predicted higher course grades,¹ $r = .45$ $p < .001$.

Ruling Out “Good Student” Alternate Explanation

Finally, we conducted analyses to rule out a plausible alternate explanation for the results. One could argue that the results already presented are not a reflection of quiz effectiveness, but rather that high-performing students are more likely to complete the quiz assignments and also by definition perform better on the exams. This alternate explanation would not account for the first analysis (performance on quiz-covered vs. non-quiz-covered book questions) but would explain the relation to overall exam grades and course grades. If this alternate explanation is correct, students who completed a quiz should do better on all course components. By contrast, if the quizzes are actually effective at increasing reading comprehension, their effect should be primarily (if not exclusively) on exam questions relating to the chapters covered by quizzes.

We examined whether quiz completion was related to performance on those parts of the exam not covered by quizzes (lecture material and chapters not quizzed on). Across exams, there was no relation between quiz completion and performance on nonquizzed material, $F(8, 144) < 1$, *ns*.

Discussion

Results supported our hypothesis that completion of required reading quizzes would improve exam and course performance. This relatively minimal-effort technique had a significant effect on performance. The number of reading quizzes a student completed predicted both exam performance and overall course grade. Although the actual mean difference between the groups was small, students' performance on those exam questions covered by reading quizzes was significantly better than their performance on questions not covered by quizzes. Moreover, the effect of quizzes on students' performance on exam questions about other class material was mixed at best, suggesting the data reflect an actual effect of completing the quizzes, rather than a general performance effect based on student ability or motivation. The success of this exploration is encouraging in light of the decline in reading compliance over time (Brothen & Wambach, 2004; Burchfield & Sappington, 2000; Clump et al., 2004; Sappington et al., 2002).

Although we did not specifically examine mechanisms underlying the effectiveness of reading quizzes, there are several possible explanations. First, reading quizzes may encourage a more gradual approach to studying, counteracting students' tendency to concentrate their studying before examinations (Clump et al., 2004; Graham, 1999; Narloch et al., 2006). Second, regular reading quizzes might benefit students by engaging them with the material more consistently than does studying for exams. Third, frequent testing over smaller amounts of information can also be beneficial to learning (Bangert-Drowns, Kulik, & Kulik, 1991).

Implications for Instructional Practice

We based the structure of our reading quiz assignments on several empirically tested best practices. First, the quizzes were mastery based, and we provided feedback to guide mastery after students answered each question (see Bangert-Drowns, Kulik, & Kulik, 1991b; Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Brothen & Wambach, 2001; Grimstad & Grabe,

¹As noted in the Method section, because quiz completion contributed to the overall course grade, the reported analysis is for overall grade with the quiz points removed. Analysis of the overall grade with quiz points included yielded identical results: $r = .55$, $t(152) = 8.18$, $p < .001$.

2004; Ryan, 2006, for related evidence). The nature of the assignment and the feedback presented can influence how students approach the task (Bangert-Drowns, Kulik, Kulik, et al., 1991). Simply saying an answer is incorrect and presenting the correct answer allows the student to move on without further thought on the topic. A more effective feedback tactic is to indicate that the student's answer was incorrect but then offer guidance about how to learn the material necessary to master the topic (in this case, indicating where in the text additional information can be found; see Daniel & Broida, 2004, for related evidence).

A second important feature is accountability for completion of the quizzes in a timely manner. We required students to complete the reading quizzes before the class session in which related topics were covered, and completion of the quiz assignments contributed to the student's final course grade (see Brothen & Wambach, 2001; Burchfield & Sappington, 2000; Graham, 1999; Gurung, 2003; Narloch et al., 2006). Grimstad and Grabe (2004) suggested that the students who most benefit from voluntary supplemental learning tools (e.g., reading quizzes) are those who already complete reading assignments and use effective study strategies. Thus, to influence performance for students who might otherwise tend to neglect their studies, we implemented required quizzes. In this study, we had less than perfect compliance on the quiz assignments, possibly because the quizzes were not a heavily weighted course component. To motivate students to comply with all of the quiz assignments, instructors might want to increase the proportion of the course grade allocated to quizzes.

Future studies might relate the effect of reading quizzes to individual differences in motivation, the number of attempts needed to master the material, and even the difficulty level of different chapters. Additionally, researchers might examine in an integrative way which features of reading quizzes result in better comprehension of the material. Whereas past research has revealed multiple dimensions that influence quiz effectiveness (e.g., required vs. voluntary [Grimstad & Grabe, 2004], mastery-based vs. single-attempt [Bangert-Drowns, Kulik, & Kulik, 1991; Brothen & Wambach, 2004]), researchers have explored these characteristics in isolation. The next step would be to systematically manipulate various combinations of quiz features and assess which combinations optimize student learning. This, in turn, might illuminate specific mechanisms responsible for improvement in students' performance.

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Table 1

Exam Score by the Number of Reading Quizzes Completed

Quizzes Completed		Exam Score	
		<i>M</i>	<i>SD</i>
Exam 1	0 (<i>n</i> = 21)	33.43	4.53
	1 (<i>n</i> = 131)	35.42	5.73
Exam 2	0 (<i>n</i> = 8)	34.25	4.20
	1 (<i>n</i> = 27)	36.48	6.48
	2 (<i>n</i> = 63)	38.70	4.32
	3 (<i>n</i> = 52)	39.17	3.85
Exam 3	0 (<i>n</i> = 11)	33.18	4.00
	1 (<i>n</i> = 10)	34.00	3.89
	2 (<i>n</i> = 13)	35.77	3.94
	3 (<i>n</i> = 41)	34.73	4.71
	4 (<i>n</i> = 71)	35.27	4.88