

5-1-2014

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Recommended Citation

Mary Still and Jeremiah Still. "Ramifications of quiz format on retention and online studying" *Society for the Teaching of Psychology* (2014).

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Ramifications of Quiz Format on Retention and Online Studying

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Introduction

University courses are increasingly being consumed or augmented by online resources. Although these resources are available, their utility needs to be empirically verified to ensure quality learning outcomes. We investigated the impact of required online quizzes on retention and student use of voluntary online quizzes.

Question 1: Does online quizzing lead to improved retention?

Previous research suggests that repeated testing of content can lead to more effective retention of information (e.g., Coulter-Kern, Fogle, & Sibert, 2010; Roediger & Karpicke, 2006). Perhaps students engaging in extra online quizzing can obtain similar results. Current findings are inconclusive (c.f., Roediger, Putnam & Smith, 2011).

Question 2: Will students complete voluntary online quizzes? Under what conditions?

To investigate this question we tracked how often students voluntarily took online quizzes. Our goal was to see if minimal "encouragement" – requiring some in-class and online quizzes, telling students about testing effects, providing online quizzes for each chapter – would lead to regular voluntary use of online quizzes.

Method

- Students from three sections of Introductory Psychology ($N = 135$) were assigned to take an online quiz, in-class quiz, or no quiz for chapters in each unit. Assignment to quiz type x chapter was counterbalanced across sections (see Table 1).
- Online quizzes were available for all chapters, but only assigned quizzes were required for credit.
- All quizzes were open book and limited to 10 minutes.

Table 1. Assignment to Quizzing Conditions by Section

	Quizzes & Topics	Sec 1 – 9am	Sec 2 – 10am	Sec 3 – 1pm
Unit 1	Introduction	Trial online	Trial online	Trial online
	1 Neuroscience	Online	In-class	None
	2 Development	In-class	None	Online
Unit 2	3 Sensation & Perception	None	Online	In-class
	4 Learning	In-class	Online	None
	5 Memory	None	In-class	Online
Unit 3	6 Thinking, Language & Intelligence	Online	None	In-class
	7 Motivation & Emotion	None	Online	In-class
	8 Gender & Sex	Online	In-class	None
Unit 4	9 Stress, Health & Personality	In-class	None	Online
	10 Psychological Disorder	None	In-class	Online
	11 Historic Perspectives & Therapy	Online	None	In-class
	12 Social Psychology	In-class	Online	None

Results

Outcomes Associated with Required Quizzing (All sections)

Students missed more online quizzes (87) than in-class quizzes (33), $t(134) = 5.79, p < .001$.

Students scored lower on online quizzes ($M = 82\%$) than in-class quizzes ($M = 89\%$), $F(1,68) = 42.9, p < .001$. This was true even when missed quizzes (zeros) were excluded.

Retention was measured by calculating unit sub-scores for each chapter. Quiz type had a small effect on retention, $F(2,268) = 6.93, p = .001$.

- Performance was higher for content associated with required in-class quizzes ($M = .74, SE = .01$) compared to content associated with no required quiz ($M = .71, SE = .01; p = .003$).
- Performance was numerically, but not statistically, higher for content associated with required online quizzes ($M = .73, SE = .01$) compared to content associated with no quiz ($p = .08$).

Outcomes Associated with Voluntary Online Quizzing (Section 1 only)

Twenty-eight (of 47) students took at least one voluntary online quiz. Those taking 4+ quizzes earned higher exam scores [$F(2,44) = 5.50, p = .007$] and final course grades [$F(2,44) = 6.62, p = .003$] than other students.

Academic Outcomes and Number of Voluntary Online Quizzes Taken

	No quizzes ($n = 19$)	1-3 quizzes ($n = 13$)	4+ quizzes ($n = 15$)
Unit Exam Scores	68% (8)	66% (7)	77% (13)
Final Course Grade	74% (8)	72% (9)	83% (11)

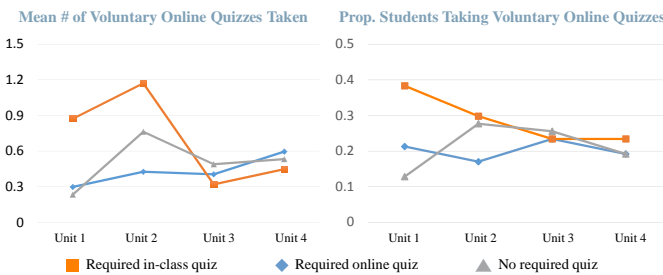
Note. Standard deviation appears in parentheses.

Participation in Voluntary Online Quizzing (Section 1 only)

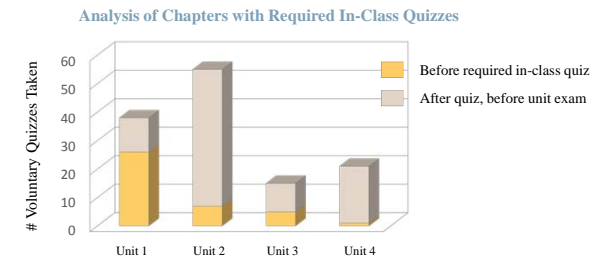
Students were most likely to take voluntary online quizzes for chapters that had required in-class quizzes, but this tendency changed as the semester progressed – Unit X Quiz Type, $F(6,276) = 4.24, p < .001$.

Looking at the total number of voluntary online quizzes taken, 81 were taken for chapters requiring online quizzes, 103 were taken for chapters requiring no-quizzes and 132 were taken for chapters requiring in-class quizzes.

In addition, the data indicate that the majority of students did *not* take advantage of voluntary online quizzing opportunities.



When do students take voluntary quizzes?



Discussion

Does online quizzing lead to improved retention?

Required multiple choice quizzing, whether in-class or online, appears to lead to minor increases in retention over conditions where no quizzing is required. These data contribute to a growing body of evidence suggesting that adoption of online quizzes does not undermine student comprehension of course material (e.g., Daniel & Broida, 2004) and may improve it.

Will students complete voluntary online quizzes? Under what conditions?

Students did not take full advantage of online quizzing opportunities. For example, 40% of students in one class never took a voluntary quiz. Therefore, the relatively passive approach used to encourage student self-testing had limited effectiveness.

Nevertheless, there appear to be benefits for students who do complete voluntary quizzes. Specifically, students who took four or more voluntary quizzes outperformed other students on exams and in final course grades.

Overall, students were more likely to take voluntary online quizzes when the content was associated with a required in-class quiz. The data suggest that these quizzes were initially used to prepare for in-class quizzes, but that strategy quickly shifted to quizzes being used to prepare for unit exams.

This preliminary work highlights the fact that in order to implement effective online content, it may be necessary to better understand student motives and incentives.

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