



Because You Can't Teach It All and They Won't Read It All: Student Response Systems Do Improve Learning

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In Introductory Psychology, 30 graduate TAs/faculty teach 2700 students annually. This year we developed an assessment program to improve student learning and graduate teaching training (Shigeto et al., 2010). Part of the program studied the pedagogical value of using student response systems to answer in-class multiple choice questions. Prior research lacks scientific rigor and provides equivocal evidence that SRSs improve learning (Caldwell, 2007).



Research Questions

We investigated the effects of SRS comprehension checks on student learning by focusing on 3 issues:

Q 1: Does the number of SRS Qs impact student learning? (Preszler et al., 2007)

Q 2: Do effects of SRS Qs on learning persist? (Crossgrove & Curran, 2008; Rubio et al, 2008)

Q 3: Do some groups benefit more from SRS Qs? (Crossgrove & Curran, 2008; Reay et al., 2007)

Experimental Methods

Design for SRS Comprehension Checks

For 2 years Intro Psych has given TAs standardized training on SRS best practice. Student participation based on SRS responses is about 10% of their grade.

Subjects: -1647 students in 30 sections

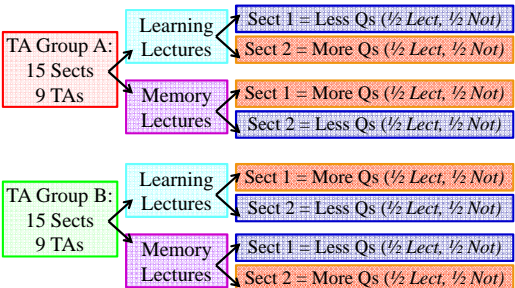
Materials: -16 SRS Qs: (8 Learning / 8 Memory)

-1 Learning Objective per Mult Choice Q

Conditions: -Number of Qs: (Less=4 Qs / More=8 Qs)

-Topic Covered: (½ Lect/ ½ No Lect)

Procedures: -Crossed design for TAs in Groups A / B



Data Acquisition and Analyses

Assessing Learning: Students earned participation points to complete online multiple choice tests. Post-test data was analyzed if a student did the pre-test, but not if they got a pre-test item correct or did not attend lecture.

Pre-Test: -2 weeks before lectures, N=620, (38%)
-16 New Qs: (8 Learning/8 Memory)

Post-Test 1: -2 weeks after lectures, N=390, (24%)
-16 New Qs: (8 Learning/8 Memory)

Post-Test 2: -3 months after lectures, N=297, (18%)
-16 New Qs: (8 Learning/8 Memory)

Logit Mixed Model Analysis: Created best-fit model for binomial post-test data (correct/incorrect for each item). Model accounted for effects of predictors while statistically controlling random variables.

Best-Fitting Model: Excluded content chapter, high-school rank, and ACT scores, as complex models did not improve the prediction of post-test data.

Predictors: -Number of Qs: (Less: 4 Qs/More: 8 Qs)
-Topic Covered: (Lect/No Lect)
-Read Chs: (Low: <40% / High: >60%)

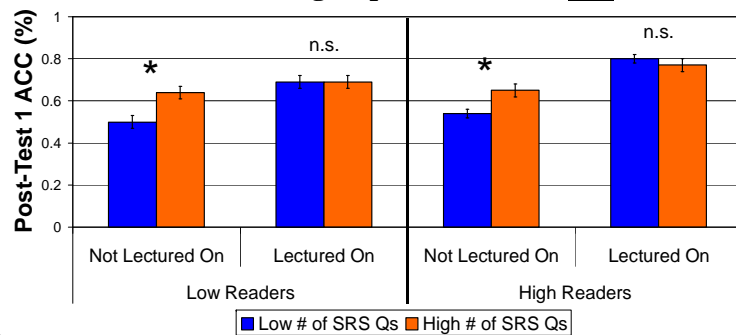
Random: -Student; Question; Section

Discussion

- 1. Having more SRS Qs is associated with improved learning.** In the short term, exposure to more SRS Qs led to greater learning of material covered in lecture, regardless of whether students read the text or not.
- 2. The benefit of SRS use persists to the end term.** Students who read <40% of text benefited from more SRS Qs even 3 months later, regardless of whether the concepts were lectured on.
- 3. Low readers benefit more than high readers from having more SRS Qs.** But no other personal variables predicted performance (e.g., ACT high school percent rank) (Shigeto et al., 2010).

Results – Immediate Post-Test

Short-Term Learning Improved for Info Not in Lecture



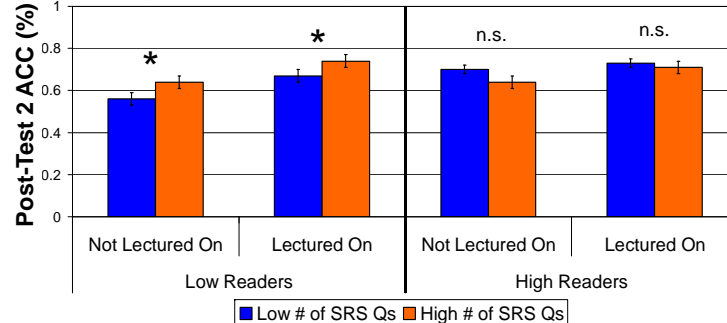
Findings:

More SRS Qs → Higher ACC:
Only for topics not in lecture
($z = -5.9, p < 0.001$)

Low readers → Lower ACC:
Regardless of Num of SRS Qs
($z = -3.07, p < 0.005$)

Results – Delayed Post-Test

Long-Term Learning Improved for “Low Readers”



Findings:

More SRS Qs → Higher ACC:
Only for low readers
($z = -2.3, p < 0.05$)

No effect of num of SRS Qs x lecture coverage:
($p > 0.21$)

Implications

This research will improve student learning in Psych by changing SRS training for graduate TAs to emphasize best practice in using SRSs:

- For more frequent comprehension checks
 - For comprehension checks of material not in lecture
 - To orient students to the most important topics
- Future research on the Intro Psych program will focus on these findings to investigate:
- Do students learn more depending on the type of SRS Q (knowledge, comprehension, application)
 - Do SRS Qs aid learning by orienting to core concepts
 - Will SRS Q effects be eliminated if we support reading (Freeman et al., 2007; Watson et al., 2010)

References

- Caldwell, 2007. *CBE-Life Sci Ed*, 6, 9.
Crossgrove & Curran, 2008. *CBE-Life Sci Ed*, 7, 46.
Freeman et al., 2007. *CBE-Life Sci Ed*, 6, 132.
Preszler, Dawe, Shuster, & Shuster, 2007. *CBE-Life Sci Ed*, 6, 132.
Reay, Li, & Bao, 2008. *Am J Phys*, 76, 71–178.
Rubio, Bassignani, White, & Brant, 2008. *AMJ*, 190, 190.
Shigeto, Grison, Luke, & Watson, 2010. Poster at NIT.
Watson, Grison, Luke, Shigeto, 2010. Poster at NIT.

Acknowledgments

The authors thank the Psych 100 graduate instructor undergraduates, the Psych Department, the Center for Teaching Excellence, the Teaching Advancement Board, and Tim Stelzer, Distinguished Teacher-Scholar.