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Best Practices in Using Student Response Systems (SRS)

Sarah Grison
Parkland College, sgrison@parkland.edu

Robert Bartsch

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Annual Society for the Teaching of Psychology Workshop:

Best Practices in Using Student Response Systems (SRS)

Sarah Grison
University of Illinois, Urbana-Champaign

Robert Bartsch
University of Houston-Clear Lake

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Workshop Materials

Did you get?
- Thought sheets
- Clicker units

Workshop handouts in binder:
- Comparison of SRS technologies
- Student response methods
- Reference list
- Two articles
- Tips for implementation
Overview

1. What are the workshop goals?
2. What are SRS and their benefits?
3. What are the best practices for SRS?
4. How can SRS best be implemented?
1. What are the workshop goals?

Who are we?

Sarah:
- Ph.D. in cognitive neuroscience
- Associate Director of Intro Psych
- Psych 100 lectures (+200) with active learning
- Teaching development for graduate instructors

Rob:
- Ph.D. in social psychology
- Small classes (10-40 students)
- Lecture and discussion
- Faculty developer
1. What are the workshop goals?

How much do you know about SRS?

A. No knowledge/experience
B. A little knowledge/experience
C. Some knowledge/experience
D. A lot of knowledge/experience
E. Expert knowledge/experience
If SRS were available to you next year, what is the likelihood you would use them?

A. Almost definitely not (1-20%)
B. Very unlikely (21-40%)
C. Maybe (41-60%)
D. Very likely (61-80%)
E. Almost definitely (81-100%)
1. What are the workshop goals?

One-Minute Writing

Please think about the classes you teach and any thoughts that you might have about using SRS in your classes.

Write these down on your thought sheet.

In a minute, we would like to hear some of your thoughts.
“I believe that [SRS] add little to classroom pedagogy, and can ultimately diminish scholarship. Can use of [SRS] capture the thoughtful and creative responses that, hopefully, professors attempt to incorporate into their classes? Are we fostering an educational environment in which technology supersedes scholarship, an academy dominated by edtechtainment — pedagogy by gimmickry?”

Alan Groveman

www.insidehighered.com
1. What are the workshop goals?

Wish List for the Workshop

1. Explain what SRS are and provide resources about various types
2. Describe the benefits of using SRS over other response methods
3. Explain how SRS can improve pedagogy and provide supporting resources
4. Describe the best practices for SRS to improve student learning
5. Provide guidance on implementing SRS
Overview

1. What are the workshop goals?
2. What are SRS and their benefits?
3. What are the best practices for SRS?
4. How can SRS best be implemented?
2. What are SRS and their benefits?

**Student response system**: Classroom technology that allows students to respond to and interact with instructor.
2. What are SRS and their benefits?

- **Types of SRS**
  - Infrared
  - Radio-frequency controlled
  - Wireless devices
    - http://www.polleverywhere.com/

- **Input methods**
  - Button-press
  - Keyboard typing
2. What are SRS and their benefits?

Other Names for SRS

- Student response device
- Audience response system
- Audience response device
- Classroom response system
- Classroom performance system
- Classroom communication system
- Electronic voting system
- Electronic response system
- Voting machine
- Interactive response system
- Clickers
- and more...
2. What are SRS and their benefits?

Benefits of SRS Over Other Response Methods

- **Everybody** participates
  - Likelihood of answering less affected by culture, sex, etc

- Responses are anonymous
  - Allows for **honest** self-assessment
  - No fear of humiliation

- Provide immediate feedback to everyone
  - Easy to see how many people chose an answer
  - Everyone sees correct answer and what others thought
  - Graphically compare responses to several questions
  - Instructor can flexibly respond to confusion

- Responses are easily linked to grades
  - Participation, low-stakes, or high-stakes
Overview

1. What are the workshop goals?
2. What are SRS and their benefits?
3. What are the best practices for SRS?
4. How can SRS best be implemented?
“Ultimately...the pedagogical practices of the instructor, not the incorporation of technology, [are] key to student comprehension.”

Judson & Sadawa, 2002, pp. 167
SRS Can Help Achieve Several Pedagogical Goals

1. Improve attendance, attention, enjoyment, & interest
2. Encourage personal involvement for students
3. Assess learning and aid flexible response to it
4. Promote active learning in students

3. What are the best practices?
One-Minute Writing

As we discuss how best practice with SRS can aid pedagogy, please write down any ideas that appeal to you on your thought sheet.

We would like to collect these later and compile a list of ideas to share with you.

Please * your best ideas to share!
3. What are the best practices?

Pedagogical Benefits of SRS

1. Improve attendance, attention, enjoyment, & interest
   - Improve attendance when SRS linked to grades (*Jackson & Trees, 2003*)
   - Increase student alertness (*Burnstein & Lederman, 2001*)
   - Majority of students enjoy SRS (*Simpson & Oliver, 2006*)
   - Increase student enjoyment of class (*Stowell & Nelson, 2007*)
   - Increase student interest in class (*Preszler, Dawe, Schuster, & Schuster, 2007*)
3. What are the best practices?

Research Spotlight

Preszler, Dawe, Schuster, & Schuster, 2007

- Tested SRS in 6 biology classes (101 - 377)
- Across classes, on a certain day could have low (0-2), med (3-4), high (5-6) questions/lecture
- 81% felt SRS increased their interest in class
- 71% felt SRS made them more likely to attend

A. Interest

<table>
<thead>
<tr>
<th>Student Response (%)</th>
<th>All Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>40</td>
</tr>
<tr>
<td>Agree</td>
<td>45</td>
</tr>
<tr>
<td>Undecided</td>
<td>15</td>
</tr>
<tr>
<td>Disagree</td>
<td>5</td>
</tr>
</tbody>
</table>

B. Attendance

<table>
<thead>
<tr>
<th>Student Response (%)</th>
<th>Biol 101</th>
<th>Biol 111 - 377</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>Agree</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Attended anyway</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Did not motivate</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>
3. What are the best practices?

What percentage attendance do you usually have in your classes?

A. 0-20%
B. 21-40%
C. 41-60%
D. 61-80%
E. 81-100%
3. What are the best practices?

How to Improve Attendance, Attention, Enjoyment, & Interest

- Explain rationale for use and grading
  - Be enthusiastic!!
  - Employ SRS from 1st week of class
  - Give points for consistent participation
  - Create a “forgiving” participation mechanism

- Use as “ice breaker”, 2x every 15 min, 6/hour
  - Give students cues for starting/stoping polls

- Use various strategies based on class level, size

Any ideas to share? Please write ideas on thought sheet!
What is Psychology?
We just watched a video of Terri Schiavo. Do you believe that she was conscious or not when the video was made?

A. Yes
B. No
C. I’m not sure

Explain your opinion! Please use your knowledge of the levels of consciousness!!
“The instructor does a great job keeping our attention and I love the interactive nature of the class.”
3. What are the best practices?

Pedagogical Benefits of SRS

2. Encourage personal involvement for students
   - Can make instructors seem warm, friendly, caring, and aware of student needs, *(Jackson & Trees, 2003; Knight & Wood, 2005)*
   - Encourage anonymous, honest assessment of attitudes *(Stowell & Nelson, 2007)*
   - Increase involvement of all students regardless of culture, sex, etc. *(Reay, Li, & Bao, 2008)*
3. What are the best practices?

Reay, Li, & Bao, 2008

- Tested SRS over 3 quarters in large physics classes
- One section used SRS, one did not
- Each term, section with SRS scored 22-26% better on common exam questions
- SRS also associated with greater gains on post test
- Women showed greater gain when using SRS vs not

![Bar chart: Mean increase on post-test by semester and gender]
3. What are the best practices?

About what proportion of your students do you think have a reluctance or sensitivity to speaking in class?

A. 0-20%
B. 21-40%
C. 41-60%
D. 61-80%
E. 81-100%
3. What are the best practices?

How to Encourage Personal Involvement

- Get to know your students, involve all of them
  - Ask about students’ backgrounds, experiences, beliefs, attitudes, opinions
  - Have them relate material to themselves
  - Reveal group differences anonymously

- Include questions on things they care about
  - Have students vote on decisions to promote democracy, sense of control, responsibility
  - Ask about current events!

- Respond to interests with questions on the fly

*Ideas to share? Write ideas you like!*
How much stress have you felt in your life in the past month? Let’s have men answer first, then women.

A. No stress
B. A little stress
C. Some stress
D. A lot of stress
E. A great deal of stress

Was there any difference? If so, how might you explain this difference?
What are your stressors?

A. **Catastrophic events**: Sudden, unexpected, life-threatening events

B. **Life changes**: Events create demands, require a lot of adjustment

C. **Chronic stressors**: Continue a long time

D. **Acute**: Highly disruptive, short-lived events

E. **Daily hassles**: Irritations, not big alone, but effects add up
“The best aspect of the course is how the instructor uses clickers to interact with students. She actually tries to get to know her students.”
Pedagogical Benefits of SRS

3. Assess learning and aid flexible response to it
   - Provide comprehension checks for self-evaluation (Morling, McAuliffe, Cohen, & DiLorenzo, 2008)
   - Especially valuable for analysis questions (Slain, Abate, Hodges, Stamatakis, & Wolak, 2004)
   - Allow flexible response to confusion with contingent teaching (Draper & Brown, 2004; Beatty, Gerace, Leonard, & Dufresne, 2006)
   - Augment long-term retention (Crossgrove & Curran, 2007)
   - May improve exam scores (Preszler, Dawe, Schuster, & Schuster, 2007)
3. What are the best practices?

Research Spotlight

- Preszler, Dawe, Schuster, & Schuster, 2007
  - Recall they tested SRS in 6 bio classes (101-377)
  - Across classes, on a certain day could have low (0-2), med (3-4), high (5-6) questions/lecture
  - Better exam grades were associated with having received more questions on that topic
3. What are the best practices?

What level classes do you teach?

A. 100
B. 200
C. 300+
D. graduate classes
E. a mixture of more than one of these
3. What are the best practices?

How to Assess and Respond to Learning

- Check comprehension of material (lower stakes)
  - Review text, material from prior/current lecture, etc.
  - Give practice exam questions in review sessions
  - Limit “basic” questions, strive for application/analysis
  - Vary nature of questions based on course
  - Give points for correctness to increase motivation

- Give in-class quizzes (higher stakes)
  - Give immediate feedback

- Students explain answers, especially if confused
  - Explain why somebody would answer a distractor

- Respond flexibly to confusion

Ideas to share? Write them down!
After suffering a large bruise during a somewhat wild game of Twister, Rachel feels a throbbing pain in her leg. This dull pain is carried by

A. A–delta fibers.
B. ganglion cells.
C. C fibers.
D. hair cells.

Why is C correct?

How can you remember this?
The 4th floor residents of a burning apartment complex had to decide to get their 9-month old infant down the stairs or to throw her out the window into the coat of a waiting police officer. The uncle said “I looked into his eyes and saw that he would catch her. Then I let her go”. His decision was made based on

A. utility.
B. expected value.
C. the gambler’s fallacy.
D. decision making flaws.

Why is A correct?

Example of B?
Student Feedback

“The clicker questions are extremely effective and help us to understand the material better.”
Pedagogical Benefits of SRS

4. Promote active learning in students
   - Help students process information more deeply (i.e., understanding, reasoning) (Beatty, 2004)
   - Provide foot-in-the-door for discussion, one-minute writing, think-pair-share (Lyman, 1981)
   - Encourage peer interaction and peer instruction (Mazur, 1997; Crouch & Mazur, 2001)
   - Require students to use and manipulate concepts (Freeman et al., 2007)
3. What are the best practices?

Freeman et al., 2007

- Tested SRS in 2 Bio 180 classes
- One used SRS, one used response cards
- Substantially similar questions on all exams
- Versus prior term, both sections’ exam scores averaged 14 points higher
- Versus prior term, across both sections, 4.7% fewer students got less than C-
3. What are the best practices?

Freeman et al., 2007

- Trend for high risk students to perform better in section with clickers versus cards
- May be an effect of:
  - *forced attendance/active learning for SRS section (14% of grade)*
  - *responsiveness to “anonymity”*
3. What are the best practices?

About what proportion of your students may be considered “high-risk” based on SAT, ACT, and/or GPA?

A. 0-20%
B. 21-40%
C. 41-60%
D. 61-80%
E. 81-100%
3. What are the best practices?

How to Promote Active Learning

- Use as foot-in-the-door for higher thought
  - Discussion, one-minute writing, think-pair-share, etc
  - Play the “devil’s advocate”
  - Ask students “what should happen” in a scenario

- Encourage peer interaction, peer instruction
  - Students discuss questions with each other

- Give in-class demos, exercises, experiments
  - Can “test” one group against another and graphically display answers for groups

_Ideas to share? Write them down!_
A person volunteered on Saturday to help pick up trash along a highway. The work was strenuous and the person was sore the next day. What does cognitive dissonance theory predict will happen?

A) The person will not volunteer again
B) The person will volunteer again

Discuss which answer is correct with your neighbor. Then log your answer.

Discuss with your neighbor under what conditions A and B could be correct.
Mini-Experiment

RIGHT half of the room, please close eyes!

LEFT half of the room, please keep looking.
Mini-Experiment

Please try to be quiet! Left half of room put pen in mouth with the tip in front of your nose. See me! Now look at this...
Mini-Experiment

How funny was the picture?

A. Very unfunny
B. Rather unfunny
C. Neither unfunny nor funny
D. Rather funny
E. Very funny
Mini-Experiment

LEFT half of the room, please close eyes!

RIGHT half of the room, please keep looking.
Mini-Experiment

Please try to be quiet! Right half of room put pen in mouth with the tip by your cheek. See me! Now look at this...
Mini-Experiment

How funny was the picture?

A. Very unfunny
B. Rather unfunny
C. Neither unfunny nor funny
D. Rather funny
E. Very funny
Mini-Experiment

Any difference in funniness ratings?

If so, how does this demonstrate the **facial feedback Hypothesis**?
“I really enjoyed using the clickers for in-class experiments. I think they are an awesome way for the student to fully understand the material.”
3. What are the best practices?

Summary

- SRS are a tool...
- Neither necessary nor sufficient for improving learning
- Research suggests SRS should help learning
- But! Only if instructor uses solid pedagogical techniques
3. What are the best practices?

If SRS were available to you next year, what is the likelihood you would use them?

A. Almost definitely not (1-20%)
B. Very unlikely (21-40%)
C. Maybe (41-60%)
D. Very likely (61-80%)
E. Almost definitely (81-100%)
3. What are the best practices?

Discussion

We have talked about how SRS can help achieve certain pedagogical goals and you have written about which ideas appealed to you.

Let’s discuss which ideas you might incorporate in your classes.

- Improve attendance, attention, enjoyment, & interest
- Encourage personal involvement for students
- Assess learning and aid flexible response to it
- Promote active learning in students
Overview

1. What are the workshop goals?
2. What are SRS and their benefits?
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4. How can SRS be implemented?

Practices That Tend to Lead to Failure

1. Fail to explain why you are using SRS.
2. Fail to discuss what learning means or the depth of participation and learning you expect in your class.
3. Only use SRS for attendance.
4. Never ask students to talk with each other.
5. Only use factual recall questions.
6. Don’t make use of the student response information.
7. Think of SRS as only a testing device, rather than a device to inform learning.

Douglas Duncan, 2008
http://casa.colorado.edu/~dduncan/clickers/Tips.htm
4. How can SRS be implemented?

Practices That Tend to Lead to Success

1. Be sure your goals match what pedagogical gain can be provided by SRS.
2. Choose SRS carefully based on needs, constraints.
3. Train yourself to use the SRS well before class starts.
4. Make appropriate changes to your course and lectures to incorporate SRS.
5. Explain SRS to students, why you are using them, how they will be graded, and other expectations.
6. Be prepared to troubleshoot a lot at first and reassure students their data are being collected.
7. Learn about and use best practice in SRS pedagogy.
8. And last but not least....Back up data, back up data, back up data!
“Like any classroom technology, clickers will not automatically improve teaching or enhance student learning. Clickers can be detrimental if poorly used, but highly beneficial if good practices are followed, as documented by a growing body of educational literature.”

*CBE Life Science Education, 2007, pp. 1.*
Questions?

Questions about SRS?
Want a copy of this slideshow?
Please feel free to contact:

Sarah Grison
sgrison@uiuc.edu

Robert Bartsch
Bartsch@uhcl.edu
Acknowledgements

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Doug Bernstein
Sandy Goss Lucas
Joanne Fetzner
Patrick Langan
Feedback & Thought Sheets

Feedback:
- We would appreciate it if you would take a minute and complete the feedback sheet.
- Please put sheet on table at back when you leave.

Thought Sheets:
- Please also put thought sheet on table at back when you leave.
- Please * your best ideas to share!
- Put your e-mail on it if you would like a summary of thought sheets ideas or a copy of this PPT.

Please return your clicker to a box by the door.
Do SRS Improve Learning?

Slain et al. (2004)

- Tested SRS in 3 pharmacy classes over 2 years
- Year 1 used lecture, year 2 used lecture + SRS
- Indicates improvement on exams, especially for
  - larger classes
  - final exam
  - analytical questions
Morling et al., 2008

- Tested SRS in 4 large intro psych sections
- 2 sections used SRS, 2 didn’t
- 5 factual mc questions at start of SRS class
- Received extra credit if correct
- Scores on 4 common exams better for the 2 SRS sections on Exams 1 and 4

Do SRS Improve Learning?
Do SRS Improve Learning?

- Poirier & Feldman (2007)
  - 2 sections
  - 1 SRS activity per week (1-3 MC questions)
  - Average effect size on exams $d = .17$
  - Significant but small effects, but did not use SRS much
Do SRS Improve Learning?

- Kennedy & Cutts (2005)
  - Computer science class (n=241)
  - Students who got more questions right with SRS did better on exams
  - Could be better students do better at both

- Schackow et al. (2004)
  - Family medicine students (n=24)
  - Cross-over design, students both had traditional and SRS
  - Given quizzes immediately after and one month after; quiz questions were same as in class
  - Students did better than control
  - Could be SRS condition pointed out important items for exam