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Evidence-Based Teaching and Learning: From Theory to Practice

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Evidence-Based Teaching and Learning: From Theory to Practice

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Parkland College

http://tinyurl.com/lcv5r5t
docgrison

Terman Teaching Conference
April, 2014
Goal is to explore using evidence-based practice in our work

1. What are our challenges in teaching & learning?
2. How can an evidence-based approach help?
3. How can we practice evidence-based teaching & learning?
4. What are the take-home messages?

http://tinyurl.com/lcv5r5t
1. What are our challenges in teaching & learning?

A “perfect storm” of challenges

- We teach a wider variety of classes and formats, but with less support
- Our students are less prepared & busier, but we must support them all
- We must show that students learn, but often without any training

Do these sound familiar to you?
1. What are our challenges in teaching & learning?

Teaching

- How can we support teachers?

Learning

- How can we help students learn?

Assessment

- How can we assess students’ progress?
Best (And New) Practices In Teaching Undergraduate Students

Best (And Old) Practices In Teaching (Mentoring) Graduate Students And Junior Colleagues
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2. How can an evidence-based approach help?

- Being evidence-based means using the methods and principles of science.

- This is relevant to all aspects of our teaching and learning.

- In Introductory Psychology we called it “Walking the walk”.
2. How can an evidence-based approach help?

Our approach to evidence-based teaching & learning

- Providing content resources for teachers
- Providing information about empirically supported pedagogies
- Using only empirically supported tools in course
- Teaching students effective study methods
- Conducting empirical classroom studies
- Using scientific methods in assessment
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1. What are our challenges in teaching & learning?

2. How can an evidence-based approach help?

3. How can we practice evidence-based teaching & learning?
   ✓ While assessing outcomes
   ✓ To enhance student learning
   ✓ To support teachers’ skills

4. What are the take-home messages?

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3. How can we practice evidence-based teaching & learning?

**Challenge for our 10-year accreditation visit:**

To develop an assessment program based on scientific principles (Dunn, Mehrotra, & Halonen, 2004)

**Step 1:** Choose learning objectives (text, APA, & Bloom’s levels (Pusateri, 2009))

**Step 2:** Develop indirect measures to assess attitudes (Breckler, 1984)

**Step 3:** Develop direct measures to assess learning on pre- and post-test

**Step 4:** Collect student data to investigate individual differences

**Step 5:** Apply results to improve student learning and support teachers’ skills
6.2 How Do We Learn by Classical Conditioning?

**Learning Goals**

- a. Remember the key terms about classical conditioning.
- b. Apply the four steps of classical conditioning.
- c. Apply the concepts of acquisition, extinction, spontaneous recovery, generalization, and discrimination.
- d. Analyze the acquisition of a phobia and counterconditioning to reduce a phobia.

The text learning goals for your text should be available to both teachers and students!
FRAMEWORK OF GUIDELINES 2.0

A SUMMARY OF THE LEARNING GOALS

This framework includes four skills-based goals and one content-focused goal. The roster of Guidelines 2.0 includes the following:

Goal 1: Knowledge Base in Psychology
Goal 2: Scientific Inquiry and Critical Thinking
Goal 3: Ethical and Social Responsibility in a Diverse World
Goal 4: Communication
Goal 5: Professional Development

Click here to access the APA Goals version 2.0

Revised Taxonomy of Cognitive Skills
(Anderson et al., 2001)

[1] Remember:
Retrieve information from memory in the same form it was learned

[2] Understand:
Construct meaning from oral, written, and graphic information

[3] Apply:
Use learned information or procedure in another task or situation

[4] Analyze:
Break down info to see how parts relate to each other and to whole

[5] Evaluate:
Assess information as whole to justify stance

[6] Create:
Put elements into a whole, new product

Click here to access the revised version of Bloom’s taxonomy
URL: http://ww2.odu.edu/educ/roverbau/Bloom/blooms_taxonomy.htm
3. How can we practice evidence-based teaching & learning?

**Finding:** Most positive attitudes towards student response systems
3. How can we practice evidence-based teaching & learning?

**Finding:**
Significant learning occurred, contingent on students' high school percent rank \((z=3.37, p<.001)\).
### 6.2 How Do We Learn by Classical Conditioning?

<table>
<thead>
<tr>
<th>LEARNING GOALS</th>
<th>READING ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Remember the key terms about classical conditioning.</td>
<td>List all of the boldface words and write down their definitions.</td>
</tr>
<tr>
<td>b. Apply the four steps of classical conditioning.</td>
<td>Use the four steps of classical conditioning to describe how to train a horse to run at the sound of a bell. Hint: Horses naturally run when hit on the rump.</td>
</tr>
<tr>
<td>c. Apply the concepts of acquisition, extinction, spontaneous recovery, generalization, and discrimination.</td>
<td>Extend these five concepts to the classical conditioning situation you described in part b.</td>
</tr>
<tr>
<td>d. Analyze the acquisition of a phobia and counterconditioning to reduce a phobia.</td>
<td>Identify how a phobia of snakes can be acquired through classical conditioning and reduced through counterconditioning.</td>
</tr>
</tbody>
</table>
3. How can we practice evidence-based teaching & learning?

Finding: In equal opportunity sections, repeated testing via online quizzing and self-explanation via written homework (note matrices) predicted better test performance.
3. How can we practice evidence-based teaching & learning?

Tips from the trenches about assessment!

- Investigate getting IRB approval to access to students’ files
- Motivate participation and performance
  - e.g., Give extra points on grade for correct answers
- Avoid practice effects
  - Two tests with different questions on same concepts/learning goals
- Examine difficulty across two tests
  - Pre-test: Half of students do Test A & half do Test B
  - Post-test: Students who had Test A now do Test B & vice versa
  - Analyze for difficulty of both tests & revise as needed
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**Challenge to improve student learning:**

Repeated testing improves memory (Roediger & Karpicke, 2006; Carpenter, et al., 2007)

So we investigated using student response systems to achieve the effects of repeated testing

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**Step 1:** Use data from assessment pre-test as baseline

**Step 2:** For 1 week TAs’ classes got 4 or 8 SRS questions (Preszler et al., 2007)

**Step 3:** For another week TAs’ classes got 8 or 4 questions (counterbalanced)

**Step 4:** Collect data on text reading; Post-test 1 in 2 weeks; Post-test 2 in 12 weeks

**Step 5:** Close the loop to change policies on SRS use across sections & train teachers
3. How can we practice evidence-based teaching & learning?

Learning After 2 Weeks Predicted By High Number of SRS Qs

*Only for topics NOT covered in lecture (z=4.7, p<0.001)*

![Graph showing learning after 2 weeks predicted by high number of SRS Qs.](Image)
3. How can we practice evidence-based teaching & learning?

![Graph showing learning after 12 weeks predicted by high number of SRS Qs. The graph is titled 'Learning After 12 Weeks Predicted By High Number of SRS Qs' and indicates that only for "Low" readers (z=-2.3, p<0.05) does the number of SRS Qs significantly affect learning. The graph compares learning outcomes for 'Low' readers who were not lectured on versus those who were, and for 'High' readers with low and high numbers of SRS Qs. The results show a significant difference for low readers who were not lectured on (p<0.05).]
Action: Engage all students in responding

Click here to access Poll Everywhere

URL: www.polleverywhere.com
6.3: Did You Get it?

Giovanni’s dog Luna won’t heel. To teach him to heel, Giovanni puts a choke chain and a leash on the dog somewhat tightly and goes for a walk. When Giovanni says “Heel” and Luna walks next to him, Giovanni loosens the choke chain. Now Luna heels much more often than before due to

A. positive reinforcement.
B. negative reinforcement.
C. positive punishment.
D. negative punishment.
6.3: Did You Get it?

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A. positive reinforcement.
B. negative reinforcement.
C. positive punishment.
D. negative punishment.

Please turn to your neighbor and discuss why this is the correct answer.

Be prepared to explain.
3. How can we practice evidence-based teaching & learning?

Tips from the trenches about student learning!

- IRB approval to find data that may predict learning/reading
  - e.g., High school rank, Mini Big 5, Achievement Motivation etc.

- Be careful about ethics in classroom studies

- Teach students the skills that will help them learn!

<table>
<thead>
<tr>
<th>Strong Support</th>
<th>Moderate Support</th>
<th>Weak Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated Testing</td>
<td>Self-explanation</td>
<td>Highlighting</td>
</tr>
<tr>
<td>Distributed practice</td>
<td>Elaborative interrogation</td>
<td>Re-reading</td>
</tr>
</tbody>
</table>

*Dunlosky et al, 2013*
Improving Students’ Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology

John Dunlosky¹, Katherine A. Rawson¹, Elizabeth J. Marsh², Mitchell J. Nathan³, and Daniel T. Willingham⁴

¹Department of Psychology, Kent State University; ²Department of Psychology and Neuroscience, Duke University; ³Department of Educational Psychology, Department of Curriculum & Instruction, and Department of Psychology, University of Wisconsin–Madison; and ⁴Department of Psychology, University of Virginia

Summary

Many students are being left behind by an educational system that some people believe is in crisis. Improving educational outcomes will require efforts on many fronts, but a central premise of this monograph is that one part of a solution involves helping students to better regulate their learning through the use of effective learning techniques. Fortunately, cognitive and educational psychologists have been developing and evaluating easy-to-use learning techniques that could help students achieve their learning goals. In this monograph, we discuss 10 learning techniques in detail and offer recommendations about their relative utility. We selected techniques that were expected to be relatively easy to use and hence could be adopted by many students. Also, some techniques (e.g., highlighting and rereading) were selected because students report relying heavily on them, which makes it especially important to examine how well they work. The techniques include elaborative interrogation, self-explanation, summarization, highlighting (or underlining), the keyword mnemonic, imagery use for text learning, rereading, practice testing, distributed practice, and interleaved practice.

To offer recommendations about the relative utility of these techniques, we evaluated whether their benefits generalize
Tokuhama-Espinosa, 2010

Mind, Brain, and Education Science
A Comprehensive Guide to the New Brain-Based Teaching

Tracey Tokuhama-Espinosa
Foreword by Judy Willis
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http://tinyurl.com/lcv5r5t
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Challenge to support teachers:

- Few receive teaching training (Buskist, Beins, & Hevern, 2004)
- We provided content & pedagogy support to TAs

Step 1: Develop classes & seminars to support content, pedagogy & technology

Step 2: Develop wiki of resources on these topics for teachers to access

Step 3: Develop non-evaluative methods for class visits & videotaping

Step 4: Provide professional development support for teaching certificates

Step 5: Close the loop to alter resources and support as appropriate
3. How can we practice evidence-based teaching & learning?

TAs’ Attitudes Were Most Positive Towards Training Activities With Immediate Benefits
For LO2. Please access the YouTube video on classical conditioning at http://www.youtube.com/watch?v=dxjgiq04Bp8&feature=youtu.be. Then first, please fill in the chart below to state the term for each phase of classical conditioning. Second, please state the stimulus or response associated with each phase.

Click here to see the full video

URL: http://www.youtube.com/watch?v=dxjgiq04Bp8&feature=youtu.be
Action: Wiki materials include videos that support development of teaching skills

Click here to see the full video

URL: http://www.youtube.com/watch?v=dxjgiq04Bp8&feature=youtu.be
3. How can we practice evidence-based teaching & learning?

Proportion of Psych 100 TAs on Excellent List Increased
3. How can we practice evidence-based teaching & learning?

Tips from the trenches about supporting teachers!

- When providing support to teachers it’s a delicate balancing act – honor experience and provide access to new information.

- Using an approach like self-determination theory can help to develop competence, autonomy, & relatedness (Deci & Ryan, 2000).

- Data is never causal, but can use statistical methods to look for predictor variables (logit mixed models).
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4. What are the take home messages?

1. We can learn about evidence-based teaching and learning
2. We can conduct our own classroom research
3. And these help us improve teachers’ skills and students educational experiences:
   - In terms of preparation, unfortunately the “rich get richer”
   - We must support students’ ability to read and comprehend text because it seems to predict learning
   - We must support text reading and provide layered ways to learn material (e.g., clickers, online quizzes, homework on text readings)
4. What are the take home messages?

Our current work is exploring ways to improve student learning by using pedagogically appropriate:

- Development of higher thinking skills (Bloom et al., 1956; Anderson et al., 2001; Henricks-Lepp et al., 2014)
- Online homework tools (Carlson et al., 2012)
- Active engagement with videos (Mayer, 2008)

You can access some of our research here: http://tinyurl.com/lcv5r5t
Thank you very much!

- Lewis M. Terman Western Regional Teaching Conference & Heidi Riggio
- Introductory Psychology teachers and students at the University of Illinois, Urbana-Champaign
- APS Fund for Teaching & Public Understanding of Psychological Science
- And especially the graduate students I have worked with – Aya Shigeto, Steven Luke, and Patrick Watson – and do work with:

  - Crystal Carlson
  - Genevieve Henricks-Lepp
  - Jenna Wiedenbenner
Any questions, thoughts, or request to access more materials?

Please catch me before the conference ends.

Please email me at sgrison@parkland.edu