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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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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?
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?

TCCTA: The Power of Harmony
1. What are our challenges in teaching & learning?

- How can we support teachers?
- How can we help students learn?
- How can we assess students’ progress?
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?
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 the 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
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?
   - While assessing outcomes
   - To enhance student learning
   - To support teachers’ skills

4. What are the take-home messages?
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)

1. **Step 1:** Choose learning objectives (text, APA, & Bloom’s levels (Pusateri, 2009))
2. **Step 2:** Develop indirect measures to assess attitudes (Breckler, 1984)
3. **Step 3:** Develop direct measures to assess learning on pre- and post-test
4. **Step 4:** Collect student data to investigate individual differences
5. **Step 5:** Apply results to improve student learning and support teachers’ skills
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 ($z=3.37, p<.001$).
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
3. How can we practice evidence-based teaching & learning?

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

Learning After 12 Weeks Predicted By High Number of SRS Qs

Only for “Low” readers (z=-2.3, p<0.05)

<table>
<thead>
<tr>
<th>Low Readers</th>
<th>High Readers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Lectured On</td>
<td>Low # of SRS Qs</td>
</tr>
<tr>
<td>Lectured On</td>
<td>High # of SRS Qs</td>
</tr>
<tr>
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</tr>
<tr>
<td>Lectured On</td>
<td>High # of SRS Qs</td>
</tr>
</tbody>
</table>

Post-Test 2 ACC (%)
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*
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?

**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

- Proportion of TAs Stating They “Definitely” Want Certain Support

- Access to Teaching & Learning Wiki
- Pre-Term Meeting to Set Teaching Goals
- Take Psych 570 Graduate Teaching Course
- Receive Technological Pedagogy Training
- Class Visit with Feedback on Teaching
- Support to Earn Teaching Certificates
- Providing or Receiving Mentoring
3. How can we practice evidence-based teaching & learning?

Proportion of Psych 100 TAs on Excellent List Increased

![Graph showing the proportion of Psych 100 TAs on the Excellent List increased from 2006 to 2010. The R² value is 0.9014.]
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).

- 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?

- Evidence-based teaching and learning can be **flexible and efficient**

And it can give us new information:

- In terms of preparation “rich get richer”
- Ability to read a text seems to predict learning
- Must support text reading and provide layered ways to learn material (e.g., clickers, online quizzes, note matrices)
4. What are the take home messages?

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)
Thank you very much!

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Any questions or thoughts?

Please email me at sgrison@parkland.edu