Practice Makes Permanent
Engaging Students In Active Learning To Help Make Things Stick

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Blended learning is an emerging paradigm for science education but has not been rigorously assessed. We performed a randomized controlled trial of blended learning. We found that in-class problem solving improved exam performance, and video assignments increased attendance and satisfaction. This validates a new model for science communication and education.
2x2 Study Design

- **Textbook**
  - **Before Class**
  - **During Class**
    - Group 1
      - Textbook
      - Lecture
    - Group 2
      - Textbook
      - Act learn

- **Video**
  - **Before Class**
  - **During Class**
    - Group 3
      - Video
      - Lecture
    - Group 4
      - Video
      - Act learn
Outcomes measured

1. Class attendance
Outcomes measured

1. Class attendance

*Take home point:
"Video" assignment students were more likely to attend class when compared with "Textbook" assignment students.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textbook</td>
<td>67%</td>
</tr>
<tr>
<td>Video</td>
<td>85%</td>
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</table>
Outcomes measured

1. Class performance

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textbook Lecture</td>
<td>Textbook Active learning</td>
</tr>
<tr>
<td>61%</td>
<td>73%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Lecture</td>
<td>Video Active learning</td>
</tr>
<tr>
<td>67%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Outcomes measured

1. Class performance

*Take home point:
“... providing students with problems to solve during class results in significantly improved exam performance, compared to simply having the instructor describe the same problems and their solutions during the course of lecture.”

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
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</table>
Practice
Simple Versus Complex Tasks

**Bloom’s Taxonomy**

- **remember**
  - Recall facts and basic concepts
  - define, duplicate, list, memorize, repeat, state

- **understand**
  - Explain ideas or concepts
  - classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

- **apply**
  - Use information in new situations
  - execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

- **analyze**
  - Draw connections among ideas
  - differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

- **evaluate**
  - Justify a stand or decision
  - appraise, argue, defend, judge, select, support, value, critique, weigh

- **create**
  - Produce new or original work
  - Design, assemble, construct, conjecture, develop, formulate, author, investigate
Simple (but profound) Practice

• “One of these things is not like the other…”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
Examples using Pop Culture
Simple (but profound) Practice

• “One of these things is not like the other...”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
One of these things is not like the other
One of these things is not like the other
One of these things is not like the other

The phantom of the opera
Starlight express
Les Miserables
Cats
Joseph
Evita
Andrew Lloyd Webber musicals
When would this activity be beneficial in the classroom?

One of these things is not like the other
One of these things is not like the other
One of these things is not like the other

- Iliocostalis m.
- Deep back m.
- Intrinsic back m.
- Epaxial m.
- Paraspinal m.
- Levator scapulae m.
- Rhomboid major m.
- Latissimus dorsi m.
- Trapezius m.
One of these things is not like the other

Or

...Innervated by a cranial nerve

- Trapezius m.
- Innervated by the spinal accessory n. (CN XI)
Simple (but profound) Practice

• “One of these things is not like the other…”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
... is to ...  

AS

... is to ...
When would this activity be beneficial in the classroom?
... is to ...  

AS 

Scapular retraction

... is to ...  

Glenohumeral adduction
Simple (but profound) Practice

• “One of these things is not like the other...”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
Match each image in the top with an image from the bottom
Match each image in the top with an image from the bottom.
Match the following

The Lord of the Rings
Galadriel and Frodo Baggins

“One ring to rule them _?_.“
Match the following:

The Wizard of Oz
The tin man
Dorothy and her ruby red slippers

“There’s no place like __?__.”
The Matrix
Morpheus giving Neo two pills to make a choice

“You take the blue pill – the story ends ...
You take the red pill – You stay in ___?____.”
Match the following

James Bond
Drinking martinis’

“Shaken ... not ___?___”
Match the following

Harry Potter
JK Rowling (Author)
Harry Potter (lightning bolt forehead scar)
When would this activity be beneficial in the classroom?

Match each image in the top with an image from the bottom:
Each of the 5 cadavers have a muscle indicated by a yellow star.

Match the cadaver image with its associated action.
Match the cadaver image with its associated action

1. Scapular retraction (with glenohumeral external rotation)
2. Humeral adduction
3. Scapular rotation (elevation)
4. Head and neck rotation (unilateral contraction)
5. Vertebral extension (bilateral contraction)
Simple (but profound) Practice

• “One of these things is not like the other…”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
Here is an image from a super hero movie ... one of the heroes is incorrectly labelled. Who is it?
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Here is an image from a super hero movie ... one of the heroes is incorrectly labelled. Who is it?
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Here are two illustrations of vertebrae. One label is incorrect. Where is it?
Here are two illustrations of vertebrae. One label is incorrect. Where is it?
Simple (but profound) Practice

• “One of these things is not like the other…”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
Who am I?

- I come from a family of seven
- I can be a pain in the neck
- I am hard on the outside but spongy in the middle
Who am I?

- I come from a family of seven
- I can be a pain in the neck
- I am hard on the outside but spongy in the middle

Cervical vertebrae
Simple (but profound) Practice

• “One of these things is not like the other...”
• “A” is to “B” as “C” is to “?”
• Matching activities
• Find the error
• “Who am i?”
• Analogies and Stories
Pleural membranes

- Visceral pleura
- Parietal pleura

LUNGS
Pleural membranes are like ...

Two plates of glass and a drop of water
Pleural membranes are like ...

Two plates of glass and a drop of water

H2O
Pleural membranes are like ...

Two plates of glass and a drop of water
Pleural membranes are like ...

Two plates of glass and a drop of water
Pleural membranes are like ... 

Two plates of glass and a drop of water
Pleural membranes are like ...

Two plates of glass and a drop of water
EXPLAIN HOW ...

Pleural membranes are like ...

Two plates of glass and a drop of water
Pleural membranes are like ...

Two plates of glass and a drop of water
Pleural membranes are like ...

Two plates of glass and a drop of water
EXPLAIN HOW ... 

Pleural membranes are like ...

Two plates of glass and a drop of water

Parietal pleura

Visceral pleura
Simple Versus Complex Tasks

Complex Tasks
Synthesize Concepts at Higher Level

Bloom’s Taxonomy

- **Create**
  - Produce new or original work
  - Design, assemble, construct, conjecture, develop, formulate, author, investigate

- **Evaluate**
  - Justify a stand or decision
  - Appraise, argue, defend, judge, select, support, value, critique, weigh

- **Analyze**
  - Draw connections among ideas
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- **Apply**
  - Use information in new situations
  - Execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

- **Understand**
  - Explain ideas or concepts
  - Classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

- **Remember**
  - Recall facts and basic concepts
  - Define, duplicate, list, memorize, repeat, state
Simple Tasks

A good soccer warm up meets three important objectives...

• Decreases the risk of injury.
• Increases agility, skill, power and performance.
• Allows players to mentally prepare and focus on the game or session at hand.
SOCCER Analogy

Complex Tasks

Strategy and Tactical Skills:

• Strategy is a 'Game Plan' based on the strengths and weaknesses of your own team, the expected behavior of the opponents, external conditions (i.e. field, weather, etc) and the rules of the game.

• Tactics are the specific actions in which individuals, component groups, or the whole team can perform. Tactics refer to targeted actions that allow the realization of the strategy.

Bloom’s Taxonomy

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  - Recall facts and basic concepts
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- Evaluate:
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- Create:
  - Produce new or original work
    - Design, assemble, construct, conjecture, develop, formulate, author, investigate

@cirtimooc
## Key Concepts
### Generational Learning

<table>
<thead>
<tr>
<th>Silent</th>
<th>Boomers</th>
<th>Generation-X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left-Brain/Logical</td>
<td>Interactive</td>
<td>Learn by Doing (Active Learning)</td>
</tr>
<tr>
<td>Consistency &amp; Logic Appreciated</td>
<td>Interested in Problem-Solving</td>
<td>Enjoy Role-Playing, Willing to Jump In and Try</td>
</tr>
<tr>
<td>Computers are Sometimes More Trouble Than They are Worth</td>
<td>Computers Can Streamline Inefficiencies</td>
<td>Enhanced Computer Skills make the Computer Do What You Need it to Do</td>
</tr>
<tr>
<td>Written Materials in Summary Form</td>
<td>Written Materials Organized for a Quick Scan (Include Details)</td>
<td>Written Materials With Bullets, Graphics, Quotes</td>
</tr>
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</table>

Alvarado C. University of Texas at Austin
Pharmacy Higher Education Delivery

1. Rejecting the use of classroom time for simple transmission of Facts;
2. Challenging students to think critically, communicate lucidly, and synthesize broadly to solve problems; and
3. Adopt a philosophy of “evidence-based education.

Core Constructs of Education Innovation and Reform
ONE MINUTE PAPER

Key Concepts:
• What have you learned?
• What questions remain?
• Is there anything you do not understand?

Presenter:
• Have you addressed your objectives?
• Do the students get it?
• Re-explain where understanding is lacking.
Dr. Munger is Coursemaster for Integrated Therapeutics (CV Module) in UUCoP
  – Debate Prep: reading assignments (handouts and ACC/AHA Guideline Statements) 20 question quiz (score included in grade)
  – In-Class Debates: 2-4 Teams of 5-10 persons (1-2 Debaters) 10-15 minutes max.
    • Case-Based
      – Which anti-HTN is the best initial treatment for patient A? Third-line agent?
      – Which rate-limiting therapy is best for patient X with atrial fibrillation with hemodynamic compromise?
      – Which anticoagulant is best for patient X with atrial fibrillation, hemodynamic compromise, and a left atrial thrombus on transesophageal echocardiogram?
      – Should patient X receive a rate-limiting agent or an antiarrhythmic agent for long-term atrial fibrillation control?

CASE-BASED DISCUSSION

• In-Class Discussions
  – Case Based (Example: HTN)
  • Broken into Sections For Ease of Learning and to Teach Algorithmic Learning
    – First: Assessment (Asymptomatic Disease, ASCVD 10-year Risk, Framingham Risk Score, Laboratory Tests, Primary Prevention Risk Status, Blood Pressure Measurement)
    – Second: Natural History
    – Third: Guideline-Based Therapy, Lifestyle Modifiers, Selection of an Antihypertensive Agent (Pharmacology, Hemodynamics, and Adverse Effects and Cost of Antihypertensive Agent)
    – Fourth: Individualized Approach to Anti-HTN Therapeutics
    – Cases: General, Elderly, DM, CKD, Other
Advantages of Case-Based Discussion

- Students sort out factual data, apply analytic tools, articulate issues, reflect on their relevant experiences, and draw conclusions they can relate to new situations.
- Students acquire substantive knowledge and develop analytic, collaborative, and communication skills.
- Cases add meaning by providing students with the opportunity to see theory in practice.
- Students seem more engaged, interested, and involved in the class.
- Develops students' skills in group learning, speaking, and critical thinking.
- Since many cases are based on contemporary or realistic problems, the use of cases in the classroom makes subject matter more relevant.
THANK-YOU

Questions and Discussion