Beyond Merely Formative: Expanding our Conceptualizations of Assessment for Learning

NIKKI WOODS  MARIA MYLOPOULOS
(MAHAN KULASEGARAM)

THE WILSON CENTRE
Assessment drives learning
ASSESSMENT TELLS LEARNERS

- What to know
- How to know it
CREATING ASSESSMENTS that support preparation and integration
Health Professions Education

<table>
<thead>
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<th>Large numbers, limited resources</th>
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<tr>
<td>More ‘authentic’ assessment desired</td>
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<tr>
<td>Meaningful to students &amp; teachers (&amp; patients?)</td>
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Assessment Drives Learning

Focus on material that is tested

Appraisal of relevance

Learning and teaching to the test
"She talked about material that wasn’t on the exam"
This will not be on the test...
LEARNING GOALS

What are your goals for your curriculum?
LEARNING GOALS

Integration, preparation for future learning, complexity, adaptive expertise, life-long learning
IS OUR ASSESSMENT PRACTICE ALIGNED WITH THESE GOALS?

Dornan 2014
Deficiencies

Gatekeeping and hoop jumping (Eva et al. 2016)

Expectations of certainty (Luther & Krandall 2011)

Dissatisfaction with the learning environment
FIXING ASSESSMENT

USING ASSESSMENT
“Main focus of assessment was on measuring the outcomes of the learning process...this approach is often referred to as assessment of learning. Currently, a second notion has gained ground, namely assessment for learning”

Schurwith et al. Consensus Statement from the Ottawa 2010 Conference
ASSESSMENT DRIVES LEARNING

THREAT/OPPORTUNITY
TEST-ENHANCED LEARNING EFFECT
Test-enhanced learning effect

- Superior to equivalent study time
- Independent of feedback
- Retention and application
- Multiple contexts
- Pre-test vs. Post-test

Kornell 2011; Larsen 2015; Bjork & Roediger 2006
<table>
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<th>Extending the Effect</th>
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<tr>
<td>Kromman &amp; colleagues (2008) – test enhanced learning of resuscitation skills</td>
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<tr>
<td>Larsen &amp; colleagues (2012) – augmenting test enhanced learning with self-explanation</td>
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MECHANISMS

Intrinsic & Direct effects on the cognition of learners
RETRIEVAL PRACTICE
Memory is not static but is reconstructed
Retrieval re-encodes
Desirable Difficulty
(Bjork 2006)
MORE FORMATIVE TESTING
PROGRAMMATIC ASSESSMENT:

THE WHOLE > SUM OF THE PARTS
BENEFITS

More ‘feedback’ and more data

Identification of learners in difficulty

More competencies

Greater complexity

Focus on learning not test taking ability

van der Vleuten & Schurwith 2010; Eva 2016
ALIGNMENT?

More assessment vs. better assessment

Assessment map vs. assessment content
The ability to apply and use knowledge
Learning & Retention  Extension & Adaptation
TRANSFER TASKS

Learning anatomy & physiology → Writing an MCQ exam
Learning biochemistry → Understanding physiology
Learning physiology → Dx patient case
Learning comm. skills with a SP → Breaking bad news to a patient
Learning a LP on a simulator → Performing LP on a real patient
Learning team crisis management during a simulation → Managing a patient crisis
DIFFICULTY OF SPONTANEOUS TRANSFER

Thorndike & Woodworth 1902;
Catrambone & Holyoak 1982;
Ross 1987; Eva 1998; Norman et al. 2007
TRANSFER APPROPRIATE PROCESSING

(TAP)

Morris, Bransford & Franks 1977
COGNITIVE PROCESS

COGNITIVE PROCESS
“there is a relationship between the process of encoding information or memory and the process of retrieving that information at the time of future learning, problem-solving, or performance”

Franks 2000
Problem Oriented Processing

Students were trained on problems and given solutions.

Memory Oriented Group were told to remember the solution.

Problem Oriented Group were told to explain the solution back.

Needham & Begg 1991
NOVEL PROBLEMS + RECALL
Recall

- Memory Oriented Group
- Problem Oriented Group
Novel Problems

- Memory Oriented Group
- Problem Oriented Group
RECALL
HAS A DIFFERENT PROCESS OF LEARNING FROM APPLICATION

Reorganization of the structure of knowledge
“Goodness” of particular acquisition activities must be defined relative to particular learning goals (as well as to tests designed to be congruent with these goals)

Morris et al. 1977
What you want to do with the knowledge DICTATES HOW YOU SHOULD LEARN IT
IT'S ABOUT PROCESSES

Hunt & McDaniel 1993; Bransford 2001; Kulasegaram et al. 2017
“AUTHENTIC” ASSESSMENT

Grierson 2014; Park 2007; Matsumoto 2002; Durning 2012; La Rochelle 2011
IMPLICATIONS

For transfer to occur TAP must evoked during learning

Format of instruction matters less than the processing evoked

Instruction: both content and processing of knowledge

Outcome task process must be understood
POP QUIZ

NO COLLABORATION ALLOWED

...AND DON'T ASK SIRI!
1. What year was Needham & Begg published?

2. What is the definition of transfer appropriate processing?

3. What are some of the potential implications of transfer appropriate processing for assessment?
4. What type(s) of processing did each question evoke?
TRANSFER

THROUGH ASSESSMENT
Which year did the War of 1812 begin?

a) 1938
b) 1912
c) 1812
d) 1811
WHAT TYPE OF PROCESSING IS CREATED DURING ASSESSMENTS?
**RECALL**
as a Response Process

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<th>True/False</th>
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<td>Single fact questions</td>
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<tr>
<td>(e.g. what is the name of; correct dose of)</td>
</tr>
<tr>
<td>It doesn’t take much understanding</td>
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</table>
RESPONSE PROCESSES

RECALL
- Factoids
- Memory

APPLICATION
- Inference or making connections
- Action
HARNESSING RESPONSE PROCESS

ASSESSMENT IS A MENTAL SIMULATION
Building the test

Identifying the appropriate ‘processing’ during learning and transfer

Alignment with instruction

Validating the presence of appropriate processing
Think about your current assessment tools, how well are they aligned with the your program goals?

What kind of processing do your formative assessments provoke?
TEST-ENHANCED LEARNING
FOR CONCEPTUAL KNOWLEDGE
MIXED AND INTERLEAVED TESTING
MIXED PRACTICE: CUMULATIVE TESTING

Multiple concepts together
Repeated cumulative testing
VARIATION MATTERS
TEST-ENHANCED LEARNING FOR INTEGRATION
Integration of basic science, social science, and clinical knowledge and experiences is an explicit goal of curricula.

Woods 2005; 2007; Baghdady 2013
INTEGRATION

Integration can aid transfer of knowledge, problem solving, learning

Integrated learning requires integrated teaching

Woods 2005; 2007; Baghdady 2013
Few assessment practices that have been evaluated to support and reinforce integration

Few tools to validate whether a learner has an integrated understanding

Kulasegaram et al. 2013
Think about how we discussed integration. Do these items test cognitive integration?
"Referred pain" is caused by:

A) convergence of visceral and somatic inputs to dorsal horn cells.
B) divergence of outputs from the dorsal horn.
C) the absence of visceral-specific regions of the sensory homunculus.
D) displacement of sensory inputs from internal organs to the body surface.
E) overlap of inputs at the level of the thalamus.
A 45-year-old man suffered a severe head injury with bilateral frontal contusions. He had a formal neuropsychological assessment which included the Stroop test. On this test, words are written in a colour that is different from what the words actually mean. For example, the word “red” may be written in blue or green. On this test, he will be required to:

A) say the colour that words are written in. For example if the word red is written in blue, the patient is required to say “blue” rather than “red”.

B) start by reading only words written in one colour and then switch mid-way during the test to read words written in a different colour. The colours are specified by the examiner.

C) read only words written in a colour that is specified at the start of the test and inhibit reading the other words.

D) read only words written in red.

E) read the words regardless of the colour that they are written in. For example, if the word red is written in blue, the patient is required to say “red” rather than “blue”.
Domains assessed separately - teaching has no effect when assessment incentivizes other behaviour

Recall of clinical knowledge only - teaching can’t show an effect when assessments fail to require integration by learners
Features of Integration

- Deliberate linking of concepts from across domains
- Creating meaningful relationships
- Semantic network
- Must be content specific

Woods 2007; Baghdady 2013
TEST-ENHANCED LEARNING FOR INTEGRATION:

REINFORCE THE PROCESS
## Test-Enhanced Learning of Integration

| Any testing that deliberately requires linkages of concepts across domains |
| Learners can be exposed to the connection, can be required to make the connection themselves |
| Can occur across multiple testing formats (MCQs, Short Answer) |
Any explanation of why...

Why is the Stroop task the recommended test?

Why the convergence of inputs is important for understanding pain?
Are multiple choice exams an accurate measure of one's knowledge?

A. Yes
B. A and C
C. A and B
D. All of the above
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<th><strong>MCQs</strong></th>
<th>Simple but not always easy</th>
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<td></td>
<td>Wide sampling of knowledge</td>
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<td></td>
<td>Near universal use</td>
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HARNESSING RESPONSE PROCESS

ASSESSMENT IS A MENTAL SIMULATION
USE THE SEMANTIC NETWORK CREATED IN THE LAST WORKSHOP

HOW WOULD YOU ASSESS FOR COGNITIVE INTEGRATION?

ACTIVITY 3
Think about your last clinical teaching encounter
What were the opportunities for integration?
What questions could you have asked of the student?
What knowledge (basic, clinical, behavioural, system) could you have connected for the student?
Recap

The challenge of assessment

The leverage: TAP, Test-Enhanced Learning

Combining both concepts to scaffold more complex processes
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<td>Promote different learning outcomes lead to transfer and greater preparedness</td>
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<td>Support curricular goals of integration</td>
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WHAT YOU TEST FOR IS WHAT YOU GET

Assessment tells the learner what to know and how to know it.
Acknowledgements

@mahanmeded

Kulasegaram & PK Rangachari. “Beyond Formative: Using Assessments to Enrich Student Learning” Advances in Physiology Education. (Forthcoming)