Designing authentic assessment

Tina Overton
School of Chemistry

Chemistry Education Research Group
The challenge

Subject knowledge

Problem solving, communication, team work, time management, handling data, etc

Professionalism, creativity, entrepreneurial, global

The employable graduate
The challenge

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Problem solving, communication, team work, time management, handling data, etc

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The employable graduate
What is authentic assessment?

- Authentic genuine real
- Using and applying knowledge and skills in a real world setting in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills (Meuller, 2014)
- Similarity between thinking required for assessment task and real life situation (Savery & Duffy, 1995)
- Use of same skills, knowledge, attitudes that would need to apply in professional life (Gulikers et al, 2004)
• Aa must be aligned to a instruction (Biggs, 1994)
• Students demonstrate competencies through significant and meaningful tasks (Wiggins, 1993)
• Authenticity is subjective. Must be perceived as authentic to students to influence learning
• Task mimics professional role
Constructive alignment

Learning outcomes

L&T activities

Assessment
# Science TLOs

<table>
<thead>
<tr>
<th>Understanding science</th>
<th>Scientific knowledge</th>
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<tbody>
<tr>
<td>1. Demonstrate a coherent understanding of science by:</td>
<td>2. Exhibit depth and breadth of scientific knowledge by:</td>
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<tr>
<td>1.1 articulating the methods of science and explaining why current scientific knowledge is both contestable and testable by further inquiry</td>
<td>2.1 demonstrating well-developed knowledge in at least one disciplinary area</td>
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<tr>
<td>1.2 explaining the role and relevance of science in society.</td>
<td>2.2 demonstrating knowledge in at least one other disciplinary area.</td>
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Inquiry and problem solving

3. Critically analyse and solve scientific problems by:
   3.1 gathering, synthesising and critically evaluating information from a range of sources
   3.2 designing and planning an investigation
   3.3 selecting and applying practical and/or theoretical techniques or tools in order to conduct an investigation
   3.4 collecting, accurately recording, interpreting and drawing conclusions from scientific data.

Communication

4. Be effective communicators of science by:
   4.1 communicating scientific results, information, or arguments, to a range of audiences, for a range of purposes, and using a variety of modes.

Personal and professional responsibility

5. Be accountable for their own learning and scientific work by:
   5.1 being independent and self-directed learners
   5.2 working effectively, responsibly and safely in an individual or team context
   5.3 demonstrating knowledge of the regulatory frameworks relevant to their disciplinary area and personally practising ethical conduct.
Assessment of learning  Assessment for learning

Knowledge  Application, competences, skills

Lower order cognitive skills  Higher order cognitive skills
21st Century science graduates.....

- Are entering a rapidly changing workplace
- Will tackle as yet unthought-of problems
- Will tackle global challenges
- Live in an information-rich and connected society
- Will have to be
  - Flexible, entrepreneurial, creative, problem solvers, global citizens.
- Are paying for their HE
How do we prepare them for this?

- Learning outcomes
- L&T activities
- Assessment
How do we prepare them for this?

Learning outcomes

Assessment
How do we prepare them for this?

Learning outcomes
How do we prepare them for this?
What does 21\textsuperscript{st} Century pedagogy look like?
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\textbf{I bring my laptop to class, but I'm not working on class stuff.}
What does 21st Century pedagogy look like?
What does 21st Century pedagogy look like?

The **Traditional** Model

Knowledge *Acquisition*

Knowledge *Construction*

The **Flipped** Model

Knowledge *Acquisition*

Knowledge *Construction*

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Have things changed?
Does it work?

I've been learning a lot, but I do terribly on tests.

That's funny, I do great on tests, but I'm not learning a thing.
The drive to innovate

• make changes in something established, especially by introducing new methods, ideas, or products
What about impact?

• ‘Evaluation of teaching’
• Evaluation
  – *Determine value or worth*
• Did it work? How do we evaluate?
  – For who?
  – Happy sheets?
  – Questionable data
  – Beware the Hawthorn effect
From evaluation to research

- Quality and quantity of data
- Identify meaningful learning gains
- Understand how students learn
- Attitudes, aspirations, experiences
- Collect valid, reliable, transferable evidence
- Evidence informed innovation and change
- Build the discipline
Why bother?

- Improve student outcomes and experience
- Convince others
- Reinventing the wheel
- Build your CV
- Publications
- Funding
- Reward
Law of Gravity!

Oranges also follow the law of Gravity!

High Impact Paper

Low Impact Paper
Some personal favourites!
Cognitive load in learning science

Cognitive load in the lab


Better performance, retention, attitudes
Cognitive load in the lecture


**Pre-lectures**

- Remove lecture time
- Replace with background reading
- Improved exam results
- Loss of correlation with previous background
Active learning


They must read, write, discuss, or be engaged in solving problems.....to be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis....strategies promoting active learning be defined as instructional activities involving students in doing things and thinking about what...leads to better student attitudes and improvements in students' thinking and writing....surpasses traditional lectures for retention of material, motivating students for further study and developing thinking skills.

![Bar chart showing comparison of students understanding concepts before and after new methods and traditional instruction.](chart.png)
• **Context-based learning**
  – Enhanced motivation and attitudes

• **E/Inquiry-based learning**
  – Deep learning, research skills, nature of science, transferable skills

• **Problem-based learning**
  – Deep learning, motivation, research skills, interdisciplinarity, range of skills
Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching

Paul A. Kirschner
Educational Technology Expertise Center
Open University of the Netherlands
Research Centre Learning in Interaction
Utrecht University, The Netherlands

John Sweller
School of Education
University of New South Wales

Richard E. Clark
Rossier School of Education
University of Southern California
Flipping or flopping?

Design, Implementation, and Evaluation of a Flipped Format General Chemistry Course

Gabriela C. Weaver* ‡ and Hannah G. Sturtevant‡

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**Diagram Description:**

- **Diagram a)**:
  - Y-axis: Standard Score - Conceptual
  - X-axis: Traditional, Flipped

- **Diagram b)**:
  - Y-axis: Standard Score - Algorithmic
  - X-axis: Traditional, Flipped
The pen is mightier....


capacity for multitasking and distraction when using laptops. The present research suggests that even when laptops are used solely to take notes, they may still be impairing learning because their use results in shallower processing. In three studies, we found that students who took notes on laptops performed worse on conceptual questions than students who took notes longhand. We show that whereas taking more notes can be beneficial, laptop note takers’ tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is detrimental to learning.
So why?
How do we convince?

- Present meaningful evidence
- Lead by example
- Mentoring, support, training
- Link to employability
- Use students as advocates
- Student representation
- Peer observation/assessment
- Define professional standards
- Retention
- Preparation for honours and PhD
- Criteria for reward, recognition, promotion
How do we get there?

KEEP CALM AND JOIN THE REVOLUTION!
And when it seems hopeless....
Thank you for listening

tina.overton@monash.edu
@tinaoverton