Evaluating Deep Learning Assessments for Higher-Order Thinking Skills (HOTS) Dee Werapitiya, MA & Gundula Bosch, PhD, MS, MEd

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Objectives

- Describe Higher-Order Thinking Skills (HOTS)
- > Review Bloom's Taxonomy in the context of HOTS
- Discuss assessment options that help evaluate deep learning
- Appraise an example for HOTS assessment in teaching practice
- Employ HOTS assessment methods into your own educational context



What are Characteristics of Higher-Order Thinking Skills (HOTS)?



- Focus on higher levels of cognition –
- beyond mere recalling or memorization



Emphasis on concept application, problem analysis, interpretation of information or evaluation of alternatives



Multi-logical thinking – "thinking that requires knowledge of more than one fact to logically and systematically apply a concept to aproblem"



Challenging tasks – asking to explore unfamiliar territory by transferring knowledge and skills to new situations and contexts



Higher-Order Thinking Skills in Bloom's Taxonomy





Example for a Task that Targets HOTS

<u>Creative problem solving & peer critique</u>

• Teacher's task: Choose practice examples, e.g.

- A published case of irreproducible research
- \circ An ethical dilemma in science

- Students' tasks: (in groups)
 - Design and discuss a strategy, troubleshooting or solution pathway
 - $\,\circ\,\,$ Defend their design in discussion with peers







Your turn!

Think about an example of a HOTS skill or task that you

- Ask your students to perform in your classroom
- Or performed as a student in a class
- Or engaged in your workplace either individually or with your co-workers



Selection Strategy for Assessment Tools



Suskie (2009)



How to use an Assessment Tool?

Formative use

- Ongoing embedded
- Focuses on the learning process
- Providing feedback to students and instructor on students' learning
- Low stakes

Summative use

- Evaluating students at the end of an instructional unit
- Focuses on learning outcomes
- High stakes





Evaluating Higher-Order Thinking

Quizzes & tests

- Written, oral
- Including questions requiring reasoning

Images & graphs

 Analysis and interpretation

Scenarios & case studies

• Complete, incomplete, staged, evolving, etc.

Problem sets

 Solution and evaluation

Discussions & Debates

- Evaluations, reasoning
- Guided, open-ended

Direct observations

- Practice performance
- Rubrics

Projects

• Papers, presentations

Please review for details: Suskie (2009), Kern (2009), Angelo & Cross (1993)



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R³ course example: **"Anatomy of Scientific Error"**

- Staged case study
- Moving learners up Bloom's Taxonomy







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Assessment levels: Application





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Assessment levels: Application, cont.

Step 1: Application of concepts to real-world case

Analyze known Retraction Watch article and make recommendations Games researcher retracts one paper, corrects three others, for plagiarism

A researcher, formerly of Bath Spa University in the UK, who studies how computer games are designed, has redesigned, has retracted a paper and corrected three others after she said she became aware that they all contained plagiarism.





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Assessment levels: Application, Analysis





Assessment levels: Application, Analysis, Evaluation





Assessment levels: Application, Analysis, Evaluation & Creation





Assessment levels: Application, Analysis, Evaluation & Creation, cont.







Your turn again!

Think about a suitable assessment tool for the task or skillset you listed on your worksheet





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