

Construction and Evaluation of Test Items: Part 2

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Session 1

Using Revised Bloom's Taxonomy to create and evaluate test items

Intended Learning Outcomes

At the end of the session participants should be able to

- Use revised Bloom's taxonomy to construct test items at appropriate level.
- Evaluate test items and examination questions

Activity - Challenge yourself... what do you know?

1. A test can be defined as?

- a. something that is limited in scope, focused on specific course material
- b. a comprehensive assessment of student knowledge
- c. typically administered in 15 minutes or less
- d. none of the above

2. A examination can be defined as?

- a. a comprehensive form of assessment of student knowledge that may be given at the end of a semester or several times during the semester
- b. an assessment limited in scope
- c. something that can be administered in 15 minutes or less
- d. all of the above

[Go to menti.com](https://www.menti.com)

What makes a test good or bad? The most basic and obvious answer to that question is that good tests measure what you want to measure, and bad tests do not.

Lecturer's Role

2 conflicting functions (Elbow, 1986)

- Gatekeeper – set & maintain high standards to ensure students are qualified to enter the community of professional practice
- Coaches – help students meet & surpass the standards

➤ Examinations - at the heart of both functions

- By making our tests comprehensive & rigorous we fulfill the gatekeeper role
- By doing our best to prepare students for them & ensuring they are fairly graded we satisfy our mission as coaches.

7 Tips

1. Test on what you teach – No surprises !!!

- Students had adequate exposure and experiences in solving high level thinking questions during TLA (eg. class exercises, assignments) before giving such question in test or exam.

2. Provide study guide before test / exam

- Make the expectation explicit and visible to students
- Promote high expectation to be achieved

3. Minimize speed as factor of performance

- Assess whether the students know how to solve the problem or not, without necessarily had to provide the entire (detail) solution within limited time

4. Work out your test / exam from scratch

- Solve it first to avoid flaws

5. Set independent multiple-part problems

6. Allocate 10 – 15 % for determining A grade students

7. Be generous in Tests/Exam but strict in Assignments

- In Exam / Tests - Less on accuracy of number crunching
- In Assignment - Be stringent on the completeness of calculation and accuracy of result

Felder, 2002

“The best way to facilitate the development of higher-level skills is to include high-level tasks in learning objectives, share them with the students in study guides for exams, give illustrations and practice in class and more practice on assignments; and then put the high level questions on the exams.”

The only way people acquire skills is through practice and feedback.

- Felder and Brent (2004)

Key points to remember in test development

- Spend enough time developing the test, quiz, and exam
- Make sure that your test content matches the LO and TLA.
- It is important for tests to have good content validity.
- Use many different testing methods (multiple choice, essay, take home, group testing)
- Write questions to address things other than recall.

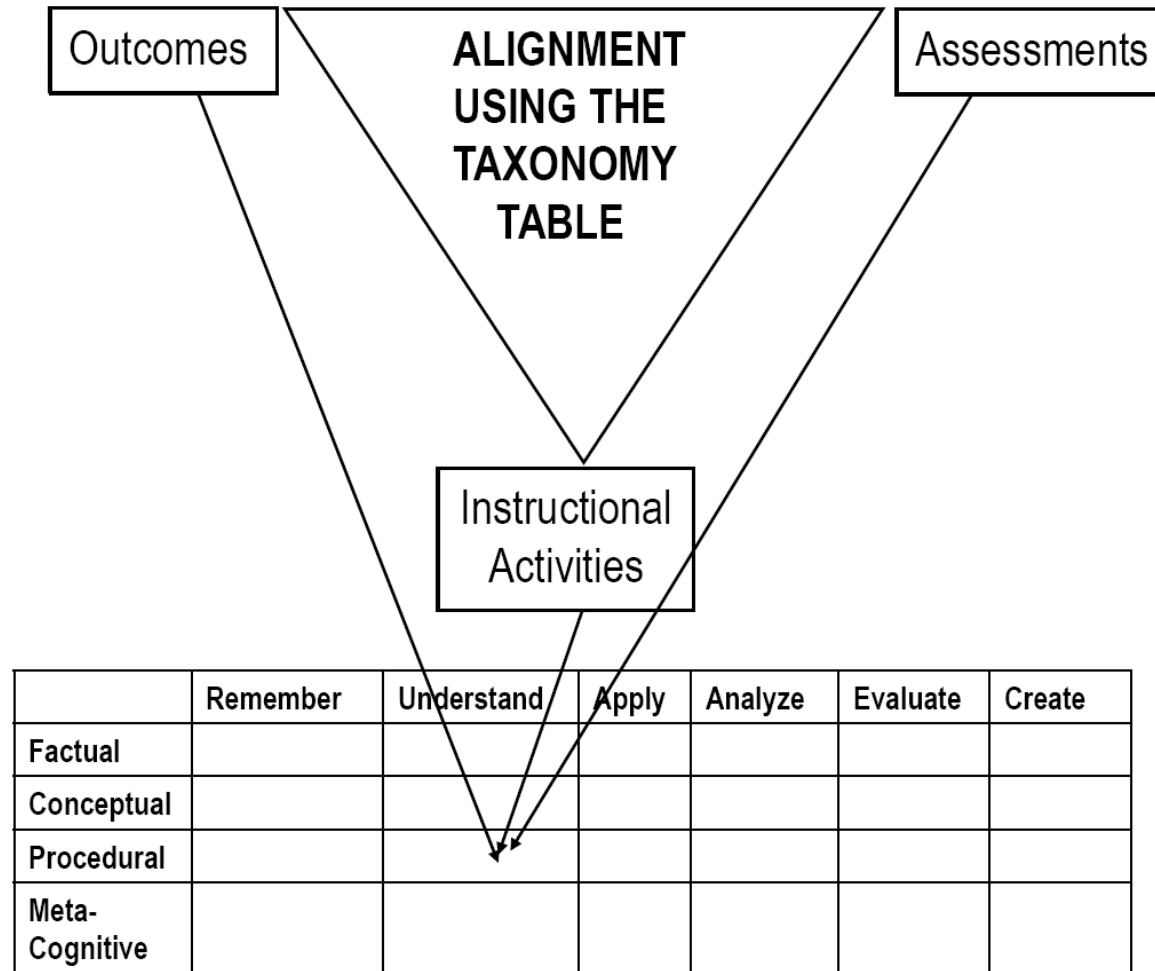
Recap - RBT

	<i>Remember</i>	<i>Understand</i>	<i>Apply</i>	<i>Analyze</i>	<i>Evaluate</i>	<i>Create</i>
<i>Fact</i>	Remember Facts	Understand Facts	Apply Facts	Analyze using Facts, Concepts, Principles and Procedures	Evaluate using Facts, Concepts, Principles and Procedures	Create using Facts, Concepts, Principles and Procedures
<i>Concept/ Principle</i>	Remember Concepts	Understand Concepts	Apply Concepts			
<i>Procedure</i>	Remember Procedures	Understand Procedures	Apply Procedures			
<i>Meta-cognitive</i>	Remember Metacog. Strategies	Understand Metacog. Strategies	Apply Metacog. Strategies		Analyze Meta. Strategies	Evaluate Metacog. Strategies
	<i>Knowledge</i>		<i>Skill</i>	<i>Ability</i>		

Basic Types of Knowledge

- **Declarative knowledge**
 - knowing that something is the case / can be declared
 - information that can be conveyed in words, orally or in writing
- **Functioning knowledge**
 - refers to as intellectual skills
 - knowing how to do something
 - involves making discriminations, applying facts, concepts & rules that govern relationships; often includes motor skills and cognitive strategies

Test Blueprint



- Visual representation of alignment between course activities & outcomes

Revised Bloom's Taxonomy (RBT)

(Anderson & Krathwohl, 2001)

- use to describe learning outcomes
- distinguishes between type of knowledge being learned & type of cognitive process being employed

- Knowledge Dimension – Kind of Knowledge to be Learned
 - Factual, Conceptual, Procedural, Meta-cognitive
- Cognitive Process Dimension – Process Used to Learn
 - Remember, Understand, Apply, Analyze, Evaluate, Create

- describes the types of thinking needed to interact with information during an activity

The kinds of knowledge that can be tested

- Factual Knowledge
 - Terminology, facts, figures
- Conceptual Knowledge
 - Classification, Principles, Theories, Structures, Frameworks
- Procedural Knowledge
 - Algorithms, Techniques and Methods and Knowing when and how to use them.
- Metacognitive Knowledge
 - Strategy, Overview, Self Knowledge, Knowing how you know

Example: Problems-based question (PBO)

- Trigger student's higher order thinking abilities.
- Questions developed from practical scenarios depict different aspects of problem relevant to students' level of training.
- Scenarios can be used to represent different practical attributes that require appraisal and test students' analytic reasoning, problem solving skills and decision-making abilities.
- Represent real life situation from simple to a complex authentic case.

Assessing LO...

Although we are grading the task, in essence we should grade the learning outcomes. That is, how well did the students do in the LO (explain...; solve...; create...)? Not how well did the students do in the assessment task (project, report, exam etc).

Well-formulated outcomes helps to identify the level of analysis, determine the appropriate assessment methods, guide in data sampling, aggregation of data, interpretation of evidence, and use of information.

Example

CLO: The student will be able to explain how the normal curve serves as a statistical model.

- You aim to prepare constructed response item that elicit the type of behaviour you want to measure.

Constructed response test item:

Briefly explain how the normal curve serves as a statistical model for estimation and hypothesis testing.

Evaluating a question

Please read the following draft question. Comment and suggest improvements.

Question 1 – Draft

Describe the structure of the cell plasma membrane and its principal components. How and where are plasma membranes usually made in the eukaryotic cell. How are molecules transferred across the membrane into and out of the cell :

- Water
- Ethanol
- Sodium and Potassium ions
- Sugars.

What other functions in the cell may lipids serve?

- The edited version of Question 1 that was eventually accepted and used in the examination.

Question 1 – accepted

- (a) Describe the structure and synthesis of the cell plasma membrane of eukaryotic cells and its principal components. (b) Explain how molecules are transferred across the membrane giving 2 examples.

Editing the Exam Question

- The need for editing is another reason to draft it now.
- You *will* make mistakes and commit the offense of ambiguity.
- Ask a colleague to read it for clarity.
- Questions that are based on mistaken premises or that create genuine confusion can virtually destroy the validity of an exam.
 - Treat writing the exam as you would any other important writing project – draft and redraft.

How much time?

Suppose you are planning a 2-hour exam paper.

- There are 30 questions in MCQ section worth 50% of the overall exam grade. How long do you expect student to spend on each MCQ?

Activity - Example

Consider the short answer question below.

How much time do student have to answer the question in a 3-hour paper?

- 6 minutes
- 18 minutes
- 24 minutes

Question

- Briefly explain the concept of life cycle analysis. (4 marks)
- Define the steps for performing a Life Cycle Assessment. (6 marks)

What is this type of question asking student to demonstrate?

- Evaluation
- Application
- Understanding

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Recap - Activity

Consider the following questions and decide what kind of knowledge you feel they would test, and the cognitive skills assessed?

- Then map the questions onto the Taxonomy table.
 - 1) Define a “computer database”.
 - 2) Explain three key characteristics of a computer database.
 - 3) Relate each of these characteristics to a database package with which you are familiar.
 - 4) Compare the database facilities of a dedicated database package to those of a general-purpose spreadsheet package.
 - 5) Suggest criteria that could be used to help users decide whether to use a database or spreadsheet package for a specific task.

Activity - decide what kind of knowledge you feel they would test, and the cognitive skills assessed

- 1) Identify in your own community sources of water.
- 2) Differentiate types of water sources and ways people obtain water.
- 3) Give examples of places or geographic regions in the country and the world in need of water to illustrate idea that not everyone has access to water.
- 4) Explain causes of wasting water resources and determine the effects or consequences.
- 5) Examine effective modern methods of conserving and harnessing water resources and decide which one is best for your community.
- 6) Explain the key mechanisms or operations of water conservation.
- 7) Make a PowerPoint presentation showing energy-saving ways of conserving and harnessing water resources for your community.
- 8) Critique the PowerPoints' proposed ways of conserving and harnessing water resources in given situations and suggest changes in your presentation.

Adapted from Tarlinton, 2003

Taxonomy Blueprint

		Cognitive Process					
		remember	understand	apply	analyze	evaluate	create
K n o w l e d g e	Factual						
	Conceptual						
	Procedural						
	Meta-cognitive						

➤ Is it balanced?

Activity

- Consider your recent examination questions and decide what kind of knowledge you feel they would test and the cognitive skills assessed?
- Then map the questions onto the Taxonomy table.
- Analyze the coverage of the knowledge/cognitive domain of the paper. What do you notice about its balance?

Cognitive Knowledge	remember	understand	apply	analyze	evaluate	create
Factual						
Conceptual						
Procedural						
Metacognitive						



Thank you