

FORMULATING ASSESSMENTS

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Overview of the guide: Why Assess?

Assessment is a crucial element in enhancing the overall quality of teaching and learning in higher education. What and how students learn depends to a major extent on how they think they will be assessed (Biggs, 1999; Biggs & Tang, 2011). All assessments lead to some amount of student learning, but a fundamental challenge lies in stimulating the right kind of learning. Therefore, it is important that assessment practices are designed to send the right signals to students in shaping the effectiveness of student learning – about what they should learn and how they should learn.

From a student's perspective, the relationship between learning and assessment often comes down to one thing: a grade. This problem arises simply because an assessment is usually about several things at once and Boud (2000) refers to this as 'double duty'. It is about grading and about learning; it is about evaluating student achievements and teaching them better; it is about standards and invokes comparisons between individuals; it communicates explicit and hidden messages.

Assessment has multiple purposes that include providing feedback on learning, facilitating improvement, measuring achievement, motivating learning and maintaining standards. Always worry about the quality of assessments rather than on their quantity. Well-designed assessment tasks will influence the way in which students approach the problems and thereby improve the quality of their learning. Thus, the level of student engagement and the amount of time students invest in any given learning experience is directly related to how much the student believes they will benefit from this experience.

Well-designed assessments set clear expectations establishing a reasonable workload, and provide opportunities for students to self-learn, rehearse, practise and receive feedback. However, when designed poorly they can be a major hindrance to thinking and learning in our students.

Assessments should be able to provide students with feedback on their progress and be able to help them in identifying their readiness to proceed to the next level of the module. Therefore, assessment tasks need to be aligned with intended learning outcomes (ILOs) and should be designed in such a way that they:

1. Elicit **higher-order cognitive skills**
2. Develop a **consequential basis** for test score interpretation and use
3. Are **fair**, and **free of bias**
4. Can be **generalized** and be **transferable**, at least across topics within a domain
5. Ensure the **quality of content** is consistent with the best current understanding of the field
6. Recognize the comprehensiveness, or scope, of **content coverage**
7. Are **high-fidelity assessment of critical abilities**
8. Are **contextualized** and **meaningful** to students' educational experiences.
9. Are **practical**, **efficient** and **cost-effective**

The above set of criteria is not exhaustive, but provides a guideline that is consistent with both current theoretical understandings of validity and the nature and potential uses of new forms of assessment (Linn et al, 1991; Darling-Hammond et al., 2013).

Ways of Framing Assessment

In formative assessment, the results are used for feedback during learning while in summative assessment, the results go towards grading students at the end of a module. Formative assessment is provided during learning, and tells students how well they are doing in the course and what might need improving. Summative assessment is after learning and informs how well students have learned (Biggs & Tang, 2011).

Summative	Assessment of Learning (Teacher Centred) <ul style="list-style-type: none">- Assists teachers in using evidence of student learning to assess achievement against outcomes and standards- Occurs at defined key points during a unit of work or at the end of a unit, term or semester, and may be used to rank or grade students- Helps plan future learning goals and pathways for students- Provides a transparent interpretation across all audiences.- Depends of the reliability and validity of the assessment for interpretation of results
Formative	Assessment for Learning (Teacher and Learner Centred) <ul style="list-style-type: none">- Helps students learn better, rather than achieve a better grade- Involves formal and informal assessment activities as part of learning and to inform the planning of future learning- Occurs throughout the teaching and learning process to clarify student learning and understanding.- Strategies designed to provide assessment and feedback for improvement- Encourages self-assessment and peer assessment as part of the regular classroom routines

Aligning your ILOs, Teaching and Assessment

According to the constructive alignment theory by Biggs and Tang (2011), assessment tasks (AT) and teaching-learning activities (TLA) are designed to ensure that students achieve the intended learning outcomes (ILO) and develop cognitive skills at a range of levels (Figure 1). The learning outcomes for a topic/unit are the criteria against which teachers make judgments about student learning. The introduction of a series of in-class teaching-learning activities and online tests/assignments that allow students to practice applying information, and the repetitive use of these skills that are spaced in regular intervals makes a difference in students' learning.

Assessment tasks need to be aligned to the learning outcomes we intend to address for a particular topic, and an appropriate AT should enable you to judge how well a student has achieved the ILO(s) it is meant to address and/or how well the task itself has been performed. A range of assessment types ensure that students develop all of the intended learning outcomes and also provides opportunities for students to demonstrate their learning. Finally transform the judgements to grades based on a standard grading criteria.

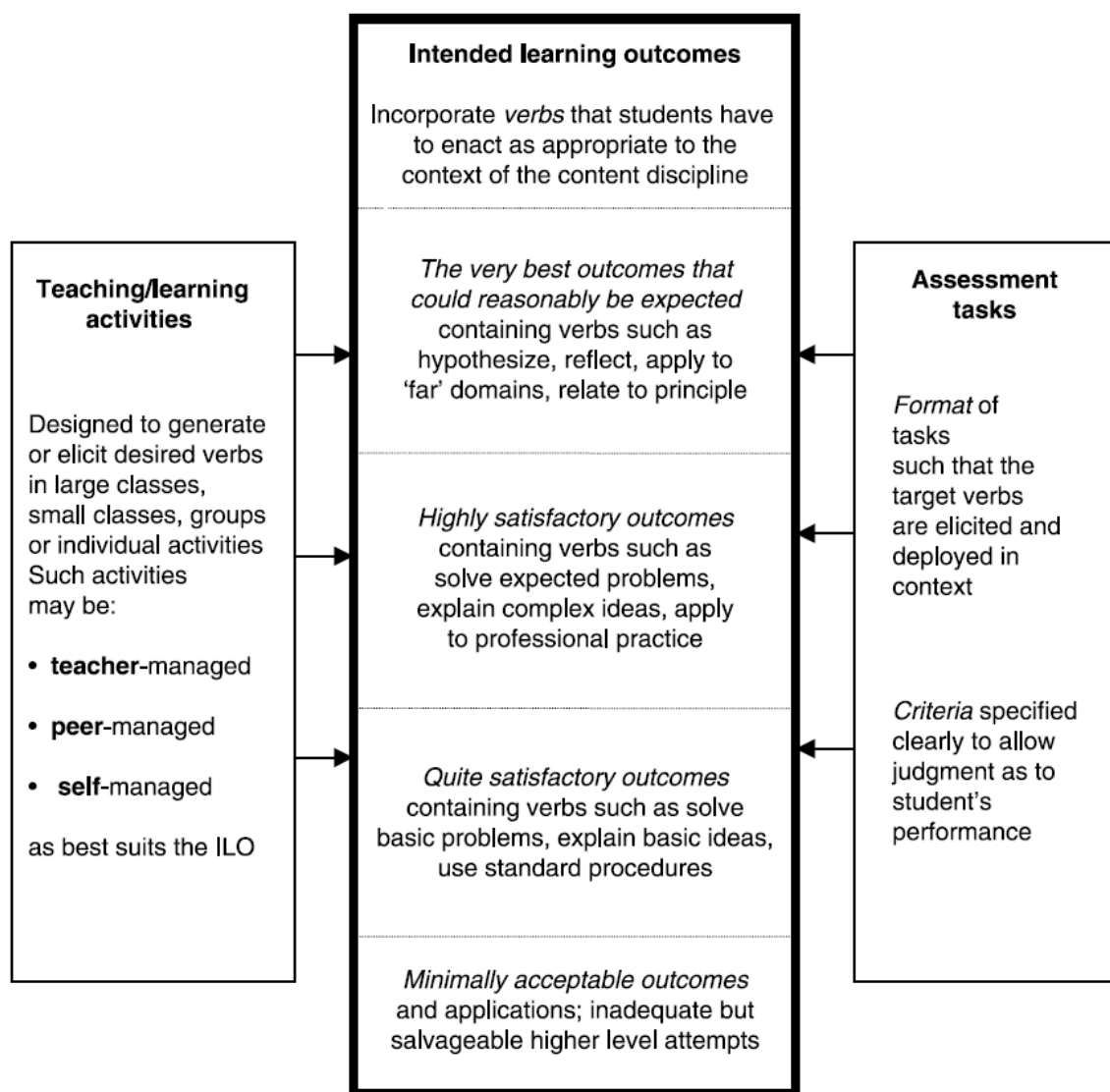


Figure 1: Aligning intended learning outcomes, teaching and assessment tasks

When designing ATs, the first task to clarify the kind of understanding that is wanted for any topic/unit and implement assessment tasks to enable you to judge if and how well students' performances achieve the outcomes. Secondly, if ATs are to be graded, develop a grading criteria (rubrics) for judging the quality of student performance on how well your outcomes have been addressed (level of pass).

To systematically understand how a learner's performance grows in complexity, and to define the hierarchical nature of understanding, SOLO taxonomy, which stands for "Structure of the Observed Learning Outcome" taxonomy (Figure 2) is a useful framework to use (Biggs, 1999; Biggs & Tang, 2011).

The SOLO taxonomy can be used as a framework to write your ILOs as well as for evaluating ILOs through appropriate ATs, so that you know at what level your students are at. However, the SOLO levels are in no way intended to parallel the grade levels, i.e., grade D is unistructural, and grade A is extended abstract.

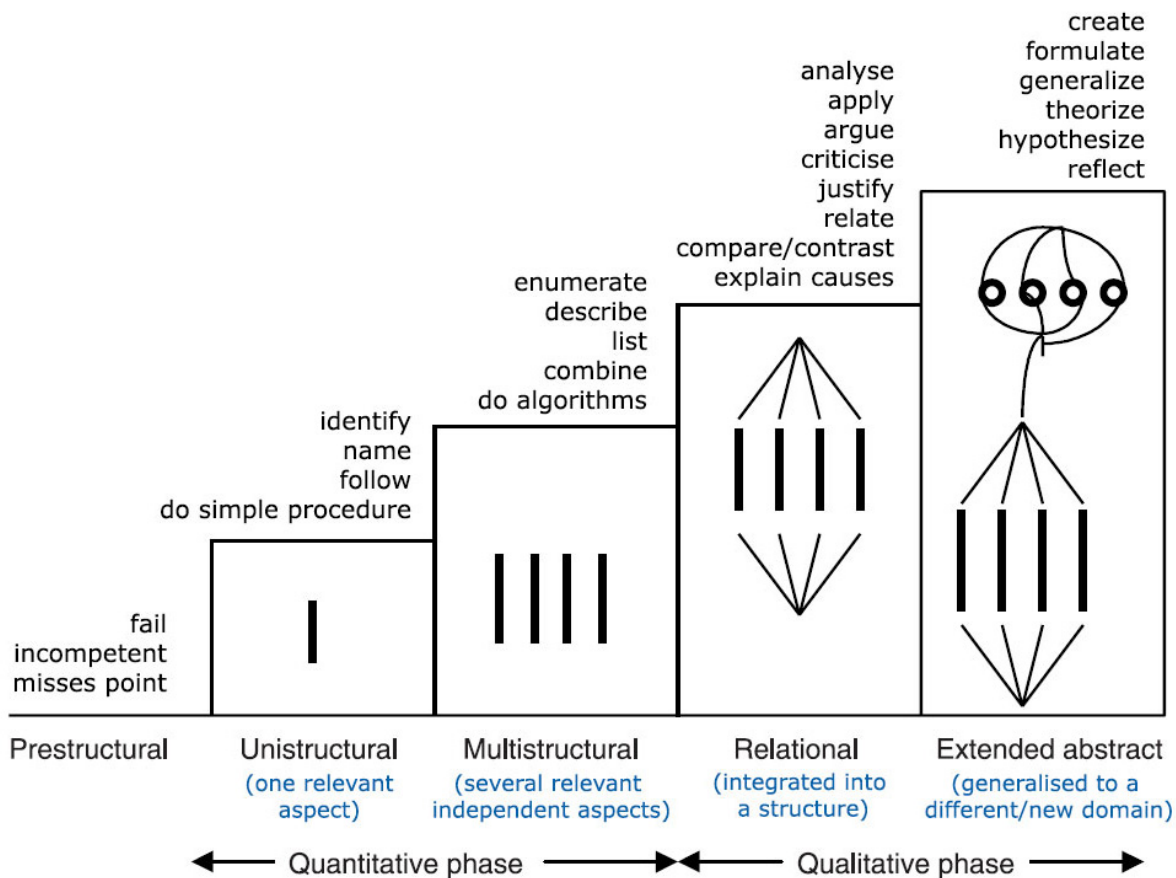


Figure 2: SOLO Taxonomy for writing and evaluating intended learning outcomes

Identify the learning outcomes you seek to test through for each of your assessment tasks. In doing so, consider whether these assessment tasks are testing familiarity with/understanding of an ILO, ability to apply an ILO to standard textbook situations or to novel situations, ability to think critically, to engage in inquiry, to reason, to organize material, *etc.*

When trying to align ILOs and ATs, consider the following points:

- The assessment tasks genuinely correspond to the intended learning outcome(s), and the level of achievement that can be achieved in varying degrees (marginally achieved, achieved, and strongly achieved)
- One assessment task can incorporate a number of learning outcomes. For example, ILO 1 can be achieved through AT1, AT2 and AT5
- Similarly, one ILO may be addressed by more than one assessment task
- It is not necessary for any one assessment task to assess all learning outcomes
- Include formative as well as summative assessment tasks
- The time spent by students performing assessment tasks and time spent by staff assessing students' performances, should reflect the relative importance of the ILOs
- Use teaching strategies that encourage the skills identified in your ILOs and required to complete the assessment tasks
- Breakdown assessment tasks into smaller components that are spread-out through the semester

- The teaching-learning activities need to be consistent with your assessment tasks (and learning outcomes), as assessment has be part of the integrated learning experience and not an isolated add-on element

Make use of the following Table 1 to map your ATs to the respective module's ILOs.

Table 1: Aligning your ILOs and Assessment Tasks (module-level)

ILOs	AT 1	AT 2	AT 3	AT 4	AT 5
1.					
2.					
3.					
4.					
5.					

✓ Marginally achieved; ✓✓ Achieved; ✓✓✓ Strongly achieved

Designing Assessments

Criteria for evaluating assessments

The requirement for assessments to be aligned with ILOs frequently necessitates the use of non-traditional, authentic assessments in courses. Criteria for traditional assessments have included efficiency, reliability, comparability and validity. However, a broader view of validity is necessary to clarify the kinds of information that non-traditional authentic forms of assessment can offer. Based on the changing needs of today's workforce, this section further elaborates on the set of nine criteria adapted from Linn et al (1991) and Darling-Hammond et al. (2013) and they include:

1. Assessments of higher-order cognitive skills

ILOs expressed within the SOLO taxonomy set the level of cognitive complexity; and the assessment tasks should be able to elicit this level of cognitive complexity in students. Assessment tasks should represent the higher-order cognitive skills that support transferable learning, rather than emphasizing on skills that focus on rote learning and/or the use of basic procedures. A careful balance should be struck between evaluating basic skills and attention to critical thinking and applications of knowledge to new contexts.

Many a time, instructors fall into a trap assuming that complex, open-ended problems require the use of more complex cognitive processes by students or a hands-on scientific task encourages the

development of problem solving skills, reasoning ability, or more sophisticated mental models of the scientific phenomenon. Assessment of higher-order skills does not only involve difficult subject matter as, for example, learning calculus; as one can just memorize the formulas without understanding, while remaining equally confused about the overall goals of the activities. Thus the construction of an open-ended problem can be a cognitively complex task or simply the display of a memorised sequence of responses to a particular problem, depending on the novelty of the task and the prior experience of the learner. Judgments regarding the cognitive complexity of an assessment need to start not only with an analysis of the task but also need to take into account student familiarity with the problems and the ways in which students attempt to solve them.

2. Assessments that develop a consequential basis for test score interpretation and use

Consequential evidence refers to the kinds of consequences an assessment has for learners and for instruction. Assessments should be used to positively influence instruction through their diagnostic value, as well as by communicating important learning goals and modeling appropriate pedagogy. They can guide helpful interventions and teaching decisions. Poorly designed assessments can lead to ways that distort teaching, or deny students access to beneficial learning opportunities.

Thus, validation of assessments involve the development of a consequential basis for test score interpretation and use as well as the more traditional evidential basis. For example, if teachers spend more time on concepts and content included in the assessment and less time teaching content that is not included on the assessment, then these consequences must be taken into account in judging the validity of the interpretations and uses of the assessment results. Similarly, if an assessment leads to the heavy use of practice materials that closely match the format of the assessment that is again a consequence that must be taken into consideration. For assessments to be truly valid for a wide range of learners, they need to be accurate in assessing students' abilities, be reliable across different tests, contexts and scorers. The collection of evidence about the intended and unintended effects of assessments must align with how teachers and students spend their time and think about the goals of education. Assessments should encourage effective approaches to learning.

There are various types of validity that can be considered. Content validity refers to the adequacy with which the content of a test represents the content of the curricular aim about which inferences are to be made. When we determine the content representativeness of a test, the content can take different forms depending on the curricular aim such as knowledge, skills or attitudes/values. Criterion-related evidence of validity helps teachers decide how much confidence can be placed in a score-based inference about a student's status with respect to one or more curricular aims. Construct-related evidence of validity is the extent to which empirical evidence confirms that an inferred construct exists and that a given assessment procedure is measuring the inferred construct accurately.

Finally, directness and transparency are important to be considered when designing assessments. Indirect assessment can distort instruction (*e.g.*, consider a multiple-choice question about writing versus direct writing), and understanding the basis on which performance will be judged facilitates the improvement of performance. Hence, intended learning outcomes and assessment tasks should be made transparent.

3. Assessments are fair, and free of bias

Fairness in assessments need to be considered both during the selection of assessment tasks, and the scoring or responses. The scoring procedures need to be carefully designed to assure that performance ratings reflect students' true capabilities and is not based on perceptions and biases of teachers evaluating them. Wherever possible, the use of more than one rater to assess a particular assessment item should be avoided.

Assessment bias refers to qualities of an assessment instrument that offend or unfairly penalize a group of students because of students' gender, race or religion. The nature of assessment bias can take the form of *offensive content* such as negative stereotyping; *unfair penalization* as in an assessment procedure having a question that describes a local cultural event which is unfamiliar to foreign students; and not taking into consideration students with disabilities and English language learners. Often, to eradicate bias from assessments requires teachers to routinely use absence-of-bias as one of the evaluative criteria to judge their own assessments and that of others.

4. Assessments are transferrable and generalisable

Student performance on assessments is highly task dependent due to situation and context specific nature of thinking, and therefore limited generalisability exists from task to task. However, this limited degree of generalisability across tasks need to be taken into account by increasing the number of performance assessment tasks for each student, as well provide support for significant weighting for continuous assessment tasks. To address the issue of transfer, range of tasks (*e.g.*, types of problems to be solved, experiments to be conducted, poems to be analysed) can be specified in advance and assessment tasks should also represent systematically critical dimensions. Whether conclusions about educational quality are based on scores on fixed-response tests or ratings of performance on written essays, laboratory experiments, or portfolios of student work, the generalization from the specific assessment tasks to the broader domain of achievement needs to be justified.

The traditional criterion of reliability is subsumed under the transfer and generalisability criterion. Two ways to think of reliability are: (1) whether there is consistency with which a test measures whatever it's measuring, and (2) the extent to which students' scores on tests are free from errors of measurement (which may be due to individual differences as in test anxiety or the condition in which the test is administered). Stability reliability evidence takes the form of consistent test results over time or among different testing occasions. Alternate-form reliability provides evidence as to whether two or more allegedly equivalent test forms are, in fact, equivalent. The degree of alternate-form consistency is usually determined by trialing the two forms of assessment with a sample of students, taking both assessments in one seating and computing a correlation coefficient (which is reflective of the relationship between students' performances on the two forms). Internal consistency reliability deals with the extent to which the items in an assessment instrument are functioning in a consistent fashion or the degree to which the test's items are homogenous. For example, if all the items in a 20-item test on critical thinking do, in fact, measure a student's critical thinking ability, then students who are skilled critical thinkers should get most of the 20 test's items right, and unskilled students should miss most of the test's 20 items. In other words, the more homogenous the responses elicited by a test's items, the higher will be the test's consistency.

5. Assessments ensure that quality of content is consistent with the best current understanding of the field

The content needs to be consistent with the best current understanding of the field and at the same time reflective of what are judged to be aspects of quality that will stand the test of time. More importantly, the tasks selected to measure a given content domain should themselves be worthy of the time and effort of the students. The assessments should be rigorous and internationally benchmarked, in terms of the kind of content and tasks they present, as well as the level of performance they expect.

6. Assessments recognise the comprehensiveness, or scope, of content coverage

If there are gaps in coverage, students are likely to underemphasize those parts of the content domain that are excluded from the assessment. There may be a trade-off between breadth of content coverage and other criteria, but nonetheless it is one of the criteria that clearly needs to be applied to any assessment.

7. Assessment measure critical abilities

In addition to key subject matter concepts, assessment tasks also assess critical abilities such as communication (speaking, reading, writing, and listening in multi-media forms), collaboration, modeling, complex problem solving, planning, reflection, and research. Tasks should measure these abilities directly as they will be used in the real world, rather than through a remote proxy.

8. Assessments are meaningful to students' educational experiences.

Assessment tasks should also be instructionally sensitive and educationally useful. That is, they should 1) represent the curriculum content in ways that respond to instruction, and 2) have value for guiding and informing teaching. The tasks should be designed so that the underlying concepts can be taught and learned, rather than reflecting students' differential access to outside-of-school experiences or depending mostly on test-taking skills. Although test-taking skills can be taught, it is not a good use of valuable instructional time to spend hours teaching students to "psych out" the tests rather than to develop the critically important skills they will need to use in the real world. The use of contextualized assessments need to get students deal with meaningful problems that provide worthwhile educational experiences.

9. Assessments are practical, efficient and cost-effective

To be practical, especially for largescale assessments, ways must be found to keep the costs at acceptable levels. One of the great appeals of multiple-choice tests is that they are extremely efficient and compared to other alternatives, quite inexpensive. With more labour-intensive performance assessments, greater attention will need to be given to the development of efficient data collection designs and scoring procedures.

Assessment Types

The modes of assessment are categorized into four groups:

1. objective format (selected response tests) – those that can be assessed rapidly;
2. extended prose/essay (constructed response tests);
3. performance assessment (task-based tests) – assesses understanding in performing tasks;
4. rapid assessments suitable for large classes.

Table 3 gives an overview of various assessment tasks available within each of the four groups of assessment modes, and the kinds of learning that can be assessed by each of those assessment tasks.

Table 2: Assessment tasks and the kinds of learning assessed

Assessment mode	Learning Assessed
Objective formats (selected response tests) <ul style="list-style-type: none"> • Multiple choice questions (MCQ) • Multiple response questions (MRQ) • Fill in the blanks • True/False • Matching questions • Ordered outcome 	<ul style="list-style-type: none"> • Recognition, strategy, comprehension, coverage • Recognition, strategy, comprehension, coverage • Unassisted recall, comprehension, coverage • Recognition, coverage • Recognition, strategy, comprehension, coverage • Hierarchies of understanding
Extended prose, essay-type (constructed response tests) <ul style="list-style-type: none"> • Essay exam • Open book • Take home assignments 	<ul style="list-style-type: none"> • Rote, question spotting, speed structuring • As for exam, but less memory, coverage • Read widely, interrelate, organise, apply, copy
Performance assessment (task-based tests) <ul style="list-style-type: none"> • Seminar, presentation • Critical incidents • Project (individual/group) • Learning contracts • Reflective journal • Case study, problems • Practicum • Portfolio • Capstone, final-year projects 	<ul style="list-style-type: none"> • Communication skills • Reflection, application, sense of relevance • Application, research skills • Reflection • Reflection, application, sense of relevance • Application, problem solving, professional skills • Skills needed in real life • Reflection, creativity, unintended outcomes • Reflection, creativity, innovation, unintended outcomes
Rapid assessments <ul style="list-style-type: none"> • Concept maps • Venn diagrams • One/Three minute essay • Short answer • Letter-to-a-friend • Cloze 	<ul style="list-style-type: none"> • Coverage, relationships • Relationships • Level of understanding, sense of relevance • Recall units of information, coverage • Holistic understanding, application, reflection • Comprehension of main ideas

Adapted from Biggs (1999), *What the student does: Teaching for enhanced learning*

[Appendix 1](#) gives more details on the advantages and disadvantages of various assessment methods.

[Appendix 2](#) provides a list of online assessment types with examples and tools that you can use.

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Appendices

Appendix 1: Advantages and Disadvantages of Various Assessment Methods

Objective formats (selected response tests)			
Type	Description	Advantages	Disadvantages
Multiple Choice Questions (MCQs)	MCQs are most appropriate for factual, conceptual , or procedural information. Some simple rules of thumb that can make for more effective questions: <ul style="list-style-type: none"> - Distractors should be incorrect, but plausible/probable. - Avoid “always” and “never” in distractors - “all of the above” and “none of the above” should be used sparingly - use of “usually”, “likely”, “rarely” keep students from easily eliminating distractors 	<ul style="list-style-type: none"> - Most versatile of the closed-ended question types, as the questions can contain more elaborate scenarios that require careful consideration on the part of the student - can be very reliable, and excellent validity as test - greater syllabus coverage - can be carried out quickly - requires less effort all round - can be used to test interpretation, decision skills as well as more basic skills 	<ul style="list-style-type: none"> - multiple-choice items can be more challenging to write compared to T/F and matching. - assesses recognition over recall - students may be guessing - takes skill to design good questions - especially to test high level skills - needs careful planning to ensure the answer choices are clear
Multiple Response Questions (MRQs)	MRQs are very similar to the MCQs except that it has more than one correct answer.	<ul style="list-style-type: none"> - Same as MCQs 	<ul style="list-style-type: none"> - Same as MCQs
Fill-in-the-blanks	Fill-in-the-blank questions are “constructed-response”, that require students to create an answer and typically one word answers.	<ul style="list-style-type: none"> - assess unassisted recall of information, rather than recognition. - relatively easy to write. 	<ul style="list-style-type: none"> - can lead to difficulties in scoring if the question is not worded carefully; as students are free to answer any way they choose
True/false (T/F)	T/F questions are most appropriate for factual information and naturally dichotomous information (information with only two plausible possibilities).	<ul style="list-style-type: none"> - easiest to write 	<ul style="list-style-type: none"> - limited in kinds of student mastery they can assess - Relatively high probability of student guessing (50%) - assesses recognition over recall of information
Match questions	Matching questions are most appropriate for assessing student understanding of related information.	<ul style="list-style-type: none"> - matching items can assess a large amount of information relative to multiple-choice questions. - If developed carefully, the probability of guessing is low. 	<ul style="list-style-type: none"> - assesses recognition over recall of information
Ordered outcome	Looks like an MCQ, but instead of choosing one correct alternative, students are required to attempt all sub-items, that are ordered into a hierarchy of complexity and reflects successive stages of learning that concept or skill	<ul style="list-style-type: none"> - The ordered-outcome can assess how students move from the basic skills of data retrieval to the advanced skills of critical analysis. 	<ul style="list-style-type: none"> - difficult to judge objectively

Extended prose, essay-type (constructed response tests)			
Type	Description	Advantages	Disadvantages
Essays	Essays and short-answer types are constructed-response questions. However, essay answers are typically much longer than those of short-answer, ranging from a few paragraphs to several pages.	<ul style="list-style-type: none"> - appropriate for assessments that cannot be accomplished with other question types - can show depth of learning as it allows students to express their thoughts and opinions in writing, granting a clearer picture of the level of student understanding. - familiarity for many students and examiners - allow for individual expression - test written communication, a useful transferable skill - examine students ability to form coherent arguments 	<ul style="list-style-type: none"> - time-consuming for students to complete - very time consuming to mark objectively - grading consistency is a problem, as scoring can be difficult because of the variety of answers, as well as the “halo effect” – students rewarded for strong writing skills as opposed to demonstrated mastery of the content - the level of the essay just marked can change - students can be rewarded for simply regurgitating ‘all they know’ on a topic grading can vary from marker to marker so grades can be subjective
Open book	Open-book examinations are similar to traditional examinations. The major difference is that in open-book examinations, students are allowed to bring their textbooks, notes or other reference materials into the examination situations. Teachers may also assign a standard set of teaching materials or a standard set of examination questions to their students before the examination, so that students can prepare in advance with the assigned resources.	<ul style="list-style-type: none"> - Less demanding on memory (regurgitation of memorized materials) - Provides a chance for students to acquire the knowledge in preparing to gather suitable learning materials rather than simply recalling or rewriting it - Enhances information retrieval skills of students through finding the efficient ways to get the necessary information and data from books and various resources - Enhances the comprehension and synthesizing skills of students 	<ul style="list-style-type: none"> - Difficult to ensure that all students are equally equipped - More desk space is needed for students during the examination - Sometimes students may spend too much time on finding resources instead of applying the knowledge, practical skills and reasoning ability - students are unfamiliar with open-book examinations, and must be provided with clear procedures and rules
Performance assessment (task-based tests)			
Type	Description	Advantages	Disadvantages
Presentations	Student presentations can be for test preparation, understanding, knowledge, capacity to structure, information and oral communication skills. They can be in the form of either oral or poster presentations.	<ul style="list-style-type: none"> - Student presentations are very close approximation to real life. - actively involves staff and students. - provides excellent opportunities for peer-assessment and for fast feedback of results. - students take presentations seriously - can be used for individual or group work - questions and answer sessions as follow ups can 	<ul style="list-style-type: none"> - assesses recognition over recall - students may be guessing - Time consuming and labor intensive to design and execute for faculty and students - unfamiliarity of students with giving presentations - appeals regarding grading of presentations can be hard to deal with presentations - cannot be anonymous

		help develop important skills students learn from their own and peer presentations	
Projects	Authentic, real world tasks. Projects can vary from simple to sophisticated. They can be carried out individually or by a group of students.	<ul style="list-style-type: none"> - can provide extensive information on students' skills, knowledge and experience - can be used for both group and individual tasks - allows for differences in ways of learning - Capture students' interests - very good for students in their final year - help students link theories, as well as linking theory and practice - Allows students to develop their strategies for taking on research 	<ul style="list-style-type: none"> - requires writing and presentation skills - it is easy to get carried away and be judged on presentation rather than content - difficult to confirm validity - takes a lot of time to assess as well as to supervise - they do not all involve the same degree of difficulty as some projects may be more complex than others - there isn't time for a second chance.
Reflective Journal	Reflective journals help students keep a record of any incidents or thoughts that help them reflect on the content of the course or programme	<ul style="list-style-type: none"> - provides opportunity for students to synthesis own work and - identify strengths and weaknesses 	<ul style="list-style-type: none"> - Assessing journals can be delicate, as they often contain personal content.
Case studies	Case studies are ideal for seeing how students can apply their knowledge and professional skills. They might need to be highly formal and carried out under supervision or be carried out independently by the student	<ul style="list-style-type: none"> - can make topics more realistic enhancing motivation and interest - can be carried individually or in a group situation - builds on current knowledge and experience 	<ul style="list-style-type: none"> - must have clear outcomes - if carried out as a group activity, roles should be defined, and individual contributions assessed - time should be allowed for a de-brief - can be time consuming to prepare and assess
Portfolios	A portfolio consists of evidence put together to show how the student can meet specified learning outcomes or assessment criteria. There are a wide variety of types from a collection of assignments to reflection upon critical incidents. The latter are probably the most useful for developmental purposes	<ul style="list-style-type: none"> - contain evidence of a wide range of skills and attributes - very effective in combination with a quick viva exam - can demonstrate progress in learning - can reflect students' attitudes and individual strengths 	<ul style="list-style-type: none"> - looking through portfolios can be time consuming - hard to mark objectively - authenticity of evidence can sometimes be questioned
Rapid assessments			
Type	Description	Advantages	Disadvantages
Concept Maps	Concept maps are particularly useful for giving an overview of the course. Enables teachers to identify if a student has an impoverished knowledge structure relating to the topic or a rich one.	<ul style="list-style-type: none"> - unique technique to understand connections of - concepts within students' knowledge-base - assessment of complex relationships 	<ul style="list-style-type: none"> - difficult to compare across students - difficult to obtain objective judgment on abilities

Appendix 2: Online Assessment Types

Assessment Type	Examples	Tools
Traditional assessment submitted online	<ul style="list-style-type: none"> - Essays - Case studies - Article reviews - Proposal writing - Report writing 	(1) LumiNUS Files (upload via student submissions) (2) Online marking and feedback (3) Digital assessments (e.g., ExamSoft)
Automated online assessment	<ul style="list-style-type: none"> - Online Quizzes (MCQs, MRQs, FIBs, T/F, matching, ordering) - In-video quizzes - Assessment of prior knowledge 	(1) LumiNUS assessments (2) Digital assessments (e.g., ExamSoft) (3) Student response systems (e.g., clickers, PollEverywhere)
Invigilated online assessment	<ul style="list-style-type: none"> - Mid-semester exams - Final exams (MCQs, short answers, essays) 	(1) LumiNUS assessments (2) Digital assessments (e.g., ExamSoft)
Online interaction	<ul style="list-style-type: none"> - Contributions to forums, chats, blogs and wikis - Reading summaries - Collaborative learning - Critical reviews 	(1) LumiNUS assessment (2) LumiNUS Forum (3) LumiNUS Chat (4) Blogs/wikis/Google docs
Group assessments online	<ul style="list-style-type: none"> - Online presentations - Group online projects - Role play - Online debates 	(1) Screencast (Ink2Go) (2) LumiNUS projects (3) YouTube (4) Google Docs
Critical reflection and meta-cognition	<ul style="list-style-type: none"> - Electronic portfolios - Online journals, logs, diaries, blogs, wikis - Embedded reflective activities - Peer & self-assessment 	(1) e-portfolio (2) Wikis (3) Blogs (4) Peer assessment tools
Authentic assessment	<ul style="list-style-type: none"> - Scenario based learning - Laboratory/field trip reports - Simulations - Case studies/Role play - Online oral presentations and/or debate 	

Adapted from Donnan (2007), *Conducting assessment online: Educational developers' perspectives*