

Designing Effective Online Assessments

RESOURCE GUIDE

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Assessments: An Overview

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 & Tang, 2007). 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 (McMorran, Ragupathi and Simei, 2015). 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. When an assessment is constructed so as to maximise opportunities for meaningful student learning, it is termed as the learning-oriented assessment (Carless 2007). The framework is summarised in Figure 1.

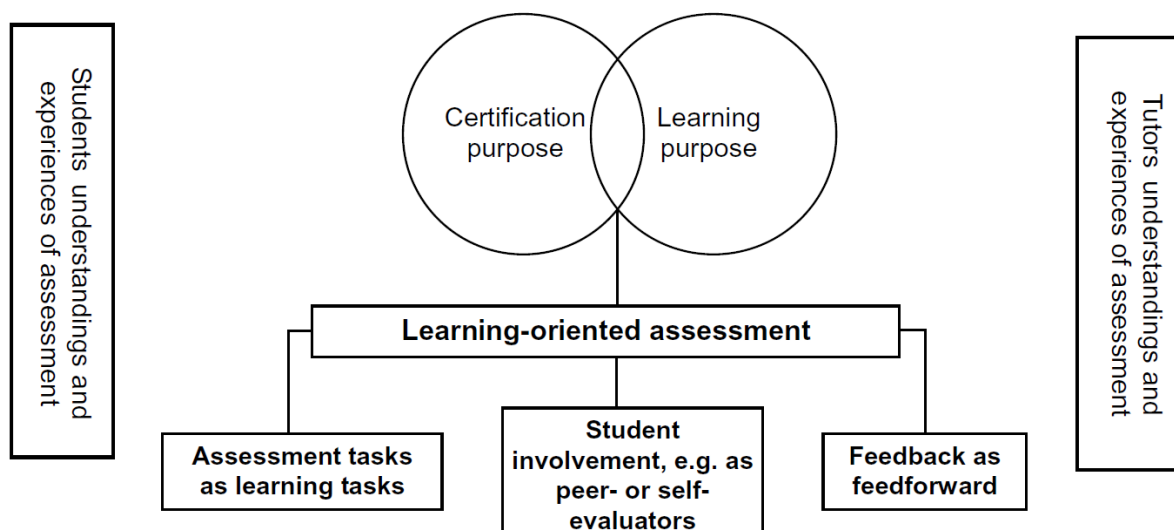


Figure 1: Framework for learning-oriented assessment (Carless 2007)

Designing Assessment Tasks

According to the constructive alignment theory by Biggs and Tang (2007), 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. The learning outcomes for a topic/unit are the criteria against which instructors 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 indicate 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.

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).

Bloom's Taxonomy of educational objectives (Table 1) can also serve as a useful reminder when designing assessment tasks. Holtzman (2008) provides a quick summary of the six levels in bloom's taxonomy, and how these six skill levels build on each other. In level one, students demonstrate knowledge of a topic through simple recall. In level two, they exhibit comprehension of a topic—they demonstrate that they understand the information either by explaining or summarizing it for others. Level three involves application—the students

demonstrate they can use the information in a variety of contexts. In level four, students analyze information to uncover its relationship to other pieces of information. In level five, they synthesize various pieces of information into a new and coherent whole. Finally, in level six students evaluate the validity of the information before them.

Table 1: Bloom’s Taxonomy of educational objectives

Bloom’s Taxonomy of Educational Objectives	
Knowledge	
1. Knowledge (recall)	1.1 Knowledge of specifics 1.2 Knowledge of ways and means of dealing with specifics 1.3 Knowledge of universals and abstractions in a field
Intellectual abilities and skills	
2. Comprehension (low level understanding; ability to grasp and make use of material/ideas without seeing further implications)	2.1 Translation 2.2 Interpretation 2.3 Extrapolation
3. Application (use of abstractions in specific situations)	3.1 Use of technical principles/theories 3.2 General ideas, procedures or methods
4. Analysis (breaking down into constituent elements; perceiving relationship between—and hierarchy of—ideas)	4.1 Analysis of elements 4.2 Analysis of relationships 4.3 Analysis of organisational principles
5. Synthesis (structuring elements to form a pattern not previously apparent)	5.1 Production of a unique communication 5.2 Production of a plan or proposed set of operations 5.3 Derivation of a set of abstract relations
6. Evaluation (quantitative and qualitative judgement of idea/procedure; appraisal to satisfy criteria)	6.1 Judgements in terms of internal evidence 6.2 Judgements in terms of external criteria

Extracted from Daphne Pan (2008) “Learning to Teach, Teaching to Learn: A Handbook for NUS Teachers”, National University of Singapore

Designing online assessments

Using online assessments can provide you the flexibility to easily create assessments for each of the topics, while also allowing students to take the assessments at their own convenience. Online assessments also gives the opportunity for learners to interact and collaborate with their peers during online discussions, reflection exercises, self and peer review, and group work. Such assessments provide students with a detailed record/portfolio of learning that they can use to showcase their achievements when they graduate from university.

Some advantages of using online assessments include:

- Easy identification of areas of learner misunderstanding and misconceptions
- Flexibility that allow students to take a test from anywhere and at any time
- Offering new possibilities for interactivity
- Providing detailed and immediate feedback
- Facilitating enhanced social interactions
- Facilitating the exposition of advanced skills and capabilities
- Increasing grading accuracy
- Providing repeated opportunities for learners to practice understanding when online quizzes or assignments can be repeated multiple times
- Storing and reusing of assessments
- Shuffling and randomizing assessment questions and options

Question types in an online assessment

Online assessments support a variety of question types. Listed below are the list of question types that are available.

1. Multiple Choice Questions (MCQs):

Multiple choice questions present a question and ask students to choose from a list of possible options/answers. Most MCQs feature one correct answer, and two to four “distractor” choices that are incorrect. Questions can take the form of incomplete sentences, statements, or complex scenarios. MCQs are most appropriate for **factual**, **conceptual**, or **procedural** information. Some simple rules of thumb that can make for more effective questions:

- Distractors should be incorrect, but plausible/probable. The student should not be able to eliminate a distractor simply because it is clearly wrong.
- Avoid “always” and “never” in distractors. Choose terms like “usually”, “likely” and “rarely” to keep students from easily eliminating distractors.
- Options like “all of the above” and “none of the above” should be used sparingly.

Advantages:	Disadvantages:
MCQs are the most versatile of the closed-ended question types. This versatility stems from the fact that the questions can contain more elaborate scenarios that require careful consideration on the part of the student. The probability of student guessing is also relatively low.	When compared to true/false and matching, multiple-choice items can be more challenging to write. They also require the creation of plausible “distractors” or incorrect answer options. As with other closed-ended questions, multiple-choice assesses recognition over recall.

2. Multiple Response Questions (MRQs)

MRQs are very similar to the MCQs except that it has more than one correct answer. MRQs present a question and ask students to choose multiple options from a list of possible options/answers and usually has more than one correct answer.

3. Fill-in-the-blanks:

Fill-in-the-blank questions are “constructed-response,” that require students to create an answer and typically one word answers. Completion questions are also similar to fill-in-the blank question types. Fill-in-the-blank questions are most appropriate for **questions that require student recall over recognition**. Examples include assessing the correct spelling of items or in cases when it is desirable to ensure that the students have committed the information to memory.

Advantages:	Disadvantages:
Fill-in-the-blank questions assess unassisted recall of information, rather than recognition. They are relatively easy to write.	FIB questions are only suitable for questions that can be answered with short responses. Additionally, because students are free to answer any way they choose, FIB questions can lead to difficulties in scoring if the question is not worded carefully.

4. True/False (T/F) questions:

True/false questions present a statement, and prompt the student to choose whether the statement is true. Students typically have a great deal of experience with this type of question. T/F questions are most appropriate for **factual information and naturally dichotomous information** (information with only two plausible possibilities). Dichotomous information is “either/or” in nature.

Advantages:	Disadvantages:
True/false questions are among the easiest to write.	True/false questions are limited in what kinds of student mastery they can assess. They have a relatively high probability of student guessing the correct answer (50%). True/false also assesses recognition of information, as opposed to recall.

5. Matching Questions:

Matching questions involve matching paired lists that require students to correctly identify, or “match” depending on the relationship between the items. These are most appropriate for **assessing student understanding of related information**. Examples of related items include states and capitals, terms and definitions, tools and uses, and events and dates.

Advantages:	Disadvantages:
Matching items can assess a large amount of information relative to multiple-choice	Matching assesses recognition rather than recall of information.

questions. If developed carefully, the probability of guessing is low.	
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6. 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. Most appropriate for assessments that cannot be accomplished with other question types. Because essays are the only question types that can effectively assess the highest levels of student mastery, they are the only option if the goal of testing is the assessment of synthesis and evaluation levels.

Advantages:	Disadvantages:
Essay questions are the only question type that can effectively assess all six levels of Bloom’s Taxonomy. They allow students to express their thoughts and opinions in writing, granting a clearer picture of the level of student understanding. Finally, as open-ended questions, they assess recall over recognition.	There are two main disadvantages to essay questions — time requirements and grading consistency. Essays are time-consuming for students to complete. 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).

Table 2 provides a summary of the available question types and their associated methods of grading along with a mapping to Bloom’s levels of learning that the question type assesses.

Table 2: Question types and Bloom’s levels of learning

Question Type	Grading method	Bloom’s Levels of learning
Multiple Choice Questions (MCQs)	Automatically graded	Knowledge; Comprehension Application; Analysis
Multiple Response Questions (MRQs)	Automatically graded	Knowledge; Comprehension Application; Analysis
Fill-in-the-blank(s) (FIBs)	Automatically graded	Knowledge; Comprehension Application
True/False Questions	Automatically graded	Knowledge; Comprehension
Matching Questions	Automatically graded	Knowledge; Comprehension
Essays / Short Answer	Manually graded (online)	Knowledge; Comprehension Application; Analysis Synthesis; Evaluation

Types of Online Assessments

Table 3: Online assessment types with examples and tools

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) ExamSoft + Rubrics
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 assessment (2) ExamSoft
Invigilated online assessment	<ul style="list-style-type: none"> - Mid-semester exams - Final exams (MCQs, short answers, essays) 	(1) LumiNUS assessment (2) 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 Files (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

Template for aligning your ILOs and Assessment Tasks

Identify the learning outcomes you seek to test through each of your assessment tasks (use the table below to map your ATs to the respective ILOs. 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.*

Table 4: Aligning your ILOs and Assessment Tasks

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

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

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

- The assessment tasks genuinely corresponds to the intended learning outcome(s), and can the level of achievement 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.
- It is not necessary to assess all learning outcomes
- Include formative as well as summative assessment tasks
- Use teaching strategies that encourage and skills identified in your ILOs and required to complete the assessment tasks
- Breakdown the 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.

Examples of online assessments

The following examples provide some alternative assessment techniques that can help teachers in designing effective and innovative online testing strategies.

1. Determine students prior knowledge

Using a simple quiz (LumiNUS Assessment) with multiple-choice questions, faculty can quickly gauge their students' knowledge level. For instance, you could have a short quiz at least two days before the lecture asking students to identify new concepts or distinguish between various new concepts in the assigned readings. The short quiz can have 2 to 3 open-ended, 5 to 6 short answer, or 10 to 20 multiple-choice questions that probe the students' existing knowledge.

Prior knowledge is necessary for learning, hence it would be a benefit if faculty are able to assess their students' prior knowledge of a subject before they start their introduction of the subject in class. Once all students have completed the online quiz, it is important to provide the results and feedback on how this will affect them as learners. A screencast can be used a great way of providing class-wide feedback.

(This example is taken from "Teaching and Learning with Technology Blog" by Kiruthika Ragupathi, 2011; <https://goo.gl/grrVWF>)

2. Online quizzes to understand student misconceptions

Online quizzes are mainly used to understand what students don't know. Students watch lecture videos before class (a flipped classroom approach), and take a short quiz on the lecture content. Each quiz question is designed as an MCQ type or "fill-in-the-blank" type, but it also requires students to provide a rationale for their chosen answer. Each student is given 5 attempts. When a student gets a question wrong, feedback is provided along with a hint pointing to the right answer. Students generally would be able to get full marks for the online quizzes within the allowed 5 attempts. The rationale students provide for each MCQ question will give insights on what students don't know.

The focus of this type of assessment is mainly on students' first attempt of the quiz, as this can act as a good gauge of students' understanding. Students' first attempt test score can be used to pick out discriminatory questions and can then be used to address student misconceptions in the subsequent lectures.

(This example is taken from "Virtually Vygotsky: Using Technology to Scaffold Student Learning" by Adrian Lee, 2014 In Technology in Pedagogy Series, <https://goo.gl/1Lr3Xz>)

3. Answer justification

Students are given a standard MCQ test, and students had an option to write a short justification (rationale) for any answer they felt needed more explanation. It was hoped that students would use this option for questions they perceived to be "tricky." The test is then scored where one point is added for "a good rationale/explanation of a wrong answer" and one point is subtracted for "a bad rationale/explanation of a right answer".

This technique is considered to be fairer than a typical MCQ test. It allows instructors to weed out ambiguous questions and initiates a dialogue between the student and the instructor.

(This example is extracted from "Multi-choice questions with an option to comment: Student attitudes and use" by Nield, A. F. and Wintre, M. G, 1986 In Teaching of Psychology)

4. **Take-home quizzes on reading assignments**

A take-home quiz can be designed for every reading assignment with one question for approximately each page of the text, with the order of the questions following the order of the pages. The test covering the reading assignment should be made available to students several days in advance, and should be due at the beginning of class on the first day of the in-class coverage of the assignment.

One main issue with reading assignments is that either students do not do the reading before class or do not give due attention when reading difficult texts. Then instructors often find themselves using valuable class time telling them what the text said rather than discussing the ideas found in the text. However, it is important to note that an instructor need to carefully structure the quiz, so as to achieve the goal of encouraging students to read. The test questions (stem) should be "objective" in a fairly literal sense, the answers (the options) should be quite specific; to answer a question, students should need to do little more than find the right sentence or paragraph and read it with a certain degree of understanding.

(This example is extracted from "Tests that also teach" by Williams, 1988, In American Philosophical Association Newsletter on Teaching Philosophy)

5. **Group multiple-choice test**

When taking a multiple-choice in-class test, students could consult with their peers if they wished; but each student would finally have to complete the online assessment, and would be graded individually.

Multiple-choice tests that examine critical thinking need to emphasize questions that allow students to apply the concepts to realistic/real-world examples. Students generally tend to misinterpret application-type questions. Thus when they are allowed to consult with peers, students tend to **gather into groups** of two to five and **argue over the questions**. In this way, students would not sacrifice their grades, and need to be completely convinced of an answer they disagreed with. More importantly, when such disagreements occur, they set about teaching each other the concept that the question was testing.

(This example is adapted from "Better testing for better learning" by Murray, 1990 In College Teaching)

6. **A second chance to learn**

The second chance begins with an in-class invigilated online, closed-book exam. When the students complete exam, they receive a second copy of the same as an automated online assessment to complete at home. The student may use class notes, the text, or any other available reference materials except other checking with their peers or others. Once the student completes the automated assessment, he gets the graded copy of the invigilated online assessment. A composite grade is calculated using the following formula: in-class exam score plus the product of half the points missed on the in-class exam times the percentage score on the take-home exam.

(This example is adapted from "Better testing for better learning" by Murray, 1990 In College Teaching)

7. Paired testing

This assessment consists of a series of thirty-question exams of two parts each. The first set of fifteen questions is taken individually by each student. But, the second set of fifteen questions is assigned to student teams of two. Instructors can select the teams randomly, and each student turned in an individual answer sheet. The student teams were instructed to discuss each test item but were not required.

In this technique, the need for students to discuss the test questions enabled students to develop a better grasp of the material and more self-confidence.

(This example is extracted from “Peer-mediated testing: The effects of an alternative testing procedure in higher education” by Hendrickson, J. M., Brady, M. P., and Algozzine., B., 1987, Educational and Psychological Research)

Tips for good assessment and feedback practice

Good formative assessment and feedback are integral to good teaching as they provide a process for students to evaluate and improve their learning and performance on assessment tasks. An early formative assessment task, such as an online quiz, which is designed to build students’ confidence can help to increase their engagement and also provide diagnostic feedback on their abilities. Effective feedback should help students to clarify what good performance is, and deliver high quality information to students about their learning.

Nicol and Draper (2008) highlight the following tips for a good assessment and feedback practice. They should:

- 1. Help clarify what good performance is (goals, criteria, and standards).**
To what extent do students in your course have opportunities to engage actively with goals, criteria and standards, before, during and after an assessment task?
- 2. Encourage ‘time and effort’ on challenging learning tasks.**
To what extent do your assessment tasks encourage regular study in and out of class and deep rather than surface learning?
- 3. Deliver high quality feedback information that helps learners self-correct.**
What kind of teacher feedback do you provide—in what ways does it help students self-assess and self-correct?
- 4. Provide opportunities to act on feedback (to close any gap between current and desired performance).**
To what extent is feedback attended to and acted upon by students in your course, and if so, in what ways?
- 5. Ensure that summative assessment has a positive impact on learning.**
To what extent are your summative and formative assessments aligned to and supportive of the development of valued qualities, skills and understanding?
- 6. Encourage interaction and dialogue around learning (peer and teacher-student).**
What opportunities are there for feedback dialogues (peer and/or tutor-student) around

assessment tasks in your course?

- 7. Facilitate the development of self-assessment and reflection in learning.**
To what extent are there formal opportunities for reflection, self-assessment or peer assessment in your course?
- 8. Give choice in the topic, method, criteria, weighting or timing of assessments.**
To what extent do students have choice in the topics, methods, criteria, weighting and/or timing of learning and assessment tasks in your course?
- 9. Involve students in decision-making about assessment policy and practice.**
To what extent are students in your course kept informed or engaged in consultations regarding assessment policy decisions?
- 10. Support the development of learning groups and communities.**
To what extent do your assessment and feedback processes help encourage social bonding and development of learning communities?
- 11. Encourage positive motivational beliefs and self-esteem.**
To what extent do your assessment and feedback processes enhance your students' motivation to learn and be successful?
- 12. Provide information to teachers that can be used to help shape their teaching.**
To what extent do your assessment and feedback processes inform and shape your teaching?

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