

Using eLearning tools for assessment purposes

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eLearning tools entice instructors with the promise that setting and marking assessment tasks can be more efficient. Unfortunately however it is all too possible to compromise the validity of assessment and to disadvantage students if eLearning tools are applied incorrectly. This paper considers the educational importance of assessment and reveals how the context of cognitive domains can be used to determine which eLearning tools are best suited for particular assessment types. It also suggests a taxonomy of eLearning tools as they apply to assessment.

Every Learning Management System (LMS) worth its salt contains a test engine, and there are many stand-alone applications that can be used for online assessment as well (such as Chi Tester). There are also many examples of online tests prepared using Java Applets, JavaScript or Flash, though the functionality of such tools tends to be extremely similar. Typically a test engine enables site authors to prepare questions such as multiple choice, matching, ordering, multiple answer, short answer, and fill-in-the-blank. While the tools themselves are generally easy to use and execute their functions well there is an underlying practice issue that designers of online courses must consider: having access to a tool and using it appropriately are two distinct yet complementary things.

Assessment tasks are vital elements of student learning; in fact they can be extremely powerful education tools in their own right. Race (1998,p.136) describes assessment as “the engine which drives learning”, while Morgan (1993,p.103) states that “from the students’ perspective, the assessment defines the de facto curriculum.” Ramsden (1992, pp.187-188) agrees: “From our students’ point of view, assessment always defines the actual curriculum... Assessment sends messages about the standard and amount of work required, and what aspects of syllabus are most important.”

Assessment as a teaching tool

Assessment can play a greater part in what is actually learned from a course than the learning objectives themselves, because assessment focuses student attention and effort and indicates what is really required of students from the course. The potential of assessment to encourage deep learning is obvious, yet assessment is frequently under-used by course designers despite the importance educational theorists give to it. According to Ramsden (1998, p.24), there is substantial evidence to suggest that

students’ perceptions of assessment and teaching profoundly affect their approaches to learning and the quality of what they learn.... Perhaps the most significant single influence on students’ learning is their perception of assessment.

Assessment can be formative (done for feedback rather than grades), or summative (for both feedback and grading). Formative assessment consists of those tasks that students perform to get feedback on their current understanding of course content, or their perceptions of course content. Summative assessment on the other hand consists of tasks that are marked and graded by an assessor to determine the level of knowledge a student has attained. Both can and should be used to promote

understanding, and both should be used to provide some form of feedback to the student on their progress.

Many assessment tasks that tertiary educators prepare can be easily completed by students using memorised responses and surface thinking. In some assessment tasks, students who are aiming to understand rather than memorise may even be disadvantaged. Assessment tasks that require deep approaches to learning are important for two primary reasons, both expressed by Ramsden (1992, p.72):

The process of assessment influences the quality of student learning in two crucial ways: it affects their approaches and, if it fails to test understanding, it simultaneously permits them to pass courses while retaining the conceptions of subject matter that teachers wished to change. Should the assessment of students' learning go no further than testing what can be unreflectively retained in their memories, misunderstandings will never be revealed.

For example, a student who is well-read about the conquests of Alexander the Great and his influence on ancient society may or may not be able to choose between possible dates for the fall of Tyre in a multiple-choice test; conversely, a student who has simply memorized key dates but has not gone much further holds the advantage in these circumstances even if they have no idea of the significance of the spreading of the Greek language throughout Alexander's conquests. The former well-read student has studied at a deep level, the latter at a surface level. It can be seen then that choices of assessment can at least partly determine how students engage with their course materials, and favour one type of cognitive development over another. Unfortunately, most of the default LMS testing engines and other widely available Web-based applications tend to require only surface-level processing from students.

Application of assessment as a teaching tool rather than a measuring tool is needed if educators are to make the most of the opportunities that assessment provides them with, and if they are to maximize the benefits of eLearning tools in assessment. Using assessment as a teaching tool, it is possible to:

- Encourage deep approaches to learning.
- Correct student misconceptions.
- Pace student progress.
- Reflect on and improve course materials in terms of their effectiveness.
- Motivate students to focus on the important elements and concepts of the course.
- Motivate students to explore further as a result of feedback.
- Provide feedback to the learner as to how they might improve their analytical and critical thinking skills.
- Update student profiles, which in turn permits better student support, and
- Grade students in terms of ability.

Studies have demonstrated that assessment paces students (Lawless, 1994), which is a useful feature for those designing courses for flexibility. Having no deadlines can disadvantage some students. Formal assessment deadlines do at least ensure that students are maintaining a certain level of progress through their studies. The volume of assessment tasks to be completed also influences the learning approach that students will take. Research by Krane (1995) establishes that six or seven assignments per course should be considered the maximum. Krane also stresses the importance that students perceive the assessment tasks as necessary and important to their learning. She suggests that the first two assignments be comparatively easy; this helps the student to settle in to the course, the tutor to become familiar with student's style, and

for students to get an opportunity to use tutor's feedback on future assessments of more worth.

Overall the focus of assessment should be on learning rather than measurement and on conceptualization rather than recall. Further, if we are to view assessment as opportunities for further learning we must consider not only the assessment tasks themselves but the feedback opportunities that they give rise to.

Online assessment tools

When online assessment is mentioned most minds imagine simple question techniques that are self-marking, such as multiple choice, fill in the blanks, true/false, ordering, matching, multiple answer, and hotspot question types. Unfortunately the additional possibilities afforded by eLearning are seldom considered when discussing online assessment, mainly because they are not in the repertoire of standard online assessment tools. A basic taxonomy is suggested here.

Self-marking assessment tools – these are the true/false, multiple choice, ordering etc. questions that can be answered in pre-determined ways. Most online assessment makes use of these tools, primarily because they are directly associated with testing in LMS systems and are standard fare of other online assessment systems. Unfortunately, self-marking online assessment tools tend to be built for the purpose of measuring student performance rather than to provide opportunities for further learning, and they are limited to pre-determined feedback. As such, they are largely incompatible with the use of summative assessment for further learning purposes.

Simulation-based assessment tools – simulations are highly interactive and responsive applications that measure student performance in a simulated environment. Simulative assessments can be very effective (see for example Lapointe and Robert, 2000) but they can be very expensive to purchase and create. Simulation-based assessment tools can provide feedback based directly on student input (see also California State University's Painless simulation, which lends itself to assessment, <http://www.cdl.edu/Painless/painless.html>). Simulations are frequently used for teaching however they can also be effectively used for assessment by requiring students to achieve a certain score or to complete a task within various pre-determined constraints. The real-world context is a vital contribution to skills-based assessment. Simulation-based assessment seems to be largely overlooked by practitioners as an online assessment option.

Collaborative and feedback-oriented tools – eLearning tools such as bulletin boards and document revision provide excellent opportunities for assessment and are worthy of exploration by those wanting to use online tools effectively for assessment purposes. While automation of marking may be non-existent using these tools, the opportunities for providing feedback to students are maximized because electronic marking (using for example the comments feature of MS Word) permits increased levels of feedback at point of relevance. Bulletin board discussion either pre- or post-assessment (or both) maximizes the opportunities for learning from assessment tasks.

With the exception of the simulation-based assessments, online assessment tools are relatively easy to make use of. Self-marking tools increase efficiency and convenience for the instructor and also ensure swift marking. Collaborative and feedback tools on the other hand increase the validity of assessment (because they measure understanding) and the effectiveness of assessment as a learning tool (providing customised feedback is provided by the instructor).

Cognitive domains as the basis for eAssessment

So there are a variety of online tools that can be used in assessment. Which is applicable to any particular course depends on the cognitive domain that needs to be assessed at any time. There are three main learning (cognitive) domains (Nichols, 2001) and each is suited to one of the online assessment tool sets:

- **Information (knowledge/comprehension)** – this is the level of recall. Self-marking tools are appropriate here, as students either know something or they do not. Feedback need only be simplistic and relate students back to the correct answer.
- **Skills (application/analysis)** – the level of application. Simulation-based tools are appropriate for assessing skills.
- **Understanding (synthesis/evaluation)** – collaborative and feedback-oriented tools are appropriate. Because understanding is concerned with how well a student knows something instead of whether or not they know it, feedback needs to be as individualized as student understandings are.

It is vital that assessment tasks are valid, that is, they need to be related to the learning objectives specified in the curriculum and target the cognitive domain each objective is written to. eLearning tools are not equally valid for assessing each of the three major cognitive domains. Forsyth, Joliffe and Stevens (1999, p.61) provide the list of verbs for each cognitive domain. These verbs are used in the learning outcomes found in curricula to indicate the cognitive domain that needs to be assessed.

	Knowledge		Comprehension	
Information	Arrange	Order	Classify	Locate
	Define	Recognise	Describe	Recognise
	Duplicate	Recall	Discuss	Report
	Label	Relate	Explain	Restate
	List	Repeat	Express	Review
	Memorize	Reproduce	Identify	Select
	Name		Indicate	Translate
	Application		Analysis	
Skills	Apply	Operate	Analyse	Differentiate
	Choose	Practice	Appraise	Discriminate
	Demonstrate	Schedule	Calculate	Distinguish
	Dramatize	Sketch	Categorise	Examine
	Employ	Solve	Compare	Experiment
	Illustrate	Use	Contrast	Question
	Interpret		Criticise	Test
	Synthesis		Evaluation	
Understanding	Arrange	Manage	Appraise	Evaluate
	Assemble	Organise	Argue	Judge
	Collect	Plan	Assess	Predict
	Compose	Prepare	Attach	Rate
	Construct	Propose	Choose	Score
	Create	Set up	Compare	Select
	Design	Write	Defend	Support
Formulate		Estimate	Value	

Table1: Verbs in the Cognitive Domain (Forsyth, Joliffe and Stevens, 1991, p.61)

In general, the verb used in the curriculum for each learning outcome should be the one used in the assessment. The assessment questions should at least use verbs from the same domain as they learning outcomes they are supposed to assess.

Assessing the information domain

The self-marking online assessment tools available in LMSs such as Blackboard and other standard Web-based solutions (which include multiple choice, true/false, ordering, matching, multiple answer and fill-in-the-blank questions) are primarily suited to the information domain. This domain is concerned primarily with information recall, which is what self-marking assessment tools measure so well.

Assessing the skill domain

It is more difficult to use self-marking online assessment tools for the skill domain, primarily because the domain is concerned with performance rather than recall. Technology has been used successfully in this domain however the simulations that are required are expensive to produce and are currently beyond the reach of LMS systems such as Blackboard. Simulations typically need to be custom-built, often from scratch. Simulation-based assessment tools are ideal for assessing skills only if the benefit justifies the costs involved, though it should be noted that existing simulations designed for teaching can have assessment tasks associated with them (for example, requiring that students achieve a particular patient rating in the Painless simulation mentioned earlier). Hopefully, learning object repositories will eventually make it possible for simulations to be shared between institutions. These simulative learning objects could then be used as the basis for assessment in accordance with the curriculum. Because of the high cost of development, institutions could also seek to partner with industry representatives. This is a particularly promising option because the outcome can be improved productivity (Lapointe and Robert, 2000).

Assessing the understanding domain

It is very difficult to create self-marking online assessment for the understanding domain using self-marking assessment tools because it is in this domain that higher-order thinking is measured. Online tools such as online bulletin boards and online journals can be used for this domain, as can the essay or short answer-type questions available in systems such as Blackboard. Another alternative is electronic marking of student work in, for example, Microsoft Word using the comments feature to provide targeted feedback to student effort. Essay/short answer and multiple answer formats are only suitable for this level when they are constructed to specifically target understanding rather than recall and when there is a commitment to providing quality feedback.

As indicated earlier, using recall-type questions to assess this domain may actually disadvantage those students who do actually understand the concepts being assessed, and give an unfair advantage to those students who do not truly understand the concepts they have been taught. Arguably, well-designed multiple answer questions (in which one, some, all or none of the multiple options might be appropriate) can be used to test for understanding however they should not be used apart from any other assessment technique.

Conclusion

It is unfortunate that online assessment is typically associated with LMS test engines and popular, standard Web-based applications; a more holistic view that also considers the potential of simulations and online collaboration is necessary before the true advantages for assessment afforded by technology can be effectively realised.

If assessment is to be more than a 'measurement-only' activity, online assessment using self-marking tools needs to be painstakingly applied or even discounted for skill and understanding domains. The efficiencies of self-marking online tests will otherwise have the unacceptable side-effect of compromising the validity of

assessment either by rewarding those who do not really understand or disadvantaging those students who do understand but lack good recall skills. Self-marking, simulation and collaborative/feedback-oriented eLearning tools should only be used when there is a match between the tool and the domain that is being assessed against.

Assessing skills can be done using simulation-based eLearning tools however they can be expensive to purchase (if they can be found at all) and create. Development partnerships with industry and learning object repositories may provide a way forward.

Finally, there are at present no efficient shortcuts for assessing understanding. Instead, instructors must continue to exercise their judgment using the marking guides that have been developed for the particular assessment. It is however possible and desirable to use technologies to maximize the amount of feedback students get on their understanding by electronically annotating student work submitted online and by encouraging online student interaction both before and after assessment takes place.

The tension between efficiency, effectiveness and validity relaxes in the cognitive domain of information however it is felt most keenly in the domain of understanding. Rather than providing opportunities for efficiency when assessing understanding, eLearning tools make it possible to maximize assessment as a learning tool and enhance effectiveness and validity.

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