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Online Assessment Strategies: A Primer

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Abstract

Instructors who design online courses have an opportunity to develop assessments to monitor students' progress toward achievement of learning objectives. When combined with well-designed learning objectives, assessment techniques can close the feedback loop and provide excellent artifacts not only for course evaluation but programmatic and campus wide assessment. The purpose of this paper is to discuss the essential elements for the design and use of formative and summative online assessments including discussion postings, assignments, SCORM modules, and proctored and non-proctored tests or quizzes. Issues associated with online test security and cheating will also be discussed. The paper is designed to provide an overview about design and use of assessment strategies for instructors who are novices to online learning.

Keywords: Online course; online assessment; cheating; formative assessment; summative assessment, online testing, online quizzes

The initial design of an online class provides a prompt for instructors to examine deliberate learning assessment strategies. For example, an instructor may contemplate questions such as "How will I know when students are confused about a topic?" or "Is there a way that I can monitor the readiness of students to advance to more complex concepts?" "How will I document the achievement of student learning outcomes for regional or national accreditation agencies?"

An effective online instructor orchestrates a number of interactive learning and assessment activities to guide and document the learning process. The purpose of this paper is to discuss the essential elements for the design and use of formative and summative online assessments including discussion postings, assignments, SCORM modules, and proctored and non-proctored tests or quizzes. Issues associated with online test security and "cheating" will also be discussed. The paper is designed to provide an overview about design and use of assessment strategies for instructors who are novices to online learning.

Matching Assessment Techniques to Learning Objectives

Learning activities and assessment are connected very closely in well-designed online courses. The first step in making connections is to identify the desired course objectives. The syllabus should clearly state information about course learning objectives, learning methods, and how learning assessments will be used. Typically, instructors use Bloom's (1956) taxonomy to write objectives for learning gains in three domains: cognitive (what the learner should know), psychomotor (what skills the learner should be able to do), and affective (how the learner feels or modifies his/her attitudes). Instructors further specify a desired level of learning for each domain. Within the cognitive domain, in higher education, the higher order skills of application, analysis, synthesis, and evaluation are preferred for course learning objectives.

New faculty members may be familiar with the more recent work of Anderson and Krathwohl (2001; Krathwohl, 2002). The most obvious difference in the two cognitive taxonomies is the change of nomenclature of categories. Bloom (1956) used nouns to describe the categories; whereas, Anderson & Krathwohl used verbs which denoted an active cognitive processes required to learn. Anderson and Krathwohl also repositioned the last two categories.
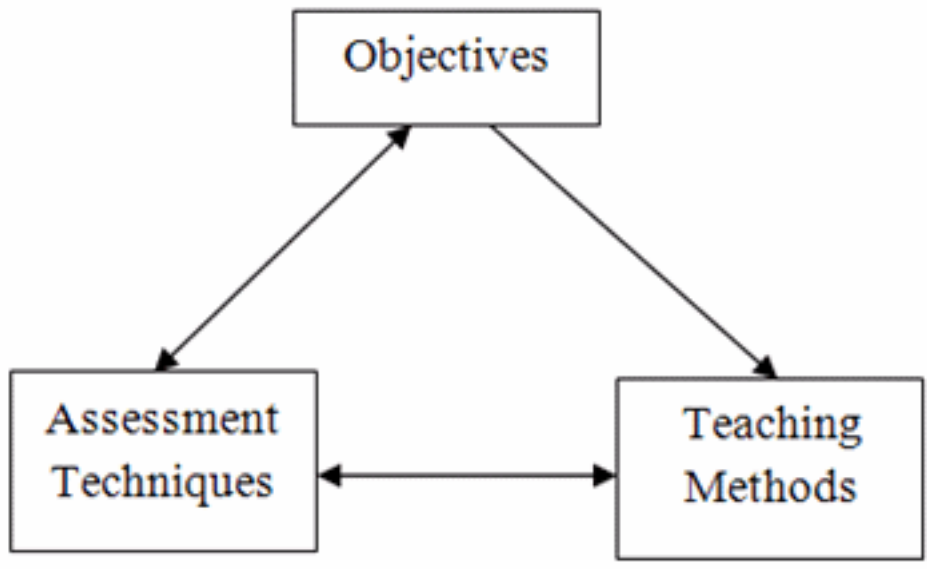
After writing or analyzing course level learning objectives, the next step is to identify individual lessons (learning modules) that constitute the course. Learning objectives should be specified for each lesson using the same process of identifying the learning domain(s) and levels of learning as course objectives. The lesson objectives should clearly map back to the course objectives and support achievement of course objectives (See Fig. 1). Course objectives should clearly map to program objectives and program objectives to the overall college/university general education objectives (See Fig. 2).

Figure 1. The Educational Triangle

A deeper examination of the work reveals how the taxonomy acts on the various levels of the knowledge dimensions of the knowledge (Thede & Sewell, 2009) and the more recent Anderson & Krathwohl (2001) taxonomy level. Wilson (2006) provides a more detailed discussion with an associated graphic depicting the changes that Anderson & Krathwohl made to Bloom's Taxonomy with the use of verbs instead of nouns, and the switch of order for evaluation (evaluate) and synthesis (create) at http://www.uwsp.edu/education/lwilson/curric/newtaxonomy.htm.

Learning Assessment Techniques

Learner assessment techniques are sometimes known as classroom assessment techniques (CATs). Long before technology was commonly used in teaching and learning management systems (LMS), Angelo and Cross (1993) described classroom assessment as "an approach to help teachers find out what students are learning in the clas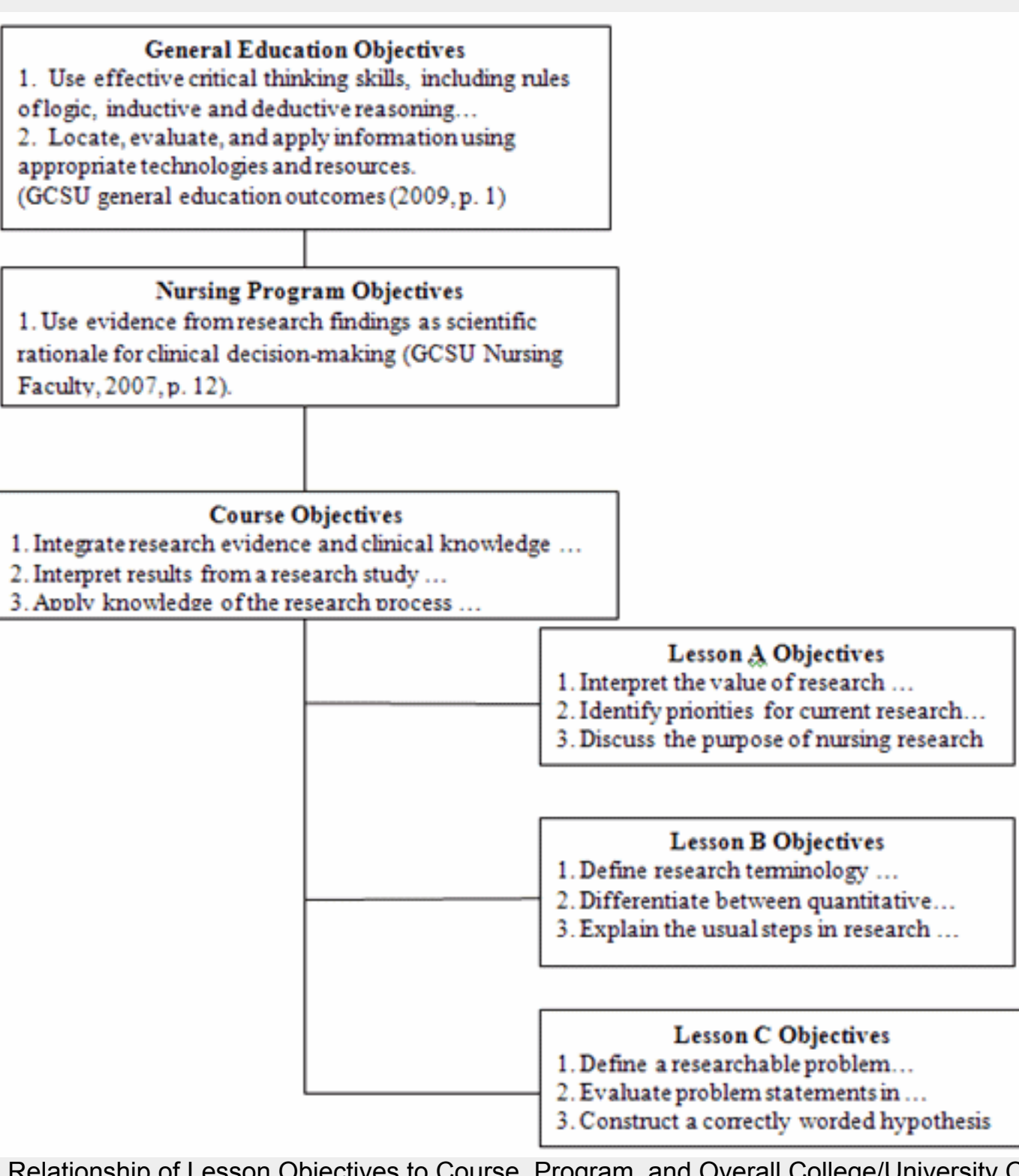sroom and how well they are learning it" (p. 4). The most effective assessments serve as motivational tools, promote learning, and can be graded using explicit criteria and standards (rubrics) (Walvoord & Anderson, 1998). Angelo and Cross discussed CATS specifically as a formative assessment tool. Today, classroom-learning assessments are regarded as both formative (developmental) and summative (final); both types are appropriate to online learning.

Figure 2. Relationship of Lesson Objectives to Course, Program, and Overall College/University Objectives

Exemplary Assessments

Exemplary assessments, whether classified as formative or summative, are meaningful, motivational, engaging, and should guide the student in the learning process (Huba & Freed, 1999; Walvoord & Anderson, 1998). Huba and Freed (1999) identified eight characteristics of exemplar assessments (See Table 2). Design of assessments can be time intensive, so the instructor should give careful consideration to make sure that the assessment techniques are exemplary and guide the student to meet the intended learning outcomes.

Table 1. Learning Assessment Techniques and Associated Taxonomy Levels

Learning Assessment Techniques	Bloom's	Anderson & Krathwohl
Virtual labs, computer simulation models, case studies, multiple choice questions	Analysis Synthesis Evaluation	Creating Evaluating Analyzing
Interactive tutorials, simulations, instructional games, case studies	Application	Applying
Simulations, animations, tutorials	Comprehension	Understanding
Flash cards, games, quizzes	Knowledge	Remembering

Table 2. Characteristics of Exemplary Learning Assessments

Characteristics of an Exemplary Learning Assessments
Authentic ● reflects real life experiences
Challenging ● stimulates the learner to apply knowledge
Coherent ● serves as a guide for the student to achieve the learning goal
Engaging ● attracts the learner's interest
Respectful ● sensitive to the individual learner's beliefs and values
Responsive ● includes a feedback mechanism to assist the student in the learning process
Rigorous ● requires applied understanding of learning to achieve a successful outcome
Valid ● provides information that is useful to meet the intended learning outcomes

Formative Assessments

Formative assessments entail sampling student learning and providing feedback to guide the learning process. Formative assessments can be anonymous surveys or they can be individual or group learning activities. In all instances, feedback rather than grading is the ultimate goal. Formative assessments allow the instructor the opportunity to modify the teaching plan and learning experience in order to meet the learning outcomes.

Selection of Learning Assessments. Because formative assessments give instructors information about progress toward learning objectives, assessments should be tightly connected to the objectives. For example, an appropriate formative assessment of students' knowledge of acid-base balance might be the one-minute paper or the muddiest point because these techniques are used to assess knowledge. Classroom opinion polls and self-confidence surveys are more useful to assess affective learning: values, attitudes, and self-awareness. Case studies are often used to assess critical thinking by asking students to solve ill-defined problems reflecting the real world and without a clearly identified correct answer (Huba & Freed, 1999). Finally, the instructor may want to assess the learner's response to instruction. Email, feedback forms, and reflection discussions are techniques to obtain feedback useful for refining the instruction process.

Most popular LMSs provide numerous features for the design and re-use of formative assessments. For example, e-mail and the discussion boards can be used for the one-minute paper, the muddiest point, and some summary, and reflection postings. Quizzing and SCORM (sharable content object reference model) modules, (discussed later) are useful for self-tests and game designed learning assessments.

Individual versus Group Learning Assessments. The decision to make learning assessments individual versus group depends upon the learning objectives and the class size. In all instances, the instructor must consider the class size when designing assessment techniques. When class size is large, group activities allow learning collaboration where students discuss and have the opportunity to appreciate other's perspectives. Most online formative assessment techniques are adaptable for use with groups. A feature in some LMSs allows the instructor to assign a learning activity to a group and to provide a group grade, which is recorded in each student's gradebook.

Reflection and self-assessments. Reflection postings typically prompt learners to use critical thinking and reflection. For learners, the ability to recognize which concepts they understand and which concepts they have a tenuous grasp is an important skill (Kayler & Weller, 2007). Reflection and self-assessment can take many different forms in online classes. When the one-minute paper is used, learners are asked to summarize the most important aspect of learning and to reflect upon questions regarding their understanding. The muddiest point simply focuses on learning that was unclear after a particular lesson or group of lessons. (Angelo & Cross, 1993). Information from the one-minute paper and the muddiest point guides the instructor to assess whether or not students achieved the lesson learning objectives and to provide clarification, as required. Both the one-minute paper and the muddiest point assessments could be designed as either individual or group postings.

A one-sentence summary asks students to write a sentence that answers the questions "who, when, where, how, and why" (Angelo & Cross, 1993, p. 183). The one-sentence summary provides information about how students synthesize and summarize large amounts of information into one sentence. The instructor could also use reflective writing as a learning assessment. Fink (2003) notes that reflective writing calls upon learners to assess learning critically using questions such as "What am I learning? Of what value is this, to me? How do I learn best, most comfortably, with difficulty? What else do I need to learn?" (p117).

Self-tests. Certain formative learning activities, such as multiple-choice self-tests, provide feedback to the learner using automated scoring. The instructor could require the learner to complete a reading assignment and then take an associated short, timed, self-test (10-15 questions) with a minimum competency expectation. If mastery is the desired outcome, the instructor may choose to provide two or more opportunities to take the self-test. Instructors should be aware that the score for the "self-test" is not recorded in the gradebook of some LMSs. A graded and recorded formative test can be helpful to both the instructor and the learner. The instructor can use item analysis to identify areas that are not clear to learners in addition to noting performance of learners. Item analysis allows the instructor to provide remediation before moving learners to new concepts. Many LMSs contain tools that can send automated messages from the instructor to students based on the score of the self-test. The learner benefits from receiving timely feedback on answers and knowing that the instructor has reviewed the score and provided additional suggestions based on their success.

SCORM modules. SCORM (shareable content object reference model) is a robust feature that provides common specification and standards for interactive learning activities that can be imported into any LMS platform. Interactivity means that the instructor has the opportunity to use gaming features to reinforce learning at the knowledge and comprehension levels. This foundational learning is essential to higher order learning. Well-constructed gaming can facilitate learning assessments and be engaging and fun! Instructors can close the feedback loop by creating a quiz associated with the gaming activities. Learners can be instructed to take a quiz once they have mastered the essential concepts presented in the SCORM.

SCORM modules are created with third party software whose features make interactive learning virtually "painless" for the instructor. Authoring SCORM modules can begin by importing existing electronic files (Microsoft PowerPoint® or Word® documents) into the software. Once imported, files are converted to a Flash® format and compressed into a zipped (.zip) file. The instructor uploads the .zip file as a SCORM module into the LMS.

Instructors have a choice of many SCORM gaming software solutions. All include tutorials that shorten the learning curve for users. For example, Hot Potatoes® (http://hotpot.uvic.ca/) is a free download for use by educators. Users can create the following interactive learning activities: matching, jumbled sentences, crossword puzzles, fill-in-the-blank, multiple-choice/short answer quizzes, or a combination of any.

Commercial third party solutions are also available ● all with 30-day free trials. With just a click of a mouse, Studymate Author by Respondus® provides a means of creating numerous learning activities from a glossary or from existing quizzes. TechSmith Camtasia Studio® (http://www.techsmith.com/camtasia.asp) and Adobe Captivate® (http://tryit.adobe.com/us/captivate/) allow users to create Flash video learning resources with or without audio. Both allow for import of slides from Microsoft PowerPoint® and have a means to create associated quizzes. If the learning assessment includes a quiz that is saved in SCORM formatting, learners' grades show in the LMS gradebook. Table 3 shows a sampling of software solutions for the design and development of learning activities. For a comprehensive list of tools for creating SCORM content, go to the Moodle LMS web site at http://docs.moodle.org/en/Tools_for_creating_SCORM_content.

Table 3. Software Solutions for Learning Activities

Software Solution	Cost	Fact Cards	Flash Cards	Pick-a-Letter	Matching	Crossword Puzzles	Quizzes	Glossary	Flash Video /Audio
Hot Potatoes®	Free*		x	x	x	x	x		
StudyMate Author®	**	x	x	x	x	x	x	x	
TechSmith Camtasia Studio®	**						x		x
Adobe Captivate®	**						x		x

* For educators
**30-Day Trial

Summative Assessments

Summative assessments are formal assessments conducted at the end of lessons, projects, and/or course to evaluate the learning achievement. Summative assessments are graded and are reflected in the final course grade. Examples of summative assessments include papers, quizzes, tests, and synthesis projects.

Grading rubrics. When instructors wish to analyze learning achievement demonstrated in papers or projects, grading rubrics can be used to communicate criteria to learners and facilitate the instructor in providing fair and timely feedback to the learner (Angelo & Cross, 1993; Huba & Freed, 1999; Thaler, Kazemi, & Huscher, 2009; Walvoord & Anderson, 1998). Rubrics reveal the expectations of the instructor to learners. Not only is grading more efficient with an assessment, but also they specify the level of performance needed to achieve learning objectives (Lombardi, 2008). The scoring system associated with the rubric closes the feedback loop between the instructor and the learner.

LMSs include built-in tools for creating learning assessment rubrics. In some LMSs, the term "rubrics" is used and in others the term "grading forms" is used. Regardless of the name of the tool provided by the LMS, the function is to reveal instructor expectations for a particular assignment to learners. If the grading rubric is not available in the LMS version, the instructor can post the assignment and associated rubric as an attachment in the assignment drop box, discussion forum, or course e-mail.

Quizzes and Tests

Quizzes or tests in LMSs can consist of multiple-choice, matching, and completion items. The instructor can customize the design and the deployment of the test as well as feedback options. The instructor can show one item at a time or the entire test. The test can be timed and password protected. Grade availability can be determined by the instructor as either immediately after the test is finished or after the instructor has completed a review of items and an item analysis. Rationales can be provided for each answer option of an item or for the item as whole.

Instructors will likely have students enrolled in courses who have never taken an online test. Practice tests can be developed with a similar design of test items, deployment options, and feedback as graded tests. This practice can prepare learners for taking tests online so that anxiety can be reduced.

General test security tips. Even when tests are not proctored, instructors can set deployment features to increase the security of tests. The first security measure is to hide the test until release date and make the test available to students who have a correct password. Next, the instructor can limit the time students see test items once the test is begun. Typically, 1 minute per multiple-choice item is sufficient for students who have studied for a test. To reduce the possibility of students getting answers from other students in the course, instructors can develop item sets. These sets have items with completion or short-answer responses. The instructor then makes parallel forms of the same tests. Most LMSs have a built in tool that can select an item from a question set to make parallel forms. In addition to having parallel forms of the test, the LMS testing tool to randomize the presentation of questions in a test and randomize the answer options of an item. When the instructor uses parallel tests, randomization, and timed items, students have more difficulty consulting one another about test items.

Other methods to promote academic honesty with non-proctored tests are to create the test as open-book/notes. The instructor can make it "legal" for students to use the Internet, textbooks, and notes, but state what is off-limits, such as discussing items with other students. Instructors can use test items that require higher-order thinking so that answers are not found on the page of a textbook or in students' notes. These strategies can support students' synthesis of concepts, analysis of problems, and development of solutions. If discussion questions are used, instructors can provide 15-30 minutes per item. Whatever the design of a non-proctored test, a wise instructor will assign low percentages of the course grade to non-proctored quizzes or tests.

Reducing Opportunities for Cheating

Cheating is clearly a frequent behavior among students. Students report that 50-75% of students self-report cheating (Burrus, McGoldrick, & Schuhmann, 2007). Although it may be intuitive to think that students who are distant from instructors in online courses cheat more often than students in face-to-face classes do, research indicates the opposite. Online cheating is no more prevalent than classroom cheating (Burrus et al., 2007; Grijalva, Kerkvliet, & Nowell, 2006; Kraak, 2007). Never-the-less, cheating is a problem in both settings. Recognizing why and how cheating occurs is the first step to changes in course policies to reduce cheating.

According to Grijalva et al. (2006), there are two types of cheating, unintentional and intentional. Unintentional cheating occurs in a moment of panic when students realize that they have no clue as to how to answer a question. In desperation, they resort to unplanned, creative means of finding the answer. In the traditional classroom, it often means looking at a classmate's test answers or text messaging a friend. In a non-proctored online environment, students can use notes, textbooks, and are friends for assistance.

The intentional cheater, on the other hand, makes plans in advance. The intentional cheater may arrange for a proxy to take the exam, plan with another person to use text messaging during the exam, sneak notes into the exam disguised as a soda or water bottle, or sneak hidden notes into the exam. Intentional cheating is planned dishonesty.

Promoting honesty. Because summative assessments are reflected in course grades, the instructor should take cheating issues into consideration when planning the assessment activities. Students cheat when the probability of being caught is low and when the severity of punishment is low (Burrus et al., 2007). Hard, Conway, and Moran (2006) reported that faculty members who are familiar with university policies regarding student academic misconduct and who use preventive techniques can reduce the incidence of cheating. This prevention starts with an environment of honesty reflected in the syllabus and course materials. Statements about academic honesty, definitions of cheating, and clearly stated consequences of cheating should be provided to students. In addition, instructors should reveal the capability of the LMS to monitor student activities (audit trails) in the course.

Instructors can promote honesty with written assignments by following several principles: (a) make clear to students what plagiarism is, (b) require students to complete the writing assignment over a semester, and (c) require documentation of originality (Fain & Bates, 2005). Although instructors believe that students should "know" what plagiarism is from writing assignments in high school, this assumption is faulty. Instructors need to be explicit about what constitutes plagiarism. Instructors can discuss copyright issues with published papers and materials on the Internet. Students are capable of searching for a particular style of citing references in text and constructing a reference page. Instructors can provide links inside online courses to excellent sites, such as the Purdue Online Writing Lab (http://owl.english.purdue.edu/), to assist students. Instructors can require students to submit sections of the paper throughout the semester for feedback. This strategy provides students with deadlines along the way (reducing panic cheating) and gives instructors an opportunity to become familiar with a student's writing style. Finally, the instructor can require all rough drafts and copies of cited references be submitted with the final paper. The final paper can be checked for originality by using plagiarism detection tools such as Turnitin® (www.turnitin.com) for written assignments or PlagiarismDetect® (www.PlagiarismDetect.com) for written assignments.

Promoting honesty with high stakes tests. When a test contributes more than 20% of the course grade, instructors should consider giving the test in a proctored environment. Students enrolled in courses that use a combination of face-to-face and online delivery can easily take a test in the university's computer center where the instructor or teaching assistants can monitor students. Rules such as not allowing students to retain papers, backpacks, hats, cell phones, or other electronic devices during the testing period should be enforced.

Other strategies to reduce intentional cheating include using assigned seating that is changed for each test administration, administering parallel forms of tests, and administrating tests at the same date and time for multiple sections of the same course (Strom & Strom, 2007). In addition, a simple agree/disagree statement at the beginning of the test serves to remind students of the penalty for dishonesty. For example, "I understand that academic dishonesty results in penalties as described in the syllabus and Undergraduate Catalog. I will not engage in any academic dishonesty during this examination." Challenges to test security exist in computer labs, and instructors should strive to reduce dishonesty by using computer monitor privacy screens, protecting the test with a password until the exam begins, and changing the password once students begin the exam.

If available, instructors can set an Internet lock-down for students to local computers in a proctored computer lab. Instructors can work with the information technology department at their universities to learn how to activate these features. If no Internet lock exists, instructors can suggest that students be required to use software that locks down the Internet. Some of these vendor solutions include Vision Classroom Management Software® - using surf lock, Respondus LockDown Browser Powerlink® (http://www.respondus.com/) and Securexam Browser Powerlink® (http://www.softwaresecure.com/browser.htm). Each of these products lock-out all applications and the Internet, other than the testing function in the LMS.

Conclusion

Learning assessments provide instructors with concrete clues about learners' achievement of learning objectives. Though assessment techniques have been used by some instructors in face-to-face classes, online courses offer technologies that make the design and reuse of assessment techniques easier. When instructors embed formative assessment techniques into online lessons, they can obtain information to evaluate how well students are learning concepts and make adjustments to teaching plans as needed. Students can receive immediate feedback on activities when automated scoring with rationales is used by the instructor. When designing assessments, instructors need to state clearly their expectations for honesty and the consequences of breaking course and university policies. Learners, instructors, programs, and the university benefit from the use of well-designed learning assessments.

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