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Assessing participant learning in online environments provides benefits and challenges. Fortunately, the available technology tools allow for a wide range of assessment techniques.

Assessing Participant Learning in Online Environments

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Assessment is a key component of any teaching and learning system. Assessment should be an ongoing process, integrated throughout the course, workshop, or program, and should consist of multiple measures, not merely a single grade provided at the conclusion of the learning event (Robles and Braathen, 2002; Shuey, 2002). Because the same data are often used to analyze student learning and to measure program effectiveness, the terms *evaluation* and *assessment* are often confused (Frederick, 2002). Reeves (2000) distinguishes the two terms by defining *assessment* as “the activity of measuring student learning and other human characteristics such as aptitude and motivation where evaluation is focused on judging the effectiveness and worth of programs and products” (p. 102). Robles and Braathen (2002) identify three key components of assessment: (1) measurement of learning objectives, (2) self-assessment for students to measure their own achievement, and (3) interaction and feedback between and among the instructor and students. Used appropriately, assessment provides helpful and much-needed guidance for learners and instructors.

Unfortunately, assessment development is an ongoing challenge for educators, whose worries range from whether their assessments are accurately measuring what they were intended to measure to whether they are fair to all learners. As instructors move to online teaching and learning environments, they face similar assessment challenges. After a discussion of assessment taxonomies, this chapter explores the benefits and challenges of assessing learning in online environments and provides a sampling of online assessment strategies and techniques.

Assessment Taxonomies

Discussions of assessment tend to follow one of two taxonomies. Hanson, Millington, and Freewood (2001) categorize assessments by purpose. They identify three categories: (1) diagnostic assessment, (2) formative assessment, and (3) summative assessment. Diagnostic assessment “provides an indicator of a learner’s aptitude and preparedness for a programme of study and identifies possible learning problems” (p. 2). Formative assessment “provides learners with feedback on progress and informs development but does not contribute to the overall assessment” (Hanson, Millington, and Freewood, 2001). The goal of formative assessment is to improve teaching and learning, not to provide evidence for grading learning achievement (Rovai, 2000). Summative assessment “provides a measure of achievement or failure made in respect of a learner’s performance in relation to the intended outcomes of the programme of study” (p. 2). According to Rovai (2000), summative assessment includes the awarding of grades and is “the process of gathering, describing, or quantifying information about learner performance” (p. 142).

Speck (2002) describes assessment as traditional or alternative, based on the learning domains of Bloom’s taxonomy that they best measure. Traditional assessment positions learners as “recipients of knowledge [whose] function is to absorb a body of information and demonstrate that they have absorbed the knowledge by answering test questions correctly” (p. 10). Traditional assessment measures learning at the lowest levels of Bloom’s cognitive domain: knowledge and comprehension (Robles and Braathen, 2002). Traditional assessments include fill-in-the-blank, true-false, matching, and multiple-choice questions. In contrast, alternative assessment positions learners as “extremely active in the process of learning . . . both encouraged and enabled to go beyond surface answers by using higher-level thinking skills of synthesis, analysis, and evaluation” (p. 11). Alternative assessment measures learning at the higher-order thinking of the cognitive domain (for example, application, analysis, synthesis, and evaluation), as well as learning that falls into the affective domain (for example, feelings, values, appreciation, enthusiasms, motivations, and attitudes). Alternative assessment embraces notions of social learning and collaboration and includes team activities, peer evaluations, self-evaluations, and portfolios.

Zeliff and Schultz (1998), in Robles and Braathen, (2002), identify a third type of assessment: performance assessment, which measures learning in the psychomotor domain. Performance assessment includes demonstrations of learner competence in a skill or task (Robles and Braathen, 2002). Reeves (2000), who considers performance assessment a type of alternative assessment rather than a new category of assessment, characterizes performance assessment as “focused on learners’ abilities to apply knowledge, skills, and judgment in ill-defined realistic contexts” (p. 105). According to Reeves, there are five key attributes of performance assess-

ment: (1) focuses on complex learning, (2) involves higher-order cognitive skills, (3) stimulates a wide range of active responses, (4) involves challenging tasks that require multiple steps, and (5) requires significant time and effort. Reeves's conceptualization of performance assessment measures learning that encompasses both the cognitive and psychomotor domains.

The two assessment taxonomies are not competing. A particular assessment may be described as diagnostic, formative, or summative, as well as traditional, alternative, or performance. The former taxonomy refers to the purpose of the assessment, whereas the latter refers to the learning domain the assessment best measures. An assessment system for a course, workshop, or program should consist of measures from multiple categories. There should be diagnostic, formative, and summative assessment in every learning event, as determined by the purpose of the learning event and the needs of the learners. Assessments should measure learning in all relevant learning domains. Because not all learning in a learning event takes place at the lower levels of the cognitive domain, then not all assessment should be concentrated at these levels.

Assessment in the Online Environment: Benefits and Challenges

The principles of assessment do not change in an online environment. In fact, assessment becomes more critical in the online environment because the environment does not allow direct observation in the way that the traditional face-to-face classroom does (Rovai, 2000). However, the technologies that underpin the online learning environment provide capabilities beyond those provided in the traditional classroom. As a result, there are benefits to assessing learning in the online environment as well as challenges.

Online Assessment Benefits. Two key benefits of online assessments are (1) the ability of every learner to respond to every question the instructor asks (Robles and Braathen, 2002) and (2) the ability of the instructor to provide immediate feedback to each learner (Wall, 2000). In a traditional course, when the instructor asks a question, the first student to answer is typically afforded the sole opportunity to provide an answer. On occasion, the instructor may ask multiple students the same question. Although important learning occurs as students listen to other students provide answers to questions, there is usually no time for every student in the class to test out his or her understanding of the concepts for feedback. This is not the case in the online environment. Using e-mail or asynchronous discussion tools, every student is allowed to respond to every question and to put forth his or her thoughts. When using asynchronous discussion tools, the online environment allows for social interaction comparable to classroom discussion in which students can build their thoughts on the thoughts of others. In contrast, when using the e-mail tool, each student has the ability to provide a fresh response, free from the influence of peers' responses.

Depending on the purpose of the assessment and the learning being assessed, one or both tools may be used.

A second key benefit to online assessment is the ability to provide immediate feedback to learners. These assessments may require the learner to complete a series of questions, after which the learner is provided with a summative grade as well as corrective feedback on each question answered incorrectly. Alternatively, the assessments may provide feedback as the learner completes each question. This feedback, for example, may provide additional information or direct the learner to related content for further study. When immediate feedback is provided automatically by the test program, it requires very little additional work for the instructor. When automatic feedback mechanisms are not provided, the instructor must provide feedback individually for each student—a time-consuming process.

Online Assessment Challenges. The key challenges to online assessment can be summed up and described in one term: *academic dishonesty* (Olt, 2002; Rovai, 2000; Shuey, 2002). This umbrella term includes issues related to learner identity and work ownership. The biggest concern for online educators is ensuring that the learner enrolled in online study is the learner who completes the coursework, including assessments. Although this issue also exists in traditional classroom courses in which the instructor does not know each student, it is exacerbated in the online environment when the instructor cannot see any of the students. Proctored testing at a site local to the learner is an often-used solution to the identity verification problem associated with major summative type assessments, for example, midterm and final exams. Possible proctored test sites include schools, libraries, churches, learning centers, and testing centers. The proctor at the test site verifies that the individual taking the test is the individual enrolled in the course. Advanced technologies based on fingerprints, voiceprints, and other unique individual traits are being developed, but these are expensive and not widely available.

Plagiarism is another component of the academic dishonesty challenge (Rovai, 2000). The Web has made finding information, copying it, and inserting it into a document very quick and easy to do. Learners can even purchase papers online. One remedy for this is to make sure that learners understand how to conduct research properly and that they understand what plagiarism is. Web sites like Plagiarism.org and Integrityguard.org provide services to help educators prevent and detect plagiarism. Instructors may submit learners' work to these sites and have it checked for plagiarism.

The use of a variety of assessments during the learning event is also a way of addressing the academic dishonesty issue. The administration of multiple and varied assessments allows instructors to identify inconsistent work and alert them to the possibility of academic dishonesty (Shuey, 2002). Relying on one measure makes academic dishonesty a much easier option for learners.

Providing learners a clear description of what constitutes academic dishonesty and its penalty also serves as a deterrent because it makes learners aware of what is acceptable and unacceptable behavior in the online environment. Finally, academic dishonesty will be an issue as long as there are dishonest people in the world. Instructors in online learning environments can take steps to prevent it, but ultimately the integrity of the learners determines whether prevention is possible.

Online Assessment Strategies and Techniques

Reeves (2000) identifies three questions that educators must answer when developing assessments: (1) What is the purpose? (2) What is the scope? and (3) What is being assessed? A successful strategy that answers these questions includes a combination of diagnostic, formative, and summative assessments that range from traditional to alternative to performance, depending on the domain of the expected learning outcomes.

This section presents a discussion of eleven different assessment techniques that may be used to assess learning in the online environment: selected response assessments, constructed response assessments, virtual discussions, concept mapping, e-portfolio assessment, writing, field experiences, individual and group projects, informal student feedback, peer assessment, and self-assessment. Although many educators today have access to systems like Blackboard and WebCT that have built-in assessment tools and templates, this section includes (where appropriate) a discussion of basic HTML tools that educators who do not have access to course management systems can use to develop their own online assessments.

Selected Response Assessments. Selected response assessments include multiple-choice, true-false, and matching questions (Shuey, 2002). Assessments of this type typically measure lower-end cognitive skills, factual recall, and recognition; thus they are characterized as traditional assessment. They are subject to security and academic honesty challenges, which are typically addressed by providing a question bank that randomly selects questions for each learner each time a test is taken.

Selected response assessments are easy to respond to and easy to grade, and are the easiest to have graded electronically. They are also the easiest to construct online. Most course management systems provide tools to create tests with these items in a fairly straightforward manner. These tools allow for automatic grading of the items, as well as immediate feedback to the learner after each question is answered or after the complete set of questions is answered. Although selected response questions can be used in summative assessment, they are most effective as formative tools to provide the learner with feedback on his or her knowledge of a particular area. In self-paced, nonfacilitated online learning environments, constructed response items can be used effectively for diagnostic assessment. For example, learn-

ers can be given an online pretest that determines which sections of the full learning content they should study.

Selected response assessments can be constructed easily by using HTML forms (Sanchis, 2001). Many Web sites provide assessment construction tools that automatically generate the HTML code needed for such items, for example, <http://a4esl.org/c/qw.html>, <http://www.connectseward.org/shs/quizctr/>. Other sites allow instructors to create tests and maintain them on the provider's server, for example, Discovery School Quiz Center at <http://school.discovery.com/quizcenter/quizcenter.html>, Quiz Lab at <http://www.quizlab.com/>, Quiz Star at <http://quiz.4teachers.org/index.php3>.

Constructed Response Assessments. Constructed response assessments include fill-in-the blank, short-answer, show-your-work, and visual-depiction activities (Shuey, 2002). In these kinds of questions, students are required to create answers to questions or visual prompts. These assessments are typically lower-end cognitive, though by adding essay questions that require more detailed responses, they can address higher-order cognitive skills. The quiz generation tools that allow instructors to create selected response items also allow the creation of constructed response items. Although automatic feedback can be provided for most constructed response items, essay questions typically require an instructor to provide individual feedback to each student.

Virtual Discussions. A key feature of the online environment is the ability to conduct virtual discussions. These discussions may be synchronous (real-time) or asynchronous (delayed). Synchronous discussions occur via tools like Internet chat and instant messaging, whereas asynchronous discussions occur over Web-based bulletin boards and discussion lists. Although synchronous discussion provides social interaction that mimics the face-to-face interaction in the traditional classroom, asynchronous discussion supports high-level learning because it allows learners to formulate their ideas through thoughtful interactions with the ideas and responses from their peers. The advantage that asynchronous discussion has over synchronous discussion is the opportunity for learners to engage in thoughtful reflection before contributing to the discussion (Harasim, 1989; Rovai, 2000; Shuey, 2002). Further, classroom discussions are characterized by their pace, that is, learners have to jump in early, else the discussion may leave them behind. Not so in the online classroom. Using an asynchronous discussion list, learners can read responses from their peers during the morning hours, prepare a thoughtful response during the day, and post it that evening.

The use of rubrics can direct students toward effective participation in online discussions and make assessing that participation much easier. Rubrics establish the written criteria for assessing student performance. In general, a rubric for asynchronous discussion should include expectations for frequency of access, level of participation (for example, reads messages

of others, posts message) and comprehensiveness of responses (for example, posts new ideas, synthesizes and analyzes peers' ideas, integrates with course content, stimulates discussion) (Bauer, 2002; Robles and Braathen, 2002; Rovai, 2000). Rubrics for synchronous discussions should include expected arrival time and level of participation (for example, responds voluntarily, responds when prompted, generates new ideas) (Bauer, 2002).

Concept Mapping. Concept mapping allows students "to diagram their structural comprehension of ideas and delineate the relationship among the components" (Frederick, 2002, p. 19). Conducted periodically during a period of study, concept maps can show how student comprehension changes over time (Frederick, 2002). Concept maps provide instructors with feedback on learner understanding and identify places where instructional emphasis should be placed. As such, concept maps are good formative assessment tools. Although programs like Inspiration are especially good for creating concept maps, word processing programs like Word and presentation programs like PowerPoint are just as effective.

Portfolio Assessment. A portfolio is a collection of work done by a learner over time; an e-portfolio is an electronic version of the portfolio. A portfolio serves as evidence of learner achievement in the areas covered by the portfolio. According to Frederick (2002), "Reviewing the portfolio reveals not only the solution at which the student arrives, but also the process of that journey. This takes away the focus from merely obtaining the 'right answer' and emphasizes the importance of using complex cognitive process to construct a valid solution" (pp. 19–20). Although portfolios tend to be summative, they can be done formatively, with a learner turning it in multiple times and getting feedback for improvement before submitting it for the final grade. Portfolio rubrics should address content, clarity, and style (Canada, 2002).

Writing. Writing formal papers can also be used as an assessment tool in the online environment (Frederick, 2002). These papers can be submitted via e-mail or via digital drop boxes, which are provided with most course management systems. Choosing a format like RTF (rich text format) ensures that files will be readable across most word processing programs. Substantive feedback, using word processing tools such as Track Changes and Insert Comment, can be easily provided directly into the text of the submitted document.

Field Experiences. Assessment in online environments need not be restricted to activity conducted online. Learners can and, in many cases, should engage in authentic activity in traditional face-to-face settings. These activities include internships, laboratory assignments, clinical assignments, and apprenticeships. Assessment includes performance reports from directors of field experience and evidence of student learning through portfolios, journals, and videotapes. Rubrics for field experiences should include a detailed project description, dates of the field experience, and learning expectations (Nicolay, 2002).

Problem-Solving Simulations. In lieu of field and lab experiences, sim-

ulations attempt to present the learner with authentic learning situations by integrating real-world elements into the online learning environment (Fredrick, 2002). The goal of these simulations is higher-order cognitive skill and psychomotor skill development. Effective simulations guide students through the process of learning and practicing new skills and then provide opportunities for them to apply their knowledge to a variety of simulated real-life situations. When students can apply what they have learned to these situations, they provide evidence that meaningful learning has taken place.

Individual and Group Projects. Individual and group projects can provide as high-level learning for online learners as they do for classroom learners. In the online environment, group members communicate via the technology. As with classroom projects, online projects require an assessment of the project and of the group participation when the project is done by a group. Group participation rubrics should include participation in group asynchronous discussion, participation in group synchronous discussion, group project grade, participation in drafting process, and participation in a peer preview of a draft (Gray, 2002). Projects can be prepared for presentation on the Web via videotape that is mailed to the course instructor or by using photographs. If the nature of the project permits, it can be mailed to the course instructor.

Individual and group projects tend most often to be used as summative evaluation. The components of the rubric for individual and group projects include project description, project due dates and milestones, and learning expectations (Nicolay, 2002).

Informal Student Feedback. The online environment provides rich and easy methods of obtaining informal feedback on individual student progress. In class-paced, instructor-facilitated learning environments, instructors can use the one-sentence summary or minute paper in which students provide a summary of the main points of the lesson or unit as formative assessment (“Better Assessment . . .,” 2002). Each of these strategies provides a way for instructors to get brief feedback from every learner. The instructor can use this information to provide structure for future learning. For example, if these assessments show that students do not grasp a topic, instructors may direct learners to additional study materials for that topic.

Peer Feedback. Peer feedback is also an effective assessment technique to use in the online environment (Levin, Levin, and Waddoups, 1999). For example, learners can share drafts of writing projects and obtain feedback from each other. When learners are provided with rubrics to structure their feedback, it becomes an opportunity for higher-level learning. In addition, with rubrics learners can also grade each other’s projects.

Self-Assessment. Opportunities for self-assessment can be valuable to learners. Levin, Levin, and Waddoups (1999) use a form of self-assessment in which they, as instructors, post previous classes’ assignments on the Web and allow students to compare their work to the exemplary work of others.

Conclusion

Assessment in the online environment has challenges and benefits. The key challenge is the issue of academic honesty; the key benefit is the ability to provide immediate feedback to students. Fortunately, the availability of online technology tools allows for the development and use of a variety of assessments. These assessments may be for diagnostic, formative, or summative purposes. Using traditional, alternative, and performance assessment, instructors may assess learning in the cognitive, affective, and psychomotor domains. When assessing higher-order cognitive learning, it is important that learners be provided rubrics to detail expected performance. Assessment techniques useful in assessing learning in an online environment include selected response assessments, constructed response assessments, virtual discussions, concept mapping, portfolio assessment, writing, field experiences, individual and group projects, informal student feedback, peer assessment, and self-assessment.

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