

Unsupervised Online Constructed-Response Tests: Maximising Student Learning and Results Integrity

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This paper reports a case study in which the Blackboard essay test tool was used to evaluate e-student learning. To promote student learning as well as maintain the integrity of test results, constructed-response items were randomly selected from a large pool of study questions and the time available to complete the tests was limited. The e-lecturer maintained a reflective journal and the e-students were invited, via email, to provide feedback on their perception of the value of the testing approach used in their e-class. Overall, students evaluated the use of the online tests positively, although issues of technology difficulties presented challenges for some students. The e-lecturer was particularly positive about the benefits of such an approach to online assessment citing ease of test management including student test submission, provision of feedback and grading. Unsupervised online constructed-response tests have the potential to enhance student learning while providing valid test scores.

Keywords: Online testing; online examinations; internet tests; unsupervised tests; e-assessment

Assessment in Undergraduate Education

In educational contexts, *assessment* refers to any processes that appraise a student's knowledge, understanding, abilities or skills (Marriott, 2009). Commonly, assessment is dichotomized as formative (i.e., informs the processes of teaching and learning) or summative (i.e., provides a summary of extent or degree of student learning; Bennett, 2011). In undergraduate university education, summative assessment includes, most typically, student performance on examinations (Barhi, 2011). Traditionally and currently, university examinations are tightly controlled to ensure that students' final grades accurately reflect their level of knowledge and skills. Such control is characteristically associated with proctoring or supervision during student completion of examinations.

Summative assessment may include test items in which students select a response from alternatives provided (e.g., multiple-choice, true-false and matching terms with definitions) and/or constructed-response test items which require written responses (e.g., fill-in-the-blank, short-answer and essay questions; Kuechler & Simkin, 2010). Both selected-response and constructed-response test items have advantages and disadvantages. Selected-response test items are easily marked but may not fully assess complex skills such as analysis, synthesis, evaluation and application of knowledge (Yonker 2011). In contrast, marking constructed-response tests is time consuming and scores may vary across markers. However, well-crafted test items and detailed scoring criteria improve the validity and reliability of constructed-response test scores (Livingston, 2009).

E-learning is a fundamental aspect of university education (Allen & Seaman, 2011) and essential to many forms of professional training (Nerguizian, Mhiri, & Saad, 2011). Learning online requires summative assessment which may include tests and examinations (Marriott, 2009). One challenge in e-assessment is the maintenance of academic integrity. The possibility of cheating is the most common reason that professionals hesitate to implement online testing (Chapman & Webster, 2003; Tippins, 2009). However, several studies have concluded that cheating on unsupervised online tests may not be as pervasive as assumed (Arthur, Glaze, Villado, & Taylor, 2009; Nye, Do, Drasgow, & Fine, 2008). Having controlled for student grade point average, Hollister and Berenson (2009) found no significant differences in average performance when online examinations were administered in a proctored environment (i.e., in class) versus an unproctored environment (i.e., offsite). In defense of e-tests, Drasgow, Nye, Jing and Tay (2009) argued that cheating also occurs during supervised examinations and that multiple forms of tests are particularly useful in minimizing student dishonesty in both online and traditional learning environments.

E-assessment research is increasingly common due to the changing nature of higher education and expectations for e-assessment practice (Nicol 2007). According to Oblinger (2006), contemporary university students reflect a broad background of technology use both at home and school. Students expect interaction, a visual experience and rapid feedback from their learning activities. Wilkinson and Rai (2009) noted that many universities use computers for online formative assessment, but “application of computers to the summative assessment arena are much more limited” (p. 368). When summative e-testing is used, it is typically restricted to selected-response items, perhaps due to the benefits of automatic marking (Lin & Dwyer, 2006). Whitelock (2009) argued for fairness in online tests and the need for systematic investigation of e-assessment and student e-learning. For example, in comparing the effects of a variety of e-test formats, Johnson (2006) reported that “short answer and true-false online quiz items were differentially associated with measures of academic achievement, suggesting that cognitive processing differed across item format” (p. 105). Marriott (2009) concluded that “e-assessment offers opportunities for creating innovative assessment practices that help engage students and increase their motivation for learning” (p. 237).

Applied Research Focus

Blackboard testing options may be applied to maintain student academic integrity while promoting student learning outcomes. The Blackboard test tool allows for random selection of test questions from a large pool of potential items. As well, enforcing time limits, easily implemented in Blackboard, may encourage students to develop effective learning strategies. This paper reports a case study in which the Blackboard essay test tool was the only sources of summative assessment in a fully-online course.

An E-Learning Case Study

Via Blackboard, all students enrolled (n=23) in a fully-online first year educational psychology course were required to complete three unsupervised constructed-response tests using the Blackboard LMS. The course was organized into weekly learning modules. Each module included an *Elluminate Live* session, required readings, online discussion and learning activities. Each module contained several study questions which helped students focused their learning efforts. Students were informed that all tests items would be taken directly from the study questions. Figure 1 provides a screenshot of the study question organized in learning modules in Blackboard.

The screenshot displays the Blackboard Learning Modules interface. At the top, there is a navigation bar with buttons for 'Build Content', 'Create Assessment', and 'Add Interactive Tool'. Below this, the 'Learning Modules' section is visible, containing three weekly modules:

- Week 1: Educational Psychology for Teaching**
 1. Differentiate between expert and novice teachers with regard to the approaches they use to teach knowledge of subject content. Use an example of teaching differently.
 2. Explain how principles and theories are derived. Discuss how knowledge of a theory (e.g. classroom management) can be helpful to a classroom.
 3. Discuss the purposes and procedures of the discipline of educational psychology today. What are the interests of educational psychology with regard to teaching?
 4. Discuss the problems or issues that most concern beginning teachers today. Which of those concerns would be the most important to you personally?
 5. Differentiate between descriptive and experimental research orientations with regard to purpose, methods and the interpretation of results.
- Week 2: A Review of Child and Adolescent Development**
 1. Describe Piaget's theoretical views on cognitive development using and defining the following terms in your answer: organisation, adaptation, assimilation, accommodation.
 2. Name and define the basic aspects of reasoning that must be mastered before a child is able to solve problems of conservation.
 3. Define Vygotsky's zone of proximal development and explain how it relates to the problem of matching cognitive stages with instructional strategies.
 4. Describe the steps or stages that children go through in the process of developing language. Include reference to the different ways that children learn language.
 5. Physical activity is increasingly becoming a focus of school curricula. Explain why this is the case, including issues about body satisfaction and self-esteem.
 6. Define the term "self-concept." How do school experiences affect the formation of self-concept? How is physical development related to school achievement?
 7. Define the skills involved in emotional competence and identity.
 8. Outline Kohlberg's three levels of moral development and describe an example of reasoning at each level.
 9. Describe recent trends in Australian family structures today and discuss the implications for children's personal development.
- Week 3: Learner Differences and Special Needs**
 1. The use of labels to describe exceptional children has both positive and negative consequences. Discuss those consequences in terms of their impact on the child and the classroom.
 2. Differentiate between and identify behaviours characteristic of each of the following cognitive styles: field-dependent, field-independent, impulsive, reflective.
 3. Using the models of intelligence given by the text as a guide, define what is meant by intelligence. What are some factors that affect the reliability of intelligence tests?

Figure 1: Weekly Study Questions Organized in Blackboard Learning Modules

Students completed the three unsupervised constructed-response tests via the Blackboard test tool. Test items were randomly drawn for a subset of study questions corresponding with the learning content covered during specified instructional weeks. The amount of time that students had to complete the online tests was reduced across the three assessments. Such reduction allowed for determination of student response to time limits in e-testing. Students were not required but simply informed that preparing written responses to all study questions would facilitate their timely completion of each online test. That is, regardless of the specific items randomly generated by the Blackboard test tool or the number of days students had to complete the test, students would be able to simply copy and paste their completed responses into the response space provided in Blackboard. Research findings suggest the student learning is maximized by careful and thorough written response to study questions (Papadopoulos, Demetriadis, Stamelos, & Tsoukalas, 2010). Figure 2 provides a screen shot of the Blackboard essay test interface.

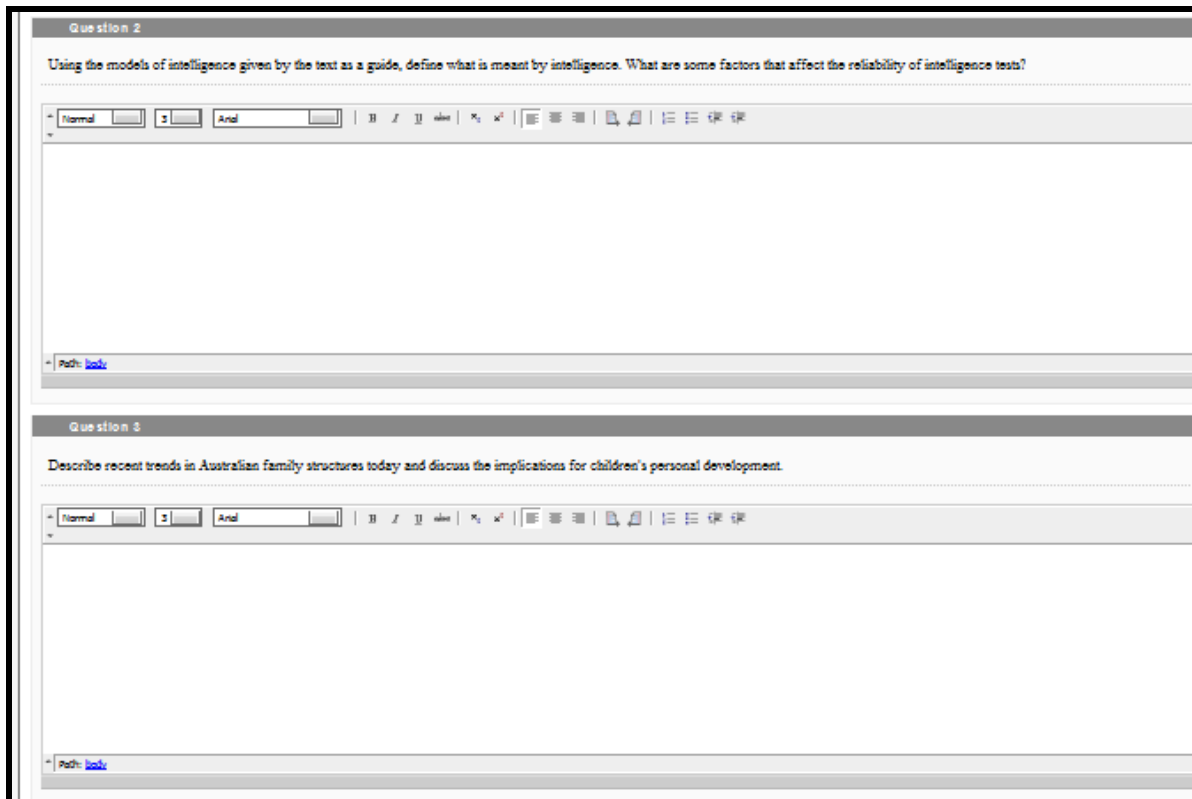


Figure 2: Blackboard Essay Test Interface

The following information summarized instructions to students with respect to each of the three required constructed-response e-tests and appeared on the course outline and in Blackboard:

Each Learning Module (i.e., weekly Elluminate Session, Blackboard learning events and corresponding textbook chapter/s) includes study questions that are posted in Blackboard in LEARNING MODULES. On the dates specified below, a subset of study questions will be available via the Blackboard link STUDY QUESTIONS ASSESSMENTS. You will have the opportunity to answer these selected questions for a limited amount of time. There is a practice set of study questions so that you can ensure that you feel comfortable with the submission processes and that your technology is functioning. Scoring criteria is available in Blackboard and will be discussed in detail during the Elluminate sessions.

Study Questions # 1 (value = 30%) assess your understanding of material presented during the first four weeks of class (Learning Modules 1 through 4 which includes textbook chapters 1 through 5). The STUDY QUESTIONS ASSESSMENT will be available from August 9th until August 15th. Students have exactly seven days to complete and submit their responses to the randomly generated five questions drawn from all the study questions associated with the specified learning modules.

Study Questions # 2 (value = 30%) assess your understanding of material presented during the fifth, sixth and seventh weeks of class (Learning Modules 5 through 7 which includes textbook chapters 6 through 9). The STUDY QUESTIONS ASSESSMENT will be available from September 2nd until September 5th. Students have exactly four days to complete and submit their responses to the randomly generated five questions drawn from all the study questions associated with the specified learning modules.

Study Questions # 3 (value = 40%) assess your understanding of all material presented during all weeks of class (Learning Modules 1 through 12 which includes textbook chapters 1 through 14). The STUDY QUESTIONS ASSESSMENT will be available from October 9th until October 10th. Students have exactly two days to complete and submit their responses to the randomly generated eight questions drawn from all the study questions associated with the specified learning modules.

Students submitted their written test responses via the Blackboard test tool which were then marked by the e-lecturer. Marking criteria, posted in Blackboard and discussed in detail during the weekly *Illuminate Live* sessions, evaluated each constructed response in terms of 1) concise statements (every word necessary), language usage (spelling, grammar, sentence structure), paraphrase (avoid copying from the textbook), terminology usage (appropriate vocabulary), analysis (explore the topic in depth) and proper referencing (adherence to APA format). Figure 3 provides a screenshot of the Blackboard essay test feedback interface. Marks automatically populated *Blackboard My Grades*.

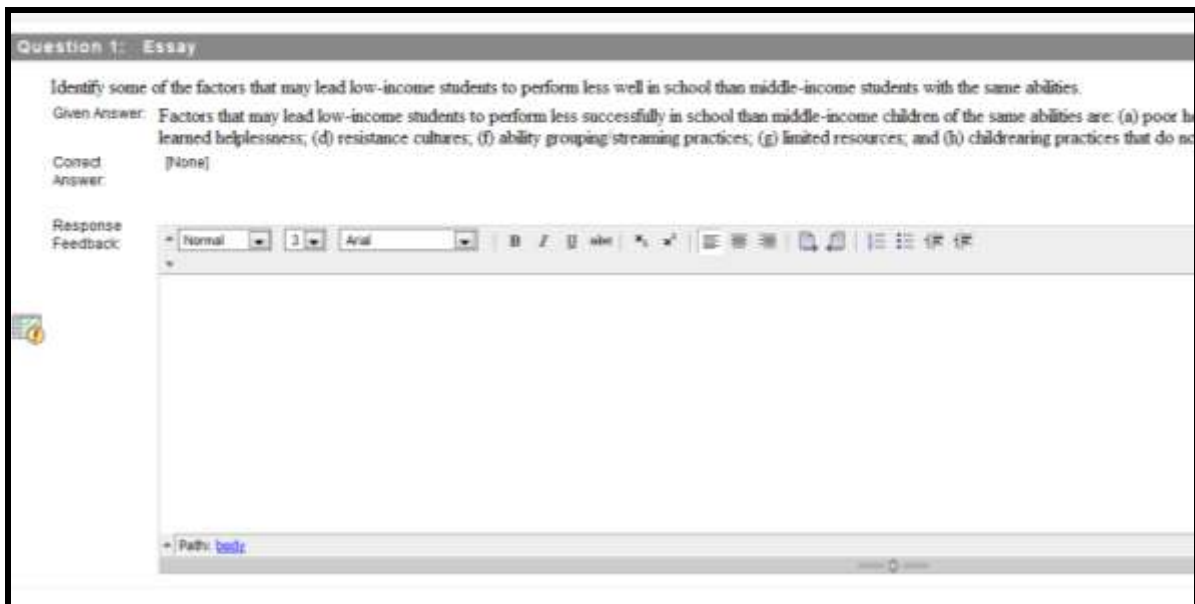


Figure 3: Blackboard Essay Test Marking Interface

E-Learning Case Study Evaluation

Throughout the academic semester, the e-lecturer engaged in professional reflective journaling with respect to experiences with students, the technology and marking the constructed-response test items in Blackboard. During the 15 week semester and until all final marks were submitted, the e-lecturer made ten journal entries. Entries varied from several words (e.g., marking is the worst part of teaching) to several sentences which made reference to email conversations with students and student comments and queries during weekly *Illuminate Live* sessions. Professional reflective journal entries were organized and analysed in terms of themes. Some journal entries included multiple statements and sentiments and, thus, multiple themes.

Following marking of all online tests and the posting of the final grades in *Blackboard*, all students who remained enrolled in the educational psychology e-class (n = 21) were invited, via email, to provide feedback on their experiences with the essay online tests. As required by research ethics, students were reminded that their response to the questions was entirely voluntary and that, if they chose to respond, the confidentiality of their identity was guaranteed. Students gave permission for their responses to be directly quoted for research

purposes and without connection to any identifying information. All students who responded to the email survey indicated that their message could be used for research. The questions in the email included:

1. How did you feel about the Blackboard essay test format?
2. Did you encounter any technical problems with the Blackboard essay test tool?
3. Where there any advantages to you using the Blackboard essay test tool to complete your assessments?
4. For the first assessment, the test tool was available for one week. For the second assessment, the test tool was available for four days. For the final assessment, the test tool was available for two days. How did this affect your approach to the assessments? Where there differences in how your approached each assessment because of the allocated time differences?
5. Can you suggest any improvements in using the Blackboard essay test tool in the future?

E-Student and E-Lecturer Feedback on the Online Essay Tests

Approximately half of the students invited to provide feedback on their experiences with the essay online tests responded to the email, although some students did not answer all five questions and some students simply wrote general comments all of which reflected satisfaction with the online tests and the course in general. Several students did provided detailed and considered written response to the email survey questions. Representational student comments are presented in Table 1. As can be seen, students varied in their perceptions and interpretations of the value of the Blackboard essay test tool. Approximately half of students who responded to email survey item #2 claimed that they experienced technical difficulties while approximately half reported that the technology worked well. Although home-based internet access is virtually universal among Australian first-year university students (Johnson & Broadley, 2011), the quality of connectivity and hardware and student comfort and ease of computer use may vary. Additionally, there was a high level of student satisfaction with the course and the e-lecturer and, perhaps, positive evaluation may have generalized to the use of the Blackboard essay test tool. Approximately 40% of the students who responded to email survey item #4 stated that they had answered all the study questions. Two students expressed the perception that the Blackboard essay test tool was more useful for the teacher than for the students. Such students expressed preference for simply submitting a text document via email, although such an approach would not have allowed for random generation of constructed-response items from specified study questions.

The e-lecturer reflective journal entries were extremely positive with respect to the students, the technology and marking the constructed-response test items in Blackboard. The e-lecturer was particularly positive about the benefits of online assessment citing ease of test management including test submission, provision of feedback and grading. Table 2 provides summative analysis of e-lecturer journal entries organized into themes. Four themes were evident from the ten professional reflective journal entries including issues related to: 1) managing students, materials and learning events online; 2) marking the constructed-response online tests; 3) professional satisfaction with specific aspects of teaching online and 4) frustration which focused primarily of marking and email from students which suggested lack of effort (e.g., failing to reading information available in Blackboard).

Integrity of student tests results was not an issue. E-student responses to the email survey and the e-lecturer reflective journal entries did not provide evidence that constructed- responses were copied or were not the work of the student who logged on to Blackboard and submitted the completed test. This may be the consequence of the testing protocol used. That is, while students did not know the specific items that would appear on each of the three online essay tests, they knew that the items would be drawn from the learning module study questions posted in Blackboard. Additionally, participating students did not need to cheat since, with sufficient preparation, they could simply copy and paste constructed-responses from previously answered study questions. Alternatively, although time was restricted, the number of items in each online test was sufficient to generate constructed-responses because students had access to their learning materials. The approach to e-learning and e-assessment reflected in the case study investigation did not require students to memorize course content. Requiring students to memorize large amount of information may spawn academic dishonesty.

Table 1: Representational Student Feedback on the Online Essay Tests

Question	Representational Student Response to Question
How did you feel about the Blackboard Essay test format?	<p>It was a little cumbersome as it was not as easy to use as Microsoft Word, so cut and paste was required to transfer answers from Word to Blackboard. Proof reading and editing was much simpler using Word and at times while researching information for the answers, I would start editing in Blackboard, then realise I should have done it in Word, or make some changes in Word and some in Blackboard, becoming totally confused.</p> <p>My results showed that I did very well responding to the questions, however I found the number of questions asked was very small, in comparison to the 81 or so questions that required preparation. (Only approx 21% of content was actually tested - is this normal?) I did enjoy using this format, and the limited word count for the questions really allowed me to study and condense my knowledge, by getting to the point, rather than writing a lot of superfluous information.</p>
Did you encounter any technical problems with the Blackboard Essay test tool?	<p>No, the technology worked well and no problems were experienced.</p> <p>I had MANY instances of technical difficulties loading the questions...I found this nerve wrecking...Also, the fact I did not know how long I had to load the questions - before the system timed out, caused anxiousness.</p>
Where there any advantages to you using the Blackboard Essay test tool to complete your assessments?	<p>I can't think of any advantages from a student's perspective, however from a lecturer's perspective the timed aspect may have been useful. This, however could also be achieved through issuing questions with a specific time limit for submission.</p> <p>Using the blackboard essay test tool allowed me to plan my study, work, family and personal commitments around the scheduled testing periods. There was ample time available to load the questions.</p>
For the first assessment, the test tool was available for one week. For the second assessment ... How did this affect your approach to the assessments? Where there differences in how your approached each assessment because of the allocated time ...?	<p>This did not affect my approach to the assessments, as once started, the assessment had to be completed. Thus the amount of time available was irrelevant, apart from coordinating a specific time within the timeframe to complete the assessment. If we were able to access the questions for the whole period of time the assessment was available, I may have approached the assessment differently each time. For example, I would have been tempted to wait until the assessment was available before completing the questions for the longer timeframes, rather than completing the questions on a weekly basis</p> <p>The three different timetable schedules worked for me. If I was doing this unit on-campus, exams would be on a certain date at a certain time, therefore this unit's format had ample flexibility. I had all my questions pre-prepared on a word document so it only required a few minutes to load the questions – except for the ‘saving’ technical difficulties I experienced. Ultimately, it’s all about organisation and preparation – and this unit supported this opportunity by providing a workable schedule in the beginning of the unit.</p>
Can you suggest any improvements in using the Blackboard Essay test tool in the future?	<p>I am unsure of Blackboard's suitability for essay writing. It is much more cumbersome than using Word. The window for writing is quite small and copying and pasting from Word leaves a margin for error, for example, in one question I accidentally left out references. I have found Blackboard very good for quizzes, but submission of essays using Microsoft Word only is a much simpler process.</p> <p>All aspects of this unit were exemplary and I thoroughly enjoyed the format. I especially felt supported by the materials used, and thought the textbook was great and easy to understand. I particularly enjoyed Elluminate, and felt all these learning tools provided me with the best opportunity to provide ‘deep’ answers to the questions asked in the Blackboard essay testing tool.</p>

Table 2: Thematic Analysis of E-Lecturer Reflective Journal Entries

Theme	Representational E-Lecturer Reflective Journal Entry
Management	I remember the old days of submissions apparently disappearing into cyberspace. This is better. Even though BB is a bit of a dinosaur, it is nice to have all aspects of the course organized and assessable in one central location.
Marking	I just love the essay interface. I made some cut-&- pastes so was able to reuse some comments. Gosh it is nice to save a branch or two. Paper is the devil.
Satisfaction	I like teaching online. The students seem more appreciative and motivated, not like my f2f classes, grrr
Frustration	Not sure what's up but several students claim their PC hiccupped and they could not get back into the test. I give them a choice, I can reset and they start again, I can email a random set of questions which they can return. Not good. What if I had a huge class??

Implications for E-Assessment and Future Research

Assessment is an essential component of learning processes. It is, therefore, not surprising that virtually all learning management systems offer assessment tools, particularly for the creation, execution and evaluation of selected-response or multiple-choice tests (Amelung, Krieger, & Rosner, 2011). Yate and Beaudrie (2009) concluded “that evaluating students through the exclusive use of online assessment is a reasonable approach that results in grades that do not differ from measuring student progress with exams that are given under proctored conditions” (p. 69). Results of the current case study investigation, although limited in scope and application, provide support for the viability and utility of exclusive use of unsupervised online constructed-response tests in fully-online learning environments. Most e-students and the e-lecturer strongly supported use of the Blackboard essay test tool as the only mechanism of assessment. No e-student objected to online constructed-response tests, although not all saw advantages over simply emailing documents to the e-lecturer. From the e-lecturer’s perspective, however, large numbers of students negate the possibility of such a submission strategy. As well, email does not necessarily provide evidence of student submission or the basic timing functionality of online test programs.

One of the potential advantages of e-assessment is automation of marking (Lin & Dwyer, 2006). This is particularly true with selected-response items (Amelung et al., 2011; Johnson, 2006), although exclusive use of selected-response may not maximize student mastery of required learning and skills such as written composition. Increasingly, programs are emerging that automatically mark constructed-response test items. For example, Jordon and Mitchell (2009) implemented a natural language system to mark short-answer test items. Students were automatically given tailored and detailed feedback on incorrect and incomplete responses. Reportedly, “a small number of the questions are now in low-stakes summative use, alongside other e-assessment tasks and tutor-marked assignments, to give students instantaneous feedback on constructed response items, to help them to monitor their progress and to encourage dialogue with their tutor” (p. 371). As natural language software continues to improve, applications to marking constructed-response e-assessment will correspondingly continue to improve. Students’ interpretation and perception of machined-marked written composition requires further investigation.

Some, but not all, students in the current case study investigation prepared responses to all study questions associated with each weekly learning module in Blackboard. Reported benefits associated with written responses to questions include increased levels of student reading comprehension, retention of information, use of cognitive strategies, motivation, satisfaction, communication, interaction and problem-solving (Abramovich & Cho, 2006; Barlow & Cates, 2006; Yu & Liu, 2009). Menary (2007) concluded that “creating and manipulating written sentences are not merely outputs from neural processes but, just as crucially, they shape the cycle of processing that constitutes a mental act” (p. 622). The actual process of writing can be used effectively as a tool for supporting students in developing critical thinking and increasing their analysis, inference and evaluation skills (Quitadamo & Kurtz 2007). Strategies directed at ensuring that all students construct responses to all study questions might be developed, implemented and evaluated. Although systematic investigation is required, one possibility is extreme restriction of online essay test availability.

E-assessment has stimulated change in assessment practices in higher education and is likely to play an increasingly important role in the future (Whitelock & Watt 2008). Stöðberga (2011) conducted a

comprehensive review of current e-assessment research and concluded “that the body of knowledge in the field is extensive enough to provide a sound basis for general guidelines” (p. 12). In considering the relationship between human cognition and the evolution of tools, the need for rote memorization may be decreasing as digital technology allows for easy storage of large amounts of information and mechanisms to quickly retrieve that information as needed to solve immediate and specific problems (Johnson, 2008). Movement away from rote memorization in university education will likely increase student academic integrity. Manipulating time-constraints, easily achieved with learning management systems, may encourage student learning (e.g., answering all study questions in advance) thereby reducing incidences of dishonesty during testing. Whitelock (2010) argued for a new focus on e-assessment driven by pedagogy rather than technology.

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