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Daniel C. Johnson

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Thinking Critically about Assessing Online Learning

Daniel C. Johnson, University of North Carolina Wilmington, NC, UNITED STATES

Abstract: Despite the proliferation of technology designed to increase efficiency and connectivity, students' understanding and comprehension of course content often lags behind the latest advances in e-learning. Critical thinking in the form of higher-order processes provides one way to improve the grasp students have on course content and related knowledge. In this session, the gap between assessment and learning is explored from a theoretical perspective in terms of Bloom's "Cognitive Taxonomy" and other paradigms. Because "the test" frequently drives the curriculum, assessment of online learning is the focus of critical thinking in this session. Discussion topics include: reasons for assessment, formative vs. summative assessments, testing vs. measuring vs. assessing, and the practicality of assessments in online learning. With a focus on learning outcomes, this session explores curricular connections by thinking critically about content knowledge and assessment strategies. By shifting the focus from technology to thinking, the advantages of making meaningful connections are investigated in terms of innovative assessments. The theoretical basis for this session will include constructivism and reflective thinking as applied to an online learning environment. Participants are encouraged to apply critical thinking assessments to their own content areas.

Keywords: Critical Thinking, Assessment, Online Learning

Introduction

STUDENTS' UNDERSTANDING OF course content frequently lags behind their technical abilities (Myers, 1986). In other words, state-of-the-art classrooms are sometimes "smarter" than the students themselves. While not meaning to criticize students' knowledge or thinking skills unfairly, this observation highlights the need for a more thoughtful approach to assessing students' learning. Unfortunately, measuring and improving student learning is not as facile a task as improving educational technology. As a possible solution to this perceived problem, educators are encouraged to apply critical thinking when addressing assessment, especially in online settings.

A discussion of assessment in educational contexts begins this paper. A general framework of "assessment" and related terms will prove useful for the following section on online learning. In this second section, some particular characteristics of online learning are discussed. In the third section of this paper, an examination of critical thinking is presented from several different theoretical perspectives. To address the gap between learning and assessment in online settings, some applications of critical thinking to assessment strategies in online learning environments are suggested in the fourth section. Implications for educators and directions for future study conclude this paper.

Assessment

As Asmus (1999) commented, assessment is synonymous with grading for many teachers. In reality, a more comprehensive view of assessment is needed to understand student achievement and direction for future study. For the purposes of this article, assessment is defined as: "the collection, analysis, interpretation, and application of information about student performance . . . in order to make educational decisions" (Asmus, 1999, p. 21). As Radocy and Boyle (1987) explained, evaluations are more comprehensive than either tests or measurements. While tests are systematic tools for collecting data and measurements are quantified test data, evaluations usually use test data. In other words, the term evaluation "involves making some judgment or decision regarding the worth, quality, or value of experiences, procedures, activities, or individual or group performances as they relate to some educational endeavor" (p. 7). Therefore, the reasons for assessment include determining student achievement, modifying instruction, and improving curricula.

As Cross (1998) asserted, "If you want to change student learning then change the methods of assessment" (p. 120). Because assessment is a powerful tool used to direct student learning (Sigala, 2005), it holds a position of particular importance in education. Two basic forms of assessment are formative and summative. A cumulative exam, usually having a major role in determining the course grade, is a typical summative assessment. During the course of

the exam, the student is expected to demonstrate the sum of his/her course knowledge. In contrast to this high-stakes assessment, more informative, low-stakes tests are termed formative assessments. These provide students with interim reports on their progress and knowledge accuracy. One distinct advantage of formative assessments is their utility in providing students with the knowledge when they can use it, in the remainder of the course (Bruner, 1970). Formative assessments often take the form of quizzes and are more numerous than summative assessments.

With the influence of educational psychologists, more responsive forms of assessment have been created in the past decade, e.g. authentic assessment, alternative assessments, and portfolio assessments. These represent an emphasis on students' age, aptitudes, abilities, and background (Wall, 1979). As Wall noted, a change in assessment models led to changes in curricula which in turn led to the development of educational taxonomies such as Bloom's cognitive taxonomy (1956), later updated by Anderson and Krathwohl (2001), as well as Harrow's taxonomy of the psychomotor domain (1972), and the affective domain taxonomy by Krathwohl, Bloom, and Masia (1964). A discussion of the earlier and updated cognitive taxonomies follows later in this paper.

Online Learning

Online learning enjoys its share of advantages as well as challenges. While technological problems and perceived disconnection sometimes impede learning online, proponents such as Draves (2002) cite reasons for advantages in cognitive learning online; among those are: flexibility to learn during peak times, self-paced instruction, selected focus by content area, self-assessments, and heightened interaction with the instructor. Although critics may argue with Draves's assertions, the effect of online education in the twenty-first century is evident; as Celente wrote "interactive on-line learning will revolutionize education . . . Not only will it affect where we learn, it also will influence how we learn and what we learn" (1997, p. 249). This section focuses on these aspects of online learning in terms of constructivism.

The evolution of education has included an ever-increasing attention to and expansion of technological resources. As described by Bates (1995), those advances in educational technology take the form of one and two-way communication. One-way technologies include print, audio, radio, television, and computer-based learning, while two-way technologies comprise audio and videoconferences, online chat, and computer based seminars (webinars). As a result, education is less pertinent to a place (i.e. a school house) and more indicative of an activity, independent of time and space (Draves, 2002). The result is more individualized learning with less external discipline. According to Draves, the current and future trends in online education are focused on web-based learning allowing more flexibility and customized instruction. While the students enjoy face-to-face interactions combined with web-based instruction, teachers act more as facilitators than traditional instructors in online education. This format is strikingly reminiscent of constructivism.

Defined as a paradigm that "emphasizes the active role of the learner in building understanding and making sense of information," (Woolfolk, 1995, p. 275) constructivism has emerged as a guiding principle in the current post-modern approach to teaching mathematics, science, language arts, and social studies (Wiggins, 2001). While de-emphasizing the teacher's role as an omniscient figure, constructivism encourages students to develop their own understanding of the course content and thereby "figure things out for themselves" (p. 4). The teacher's role is therefore to create learning environments and to engage students in activities enabling them to learn the course content most effectively. Considering guidelines for the use of synchronous and asynchronous tools in web-based instruction (Ko & Rossen, 2004; Shank, 2007), these and other uses of educational technology closely aligns with the constructivist model of education. Therefore, as discussed in the following section, educators are encouraged to explore critical thinking activities when designing assessment in online learning courses.

Twenty-first century learners are frequently overwhelmed with the sheer quantity of media and information available on-line, in print, and through other sources, often becoming passive consumers. Similarly, according to Meyers (1986), students' abilities to understand and process information have not kept pace with the voluminous resources now available to them. Learners, therefore, would benefit from an approach to instruction and correlated assessment involving inquiry and analysis. Critical thinking offers such an approach.

Critical Thinking

Great thinkers including Plato, Aristotle, and Descartes advocated an approach to education based on reason and inquiry using reflective, "Socratic" questions based on the student's reasoning and thinking abilities. Scholars and educators such as Froebel, Kant, and Dewey developed approaches to education with applications to teaching many of the traditional academic subject areas in the eighteenth and nineteenth centuries. By using reflective questions, scholars developed students' minds through

logical reasoning. The development of inductive and deductive reasoning skills gave rise to the modern definition of critical thinking (Black, 1952).

With roots extending to the early part of the twentieth century, critical thinking is an outgrowth of critical theory, a movement associated with social theorists of the Frankfurt school founded in 1923. Criticisms of the industrial society of the 1920's were framed as social commentaries; Habermas and others extended such criticisms by advocating broader understandings of social problems and new possibilities beyond the status quo. In other words, critical theory challenged "the blind acceptance of the ideology that the world of humans being human can only be described as it is, and not understood in terms of what might be or *ought* to be" [italics in original] (pp. 4-5, Regelski, 1998).

"Critical thinking" is both a major goal in education (D'Angelo, 1971) as well as a universal term in educational theory and practice (Richardson, 1998). The process of critical thinking begins by comprehending information that has been presented, but extends beyond mere comprehension. Critical thinking includes thinking for one's self, using inductive and deductive reasoning skills (Bloom, 1956; Ennis, 1962; Sternberg, 1985) and is "reasonable reflective thinking that is focused on deciding what to believe or do [with newly acquired information]" (Ennis, 1987, p. 10). In the following section, perspectives on critical thinking are presented as a framework for this paper.

In education, critical thinking and its instruction have taken many forms. These include both generalizable and context-specific approaches that embrace self-constructed meaning and discovery (Kim, 1993; Kurfiss, 1988; Meyers, 1986). Using the term "reflective thinking," Dewey (1933) first described the active and persistent consideration of belief or knowledge. His writings served to provide the basis for subsequent authors who defined critical thinking in a variety of ways. Paul (1993) articulated five dimensions of critical thinking (i.e. elements of reasoning, intellectual abilities, modes of reasoning, traits of mind, and intellectual standards), while Seigel (1988) suggested that critical thinking requires understanding the role of reason in actions and beliefs. Brookfield (1987) characterized critical thinking as questioning assumptions underlying habitual ways of thinking while Meyers (1986) suggested critical thinking is the ability to generalize and invent new possibilities. Two broad components of critical thinking emerge from an analysis of the various critical thinking definitions: the abilities necessary to think critically, and the attitudes and habits that characterize intellectual independence (Younker, 2002).

In *Dimensions of Thinking: A Framework of Curriculum and Instruction* (1988), Marzano and colleagues addressed the concern that high school graduates were not sufficiently prepared to use higher-order thinking skills independently. In this text, the authors identified one goal of education as the development of competent thinkers who can learn and make use of knowledge independently. Because independent thinking is a central goal shared by many educators, and critical thinking is an essential ingredient for an education supporting intellectual autonomy and self-determination (Paul, 1985), critical thinking instruction is a potential avenue for developing competent and independent thinkers.

In the *Taxonomy of Educational Objectives* (1956), Bloom proposed six levels of thought. Each level in the hierarchy builds upon the previous level; cognitive skills learned at one level play a part in thinking at the next successive level. The six levels are:

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

At the lowest level in the taxonomy, knowledge, learners merely learn new information by rote or by another direct means. Repetition, remembering, and reciting facts are examples of learning at this level. Learners at the comprehension level are required to understand information they have learned. For example, learners could paraphrase or restate a story in their own words to demonstrate their comprehension of the information. At the application level, learners use the information they understand in some way. Using rules to solve a problem or following a procedure in a new situation are examples of thought at the application level. Learners at the analysis level make critical judgments about what they have learned and applied. Identifying assumptions made in an argument or discovering hidden fallacies are examples of analysis-level thought. At the synthesis level, learners assemble knowledge they have acquired and analyzed. For example, learners could articulate a position for a debate or construct a scientific theory at the synthesis level. Finally, at the highest hierarchical level, evaluation, learners make critical judgments about their analysis and synthesis of new information. Learners at the evaluation level could critique a theory or position in a debate, or comment on the strength or weakness of an argument. In terms of Bloom's taxonomy, "critical thinking is an ability to evaluate, compare, analyze, critique, and synthesize information" (Coon, 1995, p. 27). Higher order thinking, including analysis, synthesis, and evaluation, provides a theoretical basis for critical thought

(Olson, 2000) and can be applied to a variety of classroom activities.

In 2001, Anderson and Krathwohl revised Bloom's taxonomy and published the *Taxonomy of Cognitive Learning.* The authors modified the levels, added a knowledge dimension, and facilitated the process of student assessment using the taxonomy. The revised taxonomy lists these six hierarchical levels of thought:

Remember
Understand
Apply
Analyze
Evaluate
Create

The new dimensions of knowledge comprise four levels in an increasingly more complex order. These dimensions are:

Factual Knowledge
Conceptual Knowledge
Procedural Knowledge
Metacognitive Knowledge

Most relevant to this paper and using critical thinking in assessment strategies is the way Anderson and Krathwohl linked cognitive processes to learning objectives. By doing so, the authors facilitated teachers' application of these concepts in both traditional and online learning settings.

The issue of generalizability is a central theme in the critical thinking literature (Younker, 2002). Ennis (1987) offered a definition of critical thinking generalizable to multiple subject areas. He wrote that critical thinking is "reasonable reflective thinking that is focused on deciding what to believe or do" (p. 10). What may be considered sound reasoning in one field, however, may not be valid in another (McPeck, 1981, 1990). McPeck instead suggested that critical thinking implies specific content knowledge and is the appropriate use of "reflective skepticism" (1981, p. 7). Similarly, Siegel (1997) suggested that there are two types of thinking abilities: subject-neutral and subject-specific; both types include elements of logic and reason applicable to different subjects, as well as judgments and evaluations dependent on specific content knowledge. While subject-neutral principles employ a logical approach to verify the correctness of an answer, subject-specific principles use a psychological approach to investigate the process of determining an answer (McDaniel & Lawrence, 1990).

Although there are differences in the models of critical thought proposed by Bloom (1956), Sternberg (1985), and Ennis (1987), there are many commonalities among their respective taxonomies. Gubbins (1985) summarized the three taxonomies in a "Matrix of Thinking Skills" comprised of six cognitive areas: problem solving, decision-making, inferences (including deductive and inductive thinking skills), divergent thinking, evaluative thinking, and philosophy and reasoning (cited in Sternberg, 1985). The pertinent cognitive skills include making decisions, analyzing open-ended problems, recognizing relationships, generating multiple ideas, generating different ideas, listing attributes, identifying components, synthesizing sequences of information, and comparing and contrasting ideas. In Gubbins's matrix, the similarities among critical thinking descriptors embrace multiple expressions of critical thinking. For example, critical thinking includes analysis, synthesis, problem solving, and evaluation. Ultimately, critical thinking is "thinking that is purposeful, reasonable, and goal-directed" (Halpern, 1989, p. 38).

From constructivist paradigms to educational interventions, critical thinking can be understood as a movement based both on theory and applied techniques. Among the goals of this movement is the responsibility to educate independent thinkers and autonomous learners (Paul, 1993). In a synthesis of research on critical thinking, Norris (1985) highlighted the following ideas:

- Critical thinking is a complex of many considerations
- Critical thinking is an educational ideal
- Teachers should look for the reasoning behind students' conclusions
- Having a critical spirit is as important as thinking critically
- We do not know a great deal about the effects of teaching critical thinking. (p. 44)

In the above points, Norris asserted that critical thinking is an educational ideal, not an option. Instead of marking answers as "right" or "wrong," Norris suggested that teachers probe and seek to understand students' thought processes, in both instruction and assessment.

Suggested Applications

Because assessment can focus student attention on important learning outcomes, educators should carefully design their assessment tools maximize student learning (Sigala, 2005). In online education, teachers frequently utilize lower-level cognitive forms of assessment. These include multiple-choice, true-false, and matching items. While not inherently ineffective, these items do not fully address the complexity of higher order thinking outcomes. They also do not take advantage of the networking possibilities that online education offers students. For example, via chat rooms, discussion boards, and live

chat, students and instructors can collaborate to develop ideas and consider ideas from alternative perspectives. As Sigala wrote,

> e-learning activities enhance learning processes when they provide students with tools to think critically, analyze situations, search for evidence, and seek links between a specific situation and their prior knowledge and experience. Collaboration also aims to crate analytical and critical learning competencies through social (interpersonal) processes by which a small group of students work together to complete a task designed to promote learning (p. 89).

Through the use of both quantitative and qualitative data generated by online e-learning tools, instructors can develop appropriate assessment strategies to address both instructor-given course content and socially mediated knowledge construction. For example, instructors could give chapter quizzes regularly to establish fundamental content knowledge. Following those formative assessments, students could further develop their understanding by searching for complexity and resolving ambiguity in small group discussion topics with a specific problem solving assignment or topic for research.

Gunawardena, Lowe, and Anderson (1997) took a gestalt approach in analyzing online interactions to emphasize the social construction of knowledge. The authors articulated several components of online discussions including: sharing and comparing information; discovering and exploring conflicts; negotiating meaning and collaborative knowledge construction; testing and modifying proposals; and applying originally constructed meanings (cited in Sigala, 2005). From a constructivist perspective, each of these elements could be applied to online assessments in the form of problem solving, collaborative group work, and answering open-ended questions with reflective and critical thought.

In an empirical research study, higher-order cognitive questions and other opportunities for critical thinking were shown to have a significant and positive effect on student learning (Johnson, 2003). This form of instruction encouraged students to engage in analysis, evaluation, and synthesis of course content. Beyond teacher-centered lecturing, critical thinking instruction engaged subjects through student-centered reasoning, imagination, and reflection on the given examples during creative, improvisatory, and leadership activities. Instead of a didactic approach based on acquiring information to be tested for accuracy, critical thinking instruction were based on a constructivist approach to learning, to facilitate student decision-making and application of musical concepts and terms without a concern for finding the "right" answer. In other research, Johnson (2007) has shown the importance of applying critical thinking to assessment strategies in both traditional and online settings. He has also collaborated with Gehringer in using peer reviews as part of online courses. Utilizing software developed by Gehringer (2007), Johnson's students showed promising work as a result of their work with peer reviews. Analysis of those reviews is now ongoing.

Conclusion

In summary, the importance of assessment in education coupled with the relevance of student-centered knowledge construction presents a strong case for critical thinking skills being using in online course assessments. As discussed above, online learning and critical thinking share key commonalities as understood using a constructivist approach. The corresponding assessment tools should therefore reflect a similar approach to reflect educational processes and goals.

Students' abilities to understand and process information have not kept pace with the amount of resources available (Meyers, 1986). As ever-advancing technology is likely to provide even greater amounts of information in the coming years, our educational focus needs to shift from content to cognition. Particularly in online education, this trend is even more apparent. To reflect technological changes, teachers should impart and assess thinking skills instead of mere information (Knowles, 1980); in other words, "in an age where textbooks are often outdated before they are off the press . . . the goals and aims of education inevitably must change" (Meyers, 1986, pp. 1-2). Whitehead suggested that the real goal of education is the development of thought processes instead of the accumulation of information (1929/1967). While human beings are naturally predisposed to create meaning and construct concepts (Hunt, cited in Meyers, 1986), Meyers wrote, "the specific ways in which we make sense of the world are learned" (1986, p. 11). Educators are therefore encouraged to think critically about the ways they assess student learning in online courses.

References

Anderson, L.W., & Krathwohl, D.R. (Eds.). (2001). *Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* New York, NY: Longman.

Asmus, E.P. (1999). Special Focus: Assessment in Music Education. *Music Educators Journal, 86,* (2), 19-24.

Bates, A.W. (1995). Technology, Open Learning and Distance Education. New York, NY: Routledge.

Bruner, J.S. (1970). Some theories on instruction. In Stones, E. (ed.) *Readings in Educational Psychology.* London: Methuen, 112-124.

Celente, G. (1997). *Trends 2000: How to Prepare for and Profit from the Changes of the 21st Century.* Clayton, Australia: Warner Books.

Comeaux, P. (Ed.) (2005). *Assessing Online Learning.* Bolton, MA: Anker Publishing Company.

Cross, K.P. (1998). *What do we know about students' learning and how do we know it?* Paper presented at the American Association for Higher Education National Conference on Higher Education, Atlanta, GA.

Draves, W.A. (2002). *Teaching Online.* River Falls, WI: Learning Resource Network.

Gehringer, E. (2007). The effect of interface style in peer review comments for UML designs. *Journal of Computing Sciences in Colleges, 22* (3) 214 – 220.

Gunawardena, L., Lowe, C., & Anderson, T. (1997). Interaction Analysis of a Global Online Debate and the Development of a Constructivist Interaction Analysis Model for Computer Conferencing. *Journal of Educational Computing Research, 17* (4), 395-429.

Harrow A.J. (1972). A Taxonomy of the Psychomotor Domain. New York, NY: McKay.

Johnson, D.C. (2003). The effect of critical thinking instruction in music listening on fifth-grade students' verbal descriptions of music. (Doctoral Dissertation, University of Arizona). *Dissertation Abstracts International*, 65, 01A.

Johnson, D.C. (2007). *Thinking Critically about Assessing Online Learning: The Wherefore and Why?* Presentation at the Teaching and Learning with Technology Collaborative, Raleigh, NC.

Ko, S. & Rossen, S. (2004). *Teaching Online: A Practical Guide.* Boston, MA: Houghton Mifflin Company.

Krathwohl, D., Bloom, B.S., and Masia, B.B. (1964). *Taxonomy of Education Objectives: The Classification of Educational Goals, Handbook II: Affective Domain.* New York, NY: McKay.

Murphy, D., Walker, R., & Webb, G. (Eds.) (2001). *Online Learning and Teaching with Technology: Case Studies, Experience and Practice.* Sterling, VA: Stylus Publishing Inc.

Radocy, R.E. & Boyle, J.D. (1987). *Measurement and Evaluation of Musical Experiences.* New York: Schirmer Books.

Shank, P. (Ed.) (2007). *The Online Learning Idea Book: 95 Proven Ways to Enhance Technology-Based and Blended Learning.* San Francisco, CA: John Wiley & Sons.

Sigala, M. (2005). Developing and implementing a model of assessing collaborative e-learning processes and products. In P. Comeaux (Ed.), *Assessing Online Learning* (pp. 88-98). Bolton, MA: Anker Publishing Company.

Wall, W. (1979). Psychology of Education. *International Review of Education*, 25 (2/3), 367-391.

Wiggins, J. (2001). *Teaching for Musical Understanding.* Boston, MA: McGraw Hill.

Yorke, M. (2003). Formative Assessment in Higher Education: Moves Towards Theory and the Enhancement of Pedagogic Practice. *Higher Education, 45,* (4), 477-501.

About the Author

Dr. Daniel C. Johnson

Assistant Professor Daniel C. Johnson, Ph.D., is the Assistant Chair of the Music Department at the University of North Carolina-Wilmington. He teaches applied tuba and euphonium studies as well as courses in music education, music technology, and the Honors Scholars Program. Johnson is a certified Orff-Schulwerk instructor and multi-instrumentalist with over dozen years of teaching experience. Dr. Johnson has performed as principal tubist with the Wilmington Symphony Orchestra, the Long Bay Symphony, and the UNCW Faculty Brass Quintet. He also performs and directs the UNCW Early Music Consort. A frequent presenter at regional, national, and international conferences, Johnson has published articles in: *The Bulletin of the Council for Research in Music Education*, *Contributions to Music Education*, *The International Journal of the Humanities*, *The International Tuba and Euphonium Association Journal*, *The Kindermusik Educators Journal*, *The Australian Band and Orchestra Directors Association Journal*, The Queensland Kodály News, and on-line at Musicstaff.com. The second edition of his textbook, *Musical Explorations: Fundamentals Through Experience*, is published by Kendall-Hunt.

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