We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900
Open access books available

185,000
International authors and editors

200M
Downloads

Our authors are among the

154
Countries delivered to

TOP 1%
most cited scientists

12.2%
Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



9

Assessment Methods of Student Learning in Web-Based Distance Courses: A Case Study

Jon R. Hufford
Texas Tech University
USA

1. Introduction

Higher education has been challenged for several years now to show with empirical evidence that it is committed to improving student learning. The United States Department of Education's Commission on the Future of Higher Education issued a report in 2006 titled *A Test of Leadership: Charting the Future of United States Higher Education*. The report makes recommendations for educational reform. A portion of a summary in the report states that "improved accountability is vital to ensuring the success of all the other reforms we propose. Colleges and universities must become more transparent about cost, price, and student [learning] success outcomes, and must willingly share this information with students and families" (U.S. Dept. of Education, 2006, pp. 4, 14-15). The Commission's report has had a significant impact on campuses across the United States.

All of the regional higher education accreditation organizations made changes in their standards in response to the Commission's report, and these changes are chiefly responsible for the trend toward student learning-outcomes assessment in the United States.[1] Some of the standards of these regional organizations relate to distance courses and, among other things, have influenced the way they are assessed. Distance learning faculty are now using student learning-outcomes assessment methods in their courses because of this new emphasis on assessment and the inclusion of distance courses in the efforts of many colleges and universities to assess their programs and courses.[2] The data collected from these assessment efforts is being used to improve student learning, the content of the courses, and the teaching skills of the instructors. Unfortunately the experiences of instructors in assessing what distance students are learning in their courses are not well documented in the professional literature. Distance learning faculty with this experience should share their assessment findings with colleagues who need to know which methods are working successfully and which are not, and how the assessment process can be used to improve learning and teaching.

---

[1] Student learning-outcomes assessment focuses on empirically measuring student performance, which is called outcomes. It requires that students demonstrate that they have learned the required skills and content taught in the course.

[2] Distance learning (also called distance education) is a method of studying in which lectures are broadcast or classes are conducted by correspondence or over the Internet, without the students needing to attend a school or college.

This chapter is in the form of a case study. It examines student learning-outcomes assessment methods that are suitable for Web-based courses, and points out some of their strengths and weaknesses as seen from the perspective of the online learning environment. The author concentrates on those assessment methods used by instructors at Texas Tech University Library in a one-hour, Web-based credit course developed to teach research skills to distance students.[3] After reviewing the various categories of methods available, the course instructors decided to use those that they thought offered the greatest potential for assisting them in reaching the course's assessment goals, comprised implementation processes that promised to be relatively easy to use and not so time-consuming, and included attributes that would facilitate student use. The course instructors' method for using assessment data to improve their course is demonstrated by way of examining the data collected in the fall of 2010 to determine findings that could help identify problems that need to be fixed in order for improvement to take place. Also, the study examines how the questions in the course's assessment tests are linked to the course learning-outcome objectives and Association of College and Research Libraries competency standards.

Before examining assessment methods, the author briefly discusses background issues that the distance learning instructors of Texas Tech Library regularly address during the early stages of planning the assessments that are used in their course each year. These issues can be understood as questions that instructors must answer during the planning process. Some of the questions are what role will standards play in assessment, what learning theories underlie the assessment and instructional strategies, and how will assessment match the course's learning objectives and instructional strategies? The Texas Tech instructors' discussion of the issues and determination of the assessment methods to be used occur in the context of a structured yearly cycle of planning, developing, marketing, implementing, assessing, and improving all aspects of the course.

2. Literature review

Searches in several bibliographic resources using the keywords "higher education," "distance learning" or "distance education," and "assessment" yield a large number of articles, books, documents, and other materials on assessment. Some of these materials are guides, manuals, or action plans; articles on the need to integrate assessment into education; or reports of accreditation trends in higher education. Other materials found discuss strategies used to gain support for or to develop assessment programs, or report on state-wide assessment programs of higher education curricula without the details of any particular assessment projects. The author found a less numerous group of articles that in some way or another discuss assessment of student learning in distance courses, including those that report the actual experiences of distance learning instructors in assessing student learning in their courses. Though a few of these articles report on studies that did not take place in a higher education environment, higher education faculty involved in distance learning should be aware of these studies because of their pertinence in the developing field of distance learning in higher education.

[3] Web-based learning (also called online learning, e-learning, or electronic learning) comprises all forms of electronically supported learning and teaching. The information and communication systems, whether networked or not, serve as specific media to implement the learning process.

One of these articles addresses the research needs of distance learning, and others describe recently developed online systems or approaches that assess in one way or another student learning outcomes. Oncu and Cakir (2011) examine the priorities and methodologies of research in online learning environments. The authors maintain that distance learning lacks research goals that, if observed, would lead to a better understanding of the impact of online learning environments on students. They propose four research goals for online learning concerned with learning achievement, engagement, and retention. Their goals are "(a) enhancing learner engagement and collaboration, (b) promoting effective facilitation, (c) developing assessment techniques, and (d) designing faculty development programs." The authors discuss some research work in these areas, and recommend research methods that are suitable for pursuing their goals. Su et al. (2011) report on the testing at three Taiwanese universities of an online portfolio assessment and diagnosis scheme (OPASS) that assists teachers in automatically assessing and diagnosing students' abilities in performing scientific inquiry. OPASS generates reports that diagnose learning problems and provide suggestions for improvement based on teacher-defined assessment input for the scientific inquiry experiment. Udo et al. (2011) propose a modified SERVQUAL instrument for assessing e-learning quality. The instrument measures five dimensions: assurance, empathy, responsiveness, reliability, and Website content. Analysis of the data collected from 203 e-learning students who participated in a pilot study of the instrument revealed that four of the dimensions (excepting reliability) played a significant role in the students' perceived e-learning quality. The authors point out that perceived quality affects student satisfaction with their e-learning, and is an indicator of future intentions to enroll in online courses. Sima et al. (2007) discuss the eMax Knowledge Assessment System developed by the Intelligent Knowledge Management Innovative Center of IBM Hungary and the John Von Neumann Faculty in Informatics at Budapest Tech. eMax can evaluate students' open-ended short answers including a few sentences or partially solved mathematical problems.[4]

A few online assessment systems or approaches are rather unique. Costagliola et al. (2009) discuss an approach to online testing that enables instructors to monitor learner behavior and test quality. The approach involves examining logging data related to learner interaction with the system during the execution of online tests and exploiting data visualization techniques to identify information useful for improving the assessment process. It focuses on discovering learners' behavior patterns and the conceptual relationships among test items. Hayes and Ringwood (2009) report on the development of a system used to authenticate telephone-based oral examinations. The authors assert that the system can, in turn, be used to confirm a student's ability in relation to submitted assignments and online test results and that it is an effective deterrent against plagiarism.

Portfolio creation is conducive to developing students' skills in documenting and tracking their learning, developing an integrated and coherent record of their learning experiences, and improving their self-understanding. Bhattacharya and Hartnett (2007) discuss a system that assesses the learning that takes place during the design and development of students' e-portfolios. Caldarola and MacNeil (2009) review the similarities and differences in student cheating among the various assessment methods. They then investigate cheating indicators and predictors, and the methods available for detecting cheating on examinations. Also,

[4] Open-ended questions allow for a spontaneous, unstructured answer.

they offer an analysis of the testing guidelines of the International Testing Commission and of several major universities, and a review and evaluation of several remote examination proctor systems in the United States along with recommendations for their use in various distance learning environments.

A limited number of actual assessments of what students are learning in online courses have been reported in the literature. Hufford and Paschel (2010) report on the experience gained by instructors at Texas Tech University Libraries while developing and implementing pre- and post-assessment tests that were administered in the distance learning section of a library research course taught in the fall of 2009. The assessment's findings were used to improve student learning, the course content, and teaching in the course's online section. Foster and Drew (2009) discuss student learning-outcome assessment that took place in an astrobiology course taught at the University of Florida. Pre- and post-tests along with "knowledge" assessments were used to evaluate the students' perceived and actual learning experiences. The course used both traditional classroom and distance learning technologies. The assessment's pre-testing indicated that the students had little prior knowledge of key astrobiology concepts. However, post-testing showed significant improvements in their comprehension of the subject. The assessment also revealed that, because of taking the course, the students developed confidence in writing on science topics as well as reading and understanding the primary literature of astrobiology. Brown and Hanks (2008) report on an innovative online workshop designed to assess and improve the writing skills of students enrolled in distance learning gerontology classes. Student learning assessment included Web-based writing evaluations in both pre- and post-tests. Urtel (2008) explores whether differences in academic achievement indicators exist between students taking a traditional classroom course and a distance learning course. The final grades; rates of D, F, and W grades; and end of term course and instructor evaluations of three-hundred and eight-five students enrolled in a course offered both in a classroom (116 students) and at a distance (269 students) were studied. The course content, instructor, textbook, and assessment methods were similar for both delivery formats. Student demographic information was included in the data analyses. Ivanitskaya et al. (2008) review the results of tests that assessed the library research skills of off-campus students. The investigators used a "Research Readiness Self-Assessment" test as a pre- and post-test in an off-campus Master's degree class at Central Michigan University. In particular, they investigated the impact that pre-tests have on the effectiveness of library instruction when students are given feedback on their pre-test performance. Similarly, Mulherrin et al. (2004) review the results of pre- and post-tests taken by students. The tests were taken by distance students enrolled in LIBS 150, a one-hour credit, elective library skills course offered at the University of Maryland. The tests were administered as one phase in the development of the course and proved to be an important factor in its eventual success.

3. Aim and scope

For several years now, Texas Tech University Library has offered a one-hour credit course titled "Introduction to Library Research" (LIBR 1100) to undergraduates. The course teaches the basics of library research and targets freshmen, though sophomores, juniors, seniors, and even an occasional graduate student enroll in the course. Most of the Information Services librarians participate as instructors. Several sections are offered each fall semester,

and two or three sections in the spring. Each semester at least one of the course's sections is taught online to distance students. There are no classroom meetings for the distance students. The entire course is taught on the Internet using the Blackboard Course Management System to students located across Texas and in some cases out-of-state.

Every term, the distance section of the course has been evaluated by students enrolled in the section in terms of the course content and instructor. The evaluations are done on printed, machine-readable forms. All credit bearing courses taught under the auspices of Texas Tech University must be evaluated using this form. The data collected on the forms is subjective and, in any case, is not the kind that can be used to assess what students have learned. Nevertheless, the course's instructors regularly consult student input recorded on the evaluations. This consulting takes place every year during the summer when the instructors revise and improve the course.

The instructors of LIBR 1100 have used more objective assessment methods to find out what their students are learning. They began measuring student learning outcomes with pre- and post-assessment tests in the fall of 2008 and have used the tests ever since. The intent of the tests is to determine as objectively as possible whether students enrolled in the distance section are learning what the instructors teaching the section intend for them to learn. Other assessment methods used in the online section of the course are practicum assignments that require the performance of skills, an annotated bibliography project, and quizzes. While the quizzes and pre- and post-assessment tests evaluate students' knowledge of the course's subject content, the practicums and annotated bibliography test the performance of skills.

This study briefly examines assessment methods that are suitable for Web-based courses, including online quizzes, tests, and exams; online discussions and other similar kinds of networked learning; problem-based learning and case-based reasoning; role playing; assessing practical skills; and laboratory experiences. The author then goes on to carefully examine those methods used to assess student learning in the Web-based distance learning course taught at Texas Tech University Library, highlighting experience gained by the instructors while developing and implementing pre- and post-assessment tests, online quizzes and exams, and authentic performance assessments that have been administered in the course. Student assessment data collected by all of the instruments employed in the fall of 2010 are analyzed, and this analysis is meant to demonstrate how the instructors' yearly cycle of developing and improving the course operates. The importance of linking assessment questions to course learning objectives and nationally recognized competency standards is also demonstrated.

The study's discussion of the various assessment methods used in the Library's online course represents a contribution to the limited documentation available in the professional literature on student learning-outcomes assessment projects that have taken place in the online distance learning environment. The assessments' findings, though relevant to one academic institution, nevertheless will enhance distance learning faculty's understanding of how the assessment process can be used to improve learning, teaching, course content, and delivery. Other important contributions are identification of assessment methods that work well in the online learning environment and an explanation of how assessment planning can fit into a yearly cycle that includes planning, developing, marketing, implementing, assessing, and revising an instructional program.

4. Background

The instructors who teach LIBR 1100 participate as team members in the process of continuously discovering student needs and expectations and improving the course's content, teaching, and learning. This team effort has evolved over the years into a structured yearly cycle of planning, developing, marketing, implementing, assessing, and improving all aspects of the course. The data collected from the various assessment methods play an important role in the process. The instructors recently started using the seven stages of Megan Oakleaf's (2009) instruction assessment cycle as a resource to assist in improving their process. These stages include reviewing learning goals, identifying learning outcomes, creating learning activities, enacting learning activities, gathering data to check learning, interpreting data, and enacting decisions (Oakleaf, 2009, pp. 541-545). The stages are incorporated into the process when and where feasible. In the near future, Blackboard Learn, the assessment module in Blackboard, will be used to track students enrolled in LIBR 1100 and will facilitate accurate reporting of the Library's impact on the learning and teaching that takes place at Texas Tech University (Oakleaf, 2011, pp. 76-77).

4.1 Planning and designing assessment

Gunawardena and LaPointe (2003) identify questions that all distance learning instructors should answer during the early stages of planning the assessments that will be used in their online courses. These questions are:

- What role will standards play in assessment?
- What learning theories underlie the assessment and instructional strategies?
- How will assessment match the course's learning objectives and instructional strategies?
- What process, product, or use of resources must the students demonstrate?
- What will be considered evidence of learning in the course?
- What tools and resources are needed to support the students as they complete the assignments?
- Will assessment be based on independent or collaborative learning?
- Will the assessment be self-paced or timed?
- Will students complete the same assignments?
- Can students choose from an instructor-provided selection of assignments?
- What kind of coaching and managing will be required?
- Will remediation and supplemental help be provided?
- Will students require feedback before proceeding to the next assignment?

All sorts of unforeseen situations could adversely impact the successful implementation of assessment in an online distance learning course. Therefore assessment should be planned and designed carefully and thoroughly before implementation takes place. Answering the questions listed above during the process of planning goes a long way towards assuring successful implementation of the assessment. The instructors of LIBR 1100 use this list of questions to assist them in planning their assessment goals, a task which takes place during the "summer planning" stage of their yearly cycle.

The LIBR 1100 instructors are always on the lookout for any conflicts or inconsistencies among the answers to these questions. Conflicts or inconsistencies may lead to course

failure if they are ignored. A self-paced course may not be successful if collaborative projects or weekly class discussions are required. Independent project assignments may cause diminished participation in class discussions. Assigning weekly projects may cause delays and a backlog of work for the instructors. This last conflict could result in some students proceeding to subsequent assignments before receiving important instructor feedback and grades. In looking for conflicts and inconsistencies during assessment planning, plagiarism must be an ever present concern instructors of online courses must face. Are the assessment methods designed to discourage, if not eliminate, cheating. LIBR 1100 instructors have found the list of questions to be a very helpful tool that facilitates successful assessment planning.

Additional considerations in planning assessment for online distance learning courses include the role communications technology will play. Does the technology facilitate the successful implementation of assessments? Multimedia technology provides multiple formats that appeal to a variety of learning styles. Graphics, images, maps, audio, and video used to convey course content or incorporated into learning activities can also be posted in online tests. Do these multimedia formats slow down the response rates of the system? Students want technology that works well and quickly, and enhances their learning. These technology concerns must also be addressed during assessment planning.

4.2 Kinds of online assessment

4.2.1 Quizzes and tests

Instructors often assign students quizzes or tests to assess their knowledge of facts or understanding of concepts. They may or may not be timed, proctored, or graded. They can be taken online using a course management system like Blackboard, mailed to the students' homes, or proctored at some designated location by an authorized individual. Identity and security issues are major concerns that should be taken into consideration when planning a test that will be taken at a distance. Some instructors use security checks such as retinal scans; facial identification using thermographs; voice, palm, or fingerprint recognition; or, in the case of tests that require writing, analyses of the writing performed at intervals throughout the term. However, the technologies supporting these options can be expensive. Accessing quizzes and tests with passwords or generating a different test for each student who logs in may provide at least some degree of security in Web-based testing. However, these options are not completely secure against cheating. In the final analysis, the instructor never knows for sure who is taking tests at a distance. This drawback has also been an ongoing concern of instructors who teach in traditional classrooms. Nevertheless quizzes and tests constitute an effective way to test knowledge and understanding.

4.2.2 Online chats and discussions

Online chats and conference calls between students and instructor provide opportunities for discussion, negotiation of meaning, validation of understanding, and assessment. Some instructors place significant weight on the quality of student participation in these chat and conference discussions. They enable the instructor to discover what students are thinking and to determine if any of the students are having problems learning. With this kind of information the instructor is able to give help on the spot and provide remediation.

Assessment of student contributions during chats or discussions can sometimes be challenging despite their obvious instructional benefits. For example, instructors may not always be available to monitor discussion sessions. Online course management systems such as Blackboard provide quantitative measures that report the number of times each student accesses a discussion and the total number of conference comments read and posted. However, the number of times discussions are accessed or comments are posted reflects neither the quality of the student's participation in the online class discussion nor the degree to which the students learned or met the requirements of the course. Therefore, instructors must always participate as a monitor if effective assessment is to take place.

4.2.3 Problem-based learning and case-based reasoning

In some distance learning courses the application of knowledge to solve an authentic problem in the Web-based environment is assessed.[5] Problem-based learning and case-based learning often require students to find information in order to solve a problem that is encountered by practitioners of the discipline. The search for information can involve reading or listening; conducting interviews or experiments; searching for information in libraries, databases, and Websites; or the acquisition of experience through service learning.[6] Assessment of student performance and learning in problem solving assignments can be problematic when done at a distance. Again, such things as security and accountability are major concerns that should be worked out during the planning process.

4.2.4 Role playing

Role playing using either Web technology or interactive television (ITV) is another way of assessing the application of knowledge in the real world. It is important for instructors to state the goal of the role playing, define its problem, set the scene, create the roles, and assign them. Students research the problem, their roles, and perhaps set goals for their role. Instructors, sometimes with input from students, establish the grading rubric. Assessment in this category can also be problematic, depending on how well the assessment procedure has been planned. Also, expensive technology is often required for this method of assessment.

4.2.5 Practical skills and laboratory experiences

One of the most challenging areas of assessment is figuring out how to assess practical skills or laboratory experiences at a distance. The instructor who gives these kinds of assignments must consider all accountability issues, especially if certification at a distance is involved.

[5] In problem-based learning students study a subject in the context of complex and realistic problems. Working in groups, they identify what they need to know and how and where to access new information that may lead to resolution of the problem. The role of the instructor is that of a facilitator. Case-based learning is similar. It involves complex problems created to stimulate classroom discussion and collaborative analysis. Through interaction, students explore realistic and specific situations. As they consider problems that require analysis, they strive to resolve questions that may have no single answer.

[6] Service learning is a method of teaching, learning, and reflecting that combines academic classroom curriculum with meaningful service, frequently youth service, throughout the community.

During the planning process he or she must first determine whether a practical skill can realistically be assessed at a distance. If this is impossible, the instructor should make arrangements for the assessment to be conducted in the presence of a qualified person. An example of a case where a qualified person should be present for assessment is airline pilot training. While simulators provide safe practice sessions, flying skills can be demonstrated and assessed only when flying an actual airplane with an assessor present.[7]

4.2.6 Assessment in the online section of LIBR 1100

The instructors who teach the distance section of LIBR 1100 have used various assessment methods over the years, some of them consistently from one year to the next. The annotated bibliography assignment and the practicums are used regularly and represent authentic assessment of skills the instructors believe are important for the students to learn. They are interrelated. The students complete the practicums in an ordered series and are graded on how well they do on each one. However, in doing the practicums, they are actually performing the research and documentation that are required in the annotated bibliography assignment. The students begin early in the term choosing a topic, creating a thesis for a fictitious paper that the bibliography supports, and determining keywords and strategies for searching databases that they use to find sources for their bibliography. When they reach the point where they begin compiling their bibliography, the students have to choose a standard style manual from a small selection of two or three and use it to establish the citations in their bibliography. The final step is writing annotations for their citations, and this requires reviewing the sources.

This work is done one step at a time following a process the instructors have built into the course. Not only does the process help students learn how to do research and create an annotated bibliography that includes several different kinds of sources for their topic but it also enables the instructor to monitor the students' acquisition of knowledge and development of research skills step by step so that remediation can be offered at any time during the research process and also to monitor for cheating and plagiarism.

The majority of the distance students enrolled in LIBR 1100 over the years have done well on the practicums and annotated bibliography assignment. Perhaps this is because several of the course readings explain how to do the research required by the assignments. The one weakness is that grading rubrics have not yet been developed for the instructors to use when grading them. Such rubrics would assure a more uniform procedure for grading students, more effectively assure that the course learning-outcomes objectives are being met, and could even be used by the students for guidance in what they are expected to do to successfully complete the assignments. Development of grading rubrics for all the practicums and the annotated bibliography assignment began in the summer of 2011.

In addition to the authentic performance assessment accomplished by way of the practicums and bibliography, the distance section of LIBR 1100 has several reading assignments available on the course's Blackboard site. The readings are titled "Campus Libraries and the

[7] Several ideas and examples discussed in section 4.2 come from Gunawardena, C. & LaPointe, D. (2003). Planning and Management of Student Assessment, In: *Planning and Management in Distance Education*, S. Panda, (Ed.), pp. 195-205, Kogan Page, ISBN 0-7494-4068-6, London, UK

Research Process," "Writing a Thesis Statement," "Search Strategies," "Controlled Vocabulary," "Proper Citing," "Ethical Use of Information," "The Information Cycle," "Newspaper Articles," "Popular Magazines and Scholarly Journals," "Documents and Books," "Encyclopedias," and "Critical Evaluation of Sources." The "Information Cycle" reading assignment provides structure for the three reading assignments that follow it. These readings provide information on how to search databases. The students use these databases to find sources on the topic they choose for their annotated bibliography. Quizzes following the required readings are used not only to assess comprehension but also to reinforce course content. The students are also required to participate in discussions. However the discussions are not assessed.

The instructors of LIBR 1100 decided to begin measuring student learning outcomes with pre- and post-assessment tests in the fall of 2008, and have continued using the tests each term. The intent of the tests is to determine as objectively as possible whether students enrolled in the distance section of LIBR 1100 are learning what the instructors teaching the section intend for them to learn. Specifically, the pre- and post-assessment tests focus on determining what distance students are learning from studying the reading assignments, so they also conduct the kind of knowledge assessment that the quizzes perform, though more thoroughly.

Each of the student learning-outcome objectives of LIBR 1100's distance section specifically address one or more of the Association of College and Research Libraries (ACRL) Information Literacy Competency Standards for Higher Education (See Table 1 for the ACRL Information Literacy Competency Standards for Higher Education and their performance indicators). Objective one, "Students will be able to identify and articulate their information needs," covers Standard one, including most, if not all, of the performance indicators listed under that Standard. Objective two, "Students will develop a knowledge base regarding the collections and services of the Texas Tech University Libraries," is meant to respond to all of the performance indicators in Standard two. Objective three, "Students will use information effectively to accomplish research goals and to develop life-long learning," addresses standard four, including all of its performance indicators. Objective four, "Students will demonstrate the ability to critically evaluate and ethically apply information" is meant to respond to all the performance indicators of Standards three and five.

Similarly, each pre- and post-assessment test question addresses particular ACRL Information Literacy Competency Standards, performance indicators, and course learning-outcome objectives. Questions one and five address Standard two, performance indicator 2.2 (course outcome objective 2) (See Tables 2 and 3 for the relationships between the course outcome objectives, the Standards, and test questions, and for the measurements of success in teaching the course content based on what the student answers to the test questions indicate they had learned). Questions two, eight, nine, ten, and eleven are meant to respond to Standard two, performance indicator 2.1 (course outcome objective 2). Questions three and seven address Standard three, performance indicator 3.2 (course outcome objective 4). Questions four and fifteen address Standard two, performance indicator 2.3 (course outcome objective 2). Questions six and thirteen address Standard one, performance indicator 1.2 (course outcome objective 1). Finally, Questions twelve and fourteen address Standard two, performance indicator 2.5 (course outcome objective 2).

Standard One

The information literate student determines the nature and extent of the information needed.

Performance Indicators

1.1 The information literate student defines and articulates the need for information.
1.2 The information literate student identifies a variety of types and formats of potential sources for information.
1.3 The information literate student considers the costs and benefits of acquiring the needed information.
1.4 The information literate student reevaluates the nature and extent of the information need.

Standard Two

The information literate student accesses needed information effectively and efficiently.

Performance Indicators

2.1 The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information.
2.2 The information literate student constructs and implements effectively-designed search strategies.
2.3 The information literate student retrieves information online or in person using a variety of methods.
2.4 The information literate student refines the search strategy if necessary.
2.5 The information literate student extracts, records, and manages the information and its sources.

Standard Three

The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

Performance Indicators

3.1 The information literate student summarizes the main ideas to be extracted from the information gathered.
3.2 The information literate student articulates and applies initial criteria for evaluating both the information and its sources.
3.3 The information literate student synthesizes main ideas to construct new concepts.
3.4 The information literate student compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.
3.5 The information literate student determines whether the new knowledge has an impact on the individual's value system and takes steps to reconcile differences.

3.6 The information literate student validates understanding and interpretation of the information through discourse with other individuals, subject-area experts, and/or practitioners. 3.7 The information literate student determines whether the initial query should be revised.
Standard Four
The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.
Performance Indicators 4.1 The information literate student applies new and prior information to the planning and creation of a particular product or performance. 4.2 The information literate student revises the development process for the product or performance. 4.3 The information literate student communicates the product or performance effectively to others.
Standard Five
The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.
Performance Indicators 5.1 The information literate student understands many of the ethical, legal, and socio-economic issues surrounding information and information technology. 5.2 The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources. 5.3 The information literate student acknowledges the use of information sources in communicating the product or performance.

Table 1. ACRL Information Literacy Competency Standards for Higher Education with Their Performance Indicators.

5. Methodology

Megan Oakleaf (2008, pp. 234-240) explains that instructors involved in information literacy instruction use "fixed-choice" tests and performance assessment (a.k.a. authentic assessment) most often to measure student learning in their courses, including distance learning courses. She identifies traditional models and behavioral theories of learning and educational measurement that serve as the theoretical basis for fixed-choice tests and relates them to early 20th century principles of scientific measurement. Fixed-choice tests include multiple-choice, matching, and true/false questions. They are conducive to quantitative assessment. On the other hand, performance or authentic assessment is based on constructivist educational theories which posit the idea that knowledge is created or "constructed" by individuals rather than passed on fully-formed from teacher to student. Learning, according to this theory, takes place through engagement and interaction in the real world, problem solving, critical thinking, and knowledge creation. Performance

assignments are conducive to qualitative assessment. Both of these kinds of assessment can be readily matched with educational or learning standards and course learning-outcome objectives.

The quizzes and pre- and post-assessment tests in LIBR 1100 belong for the most part to the fixed-choice test category. The grading of these tests is therefore readily accomplished by the Blackboard system the instructors use to teach the course. However, the instructors must review, and occasionally edit, the machine-graded quizzes because of a handful of "fill-in" questions. On the other hand, the pre- and post-assessment tests are completely machine graded. As mentioned earlier, all of the questions in the quizzes and pre- and post-tests are matched to the course learning-outcome objectives, and test what the instructors want their students to learn and know. Since the course's learning-outcome objectives address the ACRL Information Literacy Competency Standards for Higher Education, along with their performance indicators, the questions in the pre- and post-assessment tests and the reading assignment quizzes also address the Standards.

LIBR 1100's practicums and the annotated bibliography assignment are authentic assessment methods that assess performance. Students complete these assignments successfully by performing several research tasks or operations. Completion of the bibliography represents an accomplishment that the instructors believe reflects a significant part of what is done when one performs library research. Therefore the students acquire several skills as they complete the practicums and the annotated bibliography. These performance assignments are also matched to the course's learning-outcome objectives and address some of the ACRL Standards and their performance indicators.

The findings and conclusions of this study relating to the quizzes, practicums, and annotated bibliography are based on grades assigned by the instructor. Though the grades for the quizzes are initially created automatically by Blackboard, the instructor reviews the answers and may revise the grades because of the "fill-in" questions. However the practicums and bibliography are graded without the benefit of any automatic system or the use of grading rubrics. The study's findings and conclusions relating to the machine-graded pre- and post-assessment tests are based on analysis of the input of the five students who took both tests. These students are treated as a single group. The reported frequencies and percentages of correct and incorrect answers pertain to the entire group of participating students. The students' answers on both tests were downloaded from the section's Blackboard site to a Microsoft Excel spreadsheet. The author used formulae available on the Excel software to tabulate all the data and determine the averages.

The pre- and post-tests were graded as an incentive for the students to try to do well. By taking the pre-assessment test the students could earn up to 15 points toward their final grade, and by taking the post-assessment test they could earn up to 75 points. Both the pre- and post-assessment tests contain the same questions. The instructors feel that the fourteen weeks between taking the tests is a sufficient period of time for their students to forget the questions answered in the test at the beginning of the semester. They plan to update the test regularly with new and revised questions and use it every semester. Also, the order of the questions will be regularly changed.

Tables 2 and 3 show the relationships of the course outcome objectives, the ACRL Information Literacy Competency Standards for Higher Education, along with their

LIBR 1100 Outcome Objective	ACRL Information Literacy Performance Indicators 1.1 etc. identifies the Standard number and Performance Indicator number addressed by the outcome objective.																				
1	1.1	1.2	1.3	1.4																	
2					2.1	2.2	2.3	2.4	2.5												
3																4.1	4.2	4.3			
4										3.1	3.2	3.3	3.4	3.5	3.6	3.7				5.2	5.3

Table 2. Relationship of LIBR 1100 Course Outcome Objectives to ACRL Information Literacy Performance Indicators.

Assessment Test Question	ACRL Information Literacy Performance Indicators #/# identifies pre-test and post-test scores.																				
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	3.6	3.7	4.1	4.2	4.3	5.1	5.2	5.3
1						40/100																
2					80/80																	
3											80/80											
4							40/60															
5						100/100																
6		80/100																				
7											20/80											
8					60/100																	
9					100/80																	
10					20/40																	
11					100/100																	
12									60/60													
13		80/80																				
14									20/80													
15							80/100															

Table 3. Pre-test and Post-test Scores Based on Test Questions and Performance Indicators.

performance indicators, and the assessment test questions. Each pair of pre- and post-assessment scores in Table 3 (the pre-assessment score before the slash, followed by the post-assessment score) corresponding to the question number in that row is meant to serve as a rough measure of how well the students knew or had learned a particular learning point addressed by the corresponding question and standard. A higher score on

the post-assessment test question than on the pre-assessment question indicates that the students as a group had learned this outcome objective and standard performance indicator.

Each question in the test has one correct answer. Because the study's findings are based on comparisons of pre- and post-assessment answers, both for individual questions and in their aggregate, and since no cross tabulation tables are used to test relationships between variables, no statistical analysis other than the determination of totals and averages is necessary.

The pre- and post-assessment method of student learning outcomes is recognized as a legitimate way to measure what students are learning in class (Kidder, 1981, p. 45; Hernon, Dugan, &Schwartz, 2006, p. 137; Diamond, 2008, p. 163; Black & Wiliam, 2006; McMillan, 2001, 56-89). Often this method is administered as tests with questions, whether multiple choice, true or false, short-answer, or open-ended, and with the purpose of testing students' skills or what they know. Some instructors employing this method have used the same set of questions in both pre- and post-tests to evaluate a single group of students, and they made the effort to administer the pre-test before the course content was taught and the post-test at the very end of the course.

As with all testing methods, the reliability and validity of the pre- and post-test method for determining accurate measurements of what students have learned is entirely dependent on the test itself. The integrity of the questions, the test's design, and its method of application affect the reliability and validity of a testing instrument. In his 1993 article "Evaluating Library Instruction: Doing the Best You Can with What You Have," Donald Barclay provides an interesting examination of pre- and post-tests and the kinds of questions that instructors could include in such tests (Barclay, 1993, p. 197-198, 201). He concludes his article with the observation that, though assessment may not always meet the highest standards of scientific rigor, this should not deter instructors from implementing them. Early attempts at assessment can serve as a spur to begin the process of continuous improvement in the quality of the assessment.

6. Findings

Six students were enrolled in the distance section of LIBR 1100 in the fall of 2010. Five of these students actively participated in all the course assignments. One student hardly participated at all and received several 0 point scores. All of the study's findings are based on the input of the five students who actively participated. They were required to take 12 quizzes and could earn a maximum of 8 points on eleven of the quizzes and five points on one of them. Table 4 includes the students' scores on all 12 quizzes. The great majority of the questions on the quizzes were graded automatically by Blackboard. However, the instructor who taught the online course in the fall of 2010 reviewed the handful of fill-in questions and, using her own judgment, determined whether the fill-in answers were correct or not. She did not use a grading rubric while reviewing the questions.

The students also took 6 practicums, and their scores on these are reported in Table 5. Practicum one required the students to determine a thesis for their annotated bibliography assignment. Practicum two required that they find books on the topic of the thesis using keywords derived from the thesis statement. They searched for the books in online catalogs.

Quiz Number	1	2	3	4	5	6	7	8	9	10	11	12
Student Number												
1	8	8	8	8	8	7	8	8	8	8	8	5
2	8	6	8	8	8	8	8	8	8	8	8	5
3	8	8	8	8	8	6	7	8	8	8	8	5
4	8	6	6	7	8	6	7	7	7	7	7	5
5	8	6	6	7	6	6	6	7	7	8	7	4
Highest Possible Score	8	8	8	8	8	8	8	8	8	8	8	5

Table 4. Student Scores on Quizzes (fall 2010).

Practicum three required that they find government documents on their topic using appropriate databases. Practicum four required that they find magazine and newspaper articles, and practicum five that they find articles in scholarly journals. Finally, practicum six required that they find appropriate Websites on their topic using a search engine such as Google to find them. All of their sources were found online using the Internet and, after the students created accurate citations for them using either the American Psychological Association or the Modern Language Association style manual, became a substantial portion of their annotated bibliography assignment. All the practicums were graded by the instructor who did not use a grading rubric. The maximum number of points possible for each of these practicums was 20.

Practicum Number	1	2	3	4	5	6
Student Number						
1	20	20	20	20	20	20
2	20	20	20	19	19	20
3	20	20	19	18	19	20
4	20	20	15	18	10	19
5	20	19	17	6	19	18
Highest Possible Score	20	20	20	20	20	20

Table 5. Student Scores on Practicums (fall 2010).

Five students completed the annotated bibliography assignment. Three A's (the scores were 95, 95, and 90 out of 100 possible points) and two B's (88 and 85) were awarded, with a score of 90 or higher corresponding to an A letter grade and a score of 80 to 89 corresponding to a B letter grade. The instructor determined these scores and letter grades using her own judgment without the use of a grading rubric or an automatic system.

An average score of the group of five students who took both the pre- and post-assessment tests was determined by adding the percentages of the students who answered each question correctly and then determining the average of the total. The average score on the pre-assessment test was 64 percent, and the average score on the post-assessment test was 82.7 percent. Thus, as a group, the students increased their average score by 18.7 points from pre- to post-assessment. This improvement was encouraging.

Table 6 includes questions one and fourteen on the pre- and post-assessment tests. These two questions illustrate the kinds of questions found on the tests and the choice of answers the students could choose from. Also they both illustrate the handful of questions the students, as a group, did poorly on in the pre-assessment test and then significantly improved on in the post-assessment test.

Question 1
What are the 3 Boolean operators?

PR = Pre-Assessment
PO = Post-Assessment

a – Add
b – If
c – Not
d – Then
e – And
f – Or
g – Sum

PR-1	Frequency	Percent
Correct (c, e, f)	2	40
Incorrect	3	60

PO-1	Frequency	Percent
Correct (c, e, f)	5	100
Incorrect	0	0

Question 14
What information is needed for a book citation?

PR = Pre-Assessment
PO = Post-Assessment

a – Credentials, revisions, date of publication
b – Author, title, date, publisher information
c – Author, title, publisher, volume and issue number, date

PR-14	Frequency	Percent
Correct (b)	1	20
Incorrect	4	80

PO-14	Frequency	Percent
Correct (b)	4	80
Incorrect	1	20

Table 6. Test questions 1 and 14 and their pre- and post-assessment results.

Considerable improvement was made on the first question in the post-assessment survey. The students were asked to identify the three Boolean operators. Forty percent of the group answered the question correctly in the pre-assessment test, and 100 percent answered it correctly in the post-assessment test (See Table 3 for a summary of pre- and post-assessment test scores). Eighty percent of the students answered the second question correctly on both the pre-assessment test and the post-assessment test. Question two asked the students to identify the least likely resource for finding citations to articles. The answer was the Texas Tech University Libraries' online catalog.

Question three asked the students what to look for in determining the authority of an Internet site. Eighty percent answered the question correctly in both the pre-assessment test and the post-assessment test. Question four was challenging for the students. When asked to identify the correct statements in a list that included supposed examples of a book's call number, an ISBN number, a citation to a book, a citation to an article, and a URL address, only 40 percent (two students) answered the question correctly by identifying the correct examples on the list in the pre-assessment test and 60 percent (three students) answered it correctly on the post-assessment test.

Question five asked the students to identify the "word search" that would give them books most directly related to gang violence. One-hundred percent of the students correctly identified "gangs AND violence" as the correct answer in the pre-assessment test and 100 percent also selected the correct answer in the post-assessment test. The results of this and the first question in the test suggest that, by the end of the course, all the students in the group understood what Boolean operators were and how they worked. However, it would also seem that question five is probably too easy and should be replaced by a more difficult question.

Eighty percent of the students could identify primary research sources in question six in the pre-assessment test, and 100 percent in the post-assessment test. Considerable improvement took place on question seven. The students were asked to identify "typical scholarly research sources" from a list. Twenty percent of the students selected the correct answer in the pre-assessment test, and 80 percent selected the correct answer in the post-assessment test.

In question eight, 60 percent (three students) in the pre-assessment test and 100 percent in the post-assessment test correctly identified the kinds of information that can be found in the Texas Tech University Libraries' online catalog. All of the students answered question nine correctly in the pre-assessment test, thus indicating that they were aware that full-text magazine articles cannot be found in the catalog. Eighty percent answered this question correctly in the post-assessment test. This indicates regression in learning for this particular bit of knowledge. Question ten asked the students which of two databases—ABI/Inform or Lexis-Nexis Academic Universe—contained full-text newspaper articles. Twenty percent identified the correct answer (Lexis-Nexis Academic Universe) in the pre-assessment test, and 40 percent did so in the post-assessment test. This would indicate that the majority of the students are not aware of the content of this particular database and perhaps the content of databases in general.

All of the students did well on question eleven in both the pre- and post-assessment tests. This question required knowledge of the difference between PDF and HTML full-text

documents. Perhaps question eleven is also too easy. Question twelve asked the students to examine a citation to a journal article and identify its citation style. Modern Language Association style was the correct answer. Sixty percent of the students answered the question correctly in the pre-assessment test, and 60 percent did so in the post-assessment test.

Most of the students did well on question thirteen and could identify the features of an annotated bibliography. Eighty percent of the students answered this question correctly in the pre-assessment test, and 80 percent did so in the post-assessment test. Question fourteen asked "What information is needed for a book citation." Twenty percent answered question fourteen correctly in the pre-assessment test, and 80 percent did so in the post-assessment test. Apparently the students had learned something about book citations in the course. Question fifteen asked which statements were correct in a list that supposedly included two citations, an ISBN number, a URL address, and a call number. Eighty percent of the students answered the question correctly in the pre-assessment test, and 100 percent in the post-assessment test.

7. Conclusions

This case study examined student learning-outcomes assessment methods that are suitable for Web-based courses. It concentrated on those assessment methods used by instructors at Texas Tech University Library in a one-hour, Web-based credit course developed to teach library research skills to distance students. The instructors selected these methods because they thought that the methods offered the greatest potential for assisting them in reaching the course's assessment goals, included implementation processes that promised to be relatively easy to accomplish, and had attributes that the students would find user-friendly and that would discourage plagiarism. The study also reported the planning process the course instructors follow each year in identifying assessment methods appropriate for their course, in developing and implementing the methods, and how they use the data collected by the assessments to improve the course.

The instructors who teach the library research course participate as team members in the process of continuously improving the course's content and the teaching and learning that occurs in the course. This team effort has evolved over the years into a structured yearly cycle of planning, developing, marketing, implementing, assessing, and improving the course. Among other things, reviewing learning goals, identifying learning outcomes, creating learning activities, enacting learning activities, gathering data to check learning, interpreting data, and enacting decisions occur in this planning cycle. The data collected from the various assessment instruments play an important role in the process because the findings that come from the data help to identify where improvement is needed. Blackboard Learn, the assessment module in Blackboard, will soon be used to track the progress of students enrolled in the online course and will facilitate accurate reporting of the Library's impact on the learning and teaching that takes place at Texas Tech University.

Data collected by the assessment instruments employed in the fall of 2010 disclosed findings that were consulted during the summer of 2011 when plans for improving the learning and teaching experiences that would take place in the fall of 2011 were made. All five students did well on all the quizzes. Scores ranged from six to eight points with a maximum possible

score of 8 for eleven of the twelve quizzes. The students' scores for one quiz which had a maximum possible score of five points ranged from four to five points with four of the students receiving five points. Each question on these quizzes tested a teaching point the instructors wanted their students to learn, and the quiz scores indicate that, for the most part, the students learned these points. Automatic grading by Blackboard for the great majority of the questions assured that instructor bias would not affect these scores. Therefore one can assume that the students learned what they were expected to learn from the course reading assignments. The only concern would be that perhaps some of the quizzes might have been too easy for the students, especially quiz one where all the students answered all of the questions correctly.

As mentioned earlier, the six practicum assignments and the annotated bibliography assignment represent authentic assessment of how well students can perform tasks and accomplish projects that are regularly performed by individuals involved in library research. The instructors who developed these assignments felt confident they had created carefully thought out instruments for assessing what they wanted students enrolled in the "Introduction to Library Research" course to learn to perform. The scores on the practicums would indicate that for the most part the students had learned to perform the tasks and projects quite well. With the exception of three, the scores ranged from seventeen to twenty out of a maximum possible score of twenty on all six of the practicums. Seventeen represents 85 percent of twenty. The exceptions were scores of six, ten, and fifteen.

The LIBR 1100 instructors who taught in the fall of 2010 are very satisfied with their students' scores and believe much of what they wanted their students to learn was learned. The one weakness they identified with the way the course was taught was that there was no grading rubric for the instructors to use in grading the practicums, the annotated bibliography, and the handful of fill-in questions on some of the quizzes. Since the Texas Tech University Library instructors take turns teaching the online course, there was concern that these assignments were not being graded consistently. The instructors therefore began developing a grading rubric in the summer of 2011.

The instructors were also rather satisfied with the pre- and post-assessment data. The five students increased their group average score by 18.7 points from pre- to post-assessment. This indicates that they learned several of the teaching points the instructors wanted them to learn. They improved their scores on 8 of the 15 questions in the post-assessment test. In addition, two other questions were answered correctly by all the students in both tests. Six of the questions received the same number of correct answers in both the pre- and post-assessments. Fourteen of the questions in the post-assessment were answered correctly by a majority of the students and one question was answered incorrectly by a majority of the five students. The poor performance on this question indicates that many of the students need to learn more about online databases, and Lexis-Nexis in particular. The way the instructors teach or optimize the learning of databases will be revised for next year. Also, some of the questions were apparently too easy. They should be replaced with more challenging questions. And it appears that greater attention should be placed on teaching the students how to identify numbers and symbols they will run across during their research. These include such things as book call numbers and International Standard Book Numbers (ISBN).

What must the instructors who teach the distance section of LIBR 1100 do to increase still more the learning that takes place in their section? In chapter one of her book *Tools for Teaching*, Barbara Gross Davis maintains that, "in designing or revising a course, faculty must consider what material to teach, how best to teach it, and how to ensure that students are learning what is being taught" (Gross Davis, 2009, p. 3-18). Starting with this introductory statement, she then offers strategies meant to help faculty "make decisions about the content of their course, the structure and sequence of activities and assignments, the identification of learning outcomes, and the selection of instructional resources." The instructors of LIBR 1100's distance section are using Dr. Gross Davis' strategies as one of their aids in developing their course. In addition, they want to continue the process they started in 2008. Each summer, in preparation for teaching in the fall and spring semesters, they plan to meet and agree on what is important for their students to learn. Once they have agreed on what is important, the instructors plan to review the course and, where needed, improve it and bring it up-to-date. During this review, they intend to examine the previous year's assessment data and use the findings revealed by the data to help them decide what needs to be changed. The course's continuous development must include revising all course goals, learning outcome objectives, the course syllabus and schedule, reading assignments, practicums, and quizzes, and writing new materials for added content. Each year, after the course is revised, the instructors need to develop valid assessment instruments that will gauge how well the students are learning what the instructors want them to learn (McMillan, 2001, p. 56-75). The instructors believe that the assessment methods used in 2010 worked well. However, there are other ways to assess including, but not limited to, a final examination, a portfolio assignment, or use of a standard test.

If the decision is made to continue using pre- and post-assessment tests, future test questions should be determined using a pedagogically sound method, and the instructors need to make sure that the teaching points addressed by all the questions are covered in the course's reading assignments and practicums (Gross Davis, 2009, p. 362-372). In an effort to incorporate active learning into the course, the instructors of LIBR 1100 designed practicums that required the students to use databases, Websites, and other mainly online resources to fulfill the requirements of the assignment (Wexler & Tinto, 2005; Lang, 2008, p. 43-61). These practicums also proved effective in teaching students content. Several of the questions that were answered correctly by more students in the post-assessment test than in the pre-assessment test assessed specific teaching points the students had learned by doing the practicums. The instructors had previously been concerned about having too many practicums for a one-hour credit course. Perhaps, instead of adding more of them, existing practicums could be expanded to include two or more teaching points addressed in the questions.

Finally, the librarians teaching the distance section of LIBR 1100 must be sure their students have the means to learn the teaching points covered by the test questions (Erickson, Peters, & Strommer, 2006, p. 87-100). One way to do this is through carefully prepared scripts explaining each teaching point addressed in a test question. The scripts could be included among the tools and teaching aids that the instructors refer to during their instructor-directed online chat sessions. This practice should assist in reinforcing the learning (Erickson et al., 2006, p. 87-100). Above all, great emphasis should be placed on reviewing the course and its learning-outcome goals every year, and improvements should be made when appropriate.

8. Further research needed

Reports of research on the experiences of instructors in assessing what distance students are learning in their online classes are not well represented in the literature. This is unfortunate because instructors who want to enhance the learning that takes place in their courses and to gage that learning through assessment can benefit immensely from the experiences of their colleagues at other institutions. It is this kind of literature that would enable them to determine what methods work best and how the assessment process is used to improve teaching and learning. It is time for student learning-outcome assessment in Web-based distance courses to flourish.

9. References

Barclay, D. (1993). Evaluating Library Instruction: Doing the Best You Can With What You Have. *RQ,* Vol.33, No.2, (1993), pp. 197-198, 201, ISSN 0033-7072

Bhattacharya, M. & Hartnett, M. (2007). E-portfolio Assessment in Higher Education, *Proceedings of the 37th Annual Frontiers in Education Conference*, Milwaukee, Wisconsin, USA, October 10-13, 2007

Black, P. & Wiliam, D. (2006). The Reliability of Assessments, In: *Assessment and Learning,* J. Gardner, (Ed.), *pp.* 119-131, Sage, ISBN 978-141-2910-50-7, London, UK

Brown, P. & Hanks, R. (2008). Implementing an Online Writing Assessment Strategy for Gerontology. *Educational Gerontology*, Vol.34, No.5, (2008), pp. 397-399, ISSN 0360-1277

Caldarola, R. & MacNeil, T. (2009). Dishonesty Deterrence and Detection: How Technology Can Ensure Distance Learning Test Security and Validity, *Proceedings of the 8th European Conference on E-Learning*, pp. 108-115, Bari, Italy, October 29-30, 2009

Costagliola, G., Fuccella, V., Giordano, M. & Polese, G. (2009). Monitoring Online Tests through Data Visualization. *IEEE Transactions on Knowledge and Data Engineering*, Vol.21, No.6, (June 2009), pp. 773-784, ISSN 1041-4347

Diamond, R. (2008). *Designing and Assessing Courses and Curricula: A Practical Guide* (3rd ed.), Jossey-Bass, ISBN 978-047-0261-34-7, San Francisco, USA

Erickson, B., Peters, C. & Strommer, D. (2006). *Teaching First-Year College Students* (Rev. & expanded ed.), Jossey-Bass, ISBN 978-078-7964-39-9, San Francisco, USA

Foster, J. & Drew, J. (2009). Astrobiology Undergraduate Education: Students' Knowledge and Perceptions of the Field. *Astrobiology*, Vol.9, No.3, (April 2009), pp. 325-333, ISSN 1531-1074

Gross Davis, B. (2009). *Tools for Teaching* (2nd ed.), Jossey-Bass, ISBN 978-078-7965-67-9, San Francisco, USA

Gunawardena, C. & LaPointe, D. (2003). Planning and Management of Student Assessment, In: *Planning and Management in Distance Education*, S. Panda, (Ed.), pp. 195-205, Kogan Page, ISBN 0-7494-4068-6, London, UK

Hayes, B. & Ringwood, J. (2009). Authenticating Student Work in an E-Learning Programme via Speaker Recognition, *Proceedings of the 3rd International Conference on Signals, Circuits and Systems*, pp. 576-581, Medenine, Tunisia, November 6-8, 2009

Hernon, P., Dugan, R. & Schwartz, C., (Eds.). (2006). *Revisiting Outcomes Assessment in Higher Education*, Libraries Unlimited, ISBN 978-159-1582-76-2, Westport, Conn., USA

Hufford, J. & Paschel, A. (2010). Pre- and Post-Assessment Tests for the Distance Section of LIBR 1100, Introduction to Library Research. *Journal of Library Administration*, Vol.50, Nos.5&6, (July, 2010), pp. 139-158, ISSN 0193-0826

Ivanitskaya, L., DuFord, S., Craig, M. & Casey, A. (2008). How Does a Pre-assessment of Off-campus Students' Information Literacy Affect the Effectiveness of Library Instruction? *Journal of Library Administration,* Vol.48, Nos.3&4, (2008), pp. 509-525, ISSN 0193-0826

Kidder, L. (1981). *Selltiz, Wrightsman and Cook's Research Methods in Social Relations* (4th ed.), Holt, Rinehart and Winston, ISBN 978-003-0435-66-9, New York, USA

Lang, J. (2008). *On Course: A week-By-Week Guide to Your First Semester of College Teaching*, Harvard University Press, ISBN 978-067-4028-06-7, Cambridge, Mass., USA

McMillan, J. (2001). *Classroom Assessment: Principles and Practice for Effective Instruction* (2nd ed.), Allyn and Bacon, ISBN 978- 020-5297-51-1, Boston, USA

Mulherrin, E., Kelley, K., Fishman, D. & Orr, G. (2004). Information Literacy and the Distant Student: One University's Experience Developing, Delivering, and Maintaining an Online, Required Information Literacy Course. *Internet Reference Services Quarterly,* Vol.9, Nos.1&2, (2004), pp. 21-36, ISSN 1087-5301

Oakleaf, M. (2008). Dangers and Opportunities: A Conceptual Map of Information Literacy Assessment Approaches. *portal: Libraries and the Academy*, Vol.8, No.3, (July 2008), pp. 233-253, ISSN 1531-2542

Oakleaf, M. (2009). The Information Literacy Instruction Assessment Cycle: A Guide for Increasing Student Learning and Improving Librarian Instructional Skills. *Journal of Documentation,* Vol.65, No.4, (2009), pp. 539-560 ISSN 0022-0418

Oakleaf, M. (2011). Are They Learning? Are We? Learning and the Academic Library. *Library Quarterly,* Vol.81, No.1, (January 2011), pp. 61-82, ISSN 0024-2519

Oncu, S. & Cakir, H. (2011). Research in Online Learning Environments: Priorities and Methodologies. *Computers & Education*, Vol.57, No.1, (2011), pp.1098-1108, ISSN 0360-1315

Sima, D., Schmuck, B., Szollosi, S. & Miklos, A. (2007). Intelligent Short Text Assessment in eMax, *Proceedings of the 8th IEEE Africon Conference*, Windhoek, Namibia, September 26-28, 2007

Su, J., Lin, H., Tsong, S. & Lu, C. (2011). OPASS: An Online Portfolio Assessment and Diagnosis Scheme to Support Web-Based Scientific Inquiry Experiments. *TOJET: The Turkish Online Journal of Educational Technology*, Vol.10, No.2, (April 2011) pp. 151-173, ISSN 1303-6521

Texas Tech University, Office of the Provost. (February 21, 2011). Core Curriculum Committee Charge and Organization, Texas Tech University Website, August 15, 2011, Available from: http://www.depts.ttu.edu/provost.councilscmtes/ccc/index.php

Udo, G., Bagchi, K. & Kirs, P. (2011). Using SERVQUAL to Assess the Quality of E-Learning Experience. *Computers in Human Behavior*, Vol.27, No.3, (May 2011), pp. 1272-1283, ISSN 0747-5632

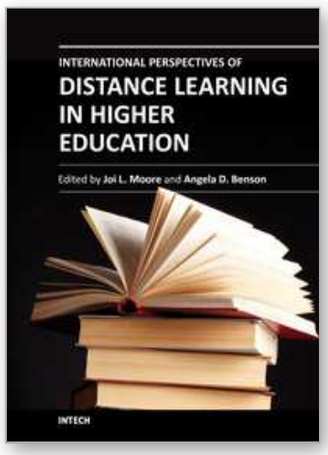
United States Department of Education. (2006). *A Test of Leadership: Charting the Future of U.S. Higher Education--a Report of the Commission Appointed by Secretary of Education Margaret Spellings*, U.S. Department of Education, Washington, D.C., USA

Urtel, M. (2008). Assessing Academic Performance between Traditional and Distance Education Course Formats. *Educational Technology & Society*, Vol.11, No.1, (2008), pp. 322-330, ISSN 1436-4522

Wexler, D. & Tinto, P. (2005). Active Learning Inside and Outside the Classroom: Creating Multiple Learning Spaces with Technology. In: *University Teaching: A Reference Guide for Graduate Students and Faculty* (2nd ed.), S.L. Tice, N. Jackson, L.M. Lambert & P. Englot. (Eds.), pp. 57-75, Syracuse University Press, ISBN 978-081-5630-79-1, Syracuse, N.Y.

IntechOpen

IntechOpen



International Perspectives of Distance Learning in Higher Education

Edited by Dr. Joi L. Moore

ISBN 978-953-51-0330-1
Hard cover, 332 pages
Publisher InTech
Published online 16, March, 2012
Published in print edition March, 2012

This book, written by authors representing 12 countries and five continents, is a collection of international perspectives on distance learning and distance learning implementations in higher education. The perspectives are presented in the form of practical case studies of distance learning implementations, research studies on teaching and learning in distance learning environments, and conceptual and theoretical frameworks for designing and developing distance learning tools, courses and programs. The book will appeal to distance learning practitioners, researchers, and higher education administrators. To address the different needs and interests of audience members, the book is organized into five sections: Distance Education Management, Distance Education and Teacher Development, Distance Learning Pedagogy, Distance Learning Students, and Distance Learning Educational Tools.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Jon R. Hufford (2012). Assessment Methods of Student Learning in Web-Based Distance Courses: A Case Study, International Perspectives of Distance Learning in Higher Education, Dr. Joi L. Moore (Ed.), ISBN: 978-953-51-0330-1, InTech, Available from: http://www.intechopen.com/books/international-perspectives-of-distance-learning-in-higher-education/assessment-methods-of-student-learning-in-web-based-distance-courses-a-case-study

INTECH
open science | open minds

InTech Europe
University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

© 2012 The Author(s). Licensee IntechOpen. This is an open access article distributed under the terms of the Creative Commons Attribution 3.0 License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

IntechOpen

IntechOpen