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# Using a Learning Management System to Facilitate Learning Outcomes Assessment

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## ABSTRACT

Increased demands for accountability among state and federal policy makers require that colleges and universities improve the process of measuring student learning outcomes. Despite a growing need, there has been limited development of integrated, electronic processes and tools that facilitate assessment of student progress toward program-level learning outcomes. Collecting student course materials, classifying by program and course-level objectives and reporting the results remains a tedious and labor-intensive task. This project demonstrates how course-level assessment data from a learning management system (LMS) can be utilized for program-level outcomes assessment. A pilot system was developed to integrate data from a LMS to provide continuous reporting of program and course-level assessment with minimal additional effort from faculty and students. This chapter shares our outcomes assessment system development approach, faculty development approach, and the lessons learned from our project, including the challenges confronted during system implementation.

## KEY TERMS

Assessment, Learning Outcomes, Electronic Learning (E-Learning), Action Research, Case Study, Web-Based Courses, Technology Enhanced Learning, Undergraduate Education, Web-enhanced Courses, Hybrid courses, Learning Management System

## INTRODUCTION

Over the past decade institutions of higher education have focused increased attention on the assessment of student learning outcomes. In part, this is a reaction to increased calls for accountability in higher education as expressed by various political and competitive forces, encouraged by the debate surrounding the reauthorization of the Higher Education Act of 1965 (Lovett, 2004; Shulock, 2004). However, it also reflects a growing understanding on the part of faculty and administrators regarding the role outcomes assessment play in both shaping the student learning experience as well as shaping the academic programs and curriculum from which students graduate. Both regional and professional accreditation agencies acknowledge this growing call for accountability and have integrated assessment standards into the accreditation process (AASCB, 2005). Measurement of these broad program-level outcomes requires program administrators, faculty, advisory boards and other constituent groups to determine what metrics constitute mastery or demonstration of a particular skill or accomplishment.

This expanded interest in outcomes assessment, while important and welcomed, creates several challenges for college faculty and administrators. For example, the manual process of monitoring the integration and achievement of learning outcomes within courses and degree programs is typically a labor intensive, paper-based process often driven by accreditation visits and timelines. Faculty and administrators are then asked to report which outcomes are addressed by which course activities and how student achievement is assessed. This information, along with sample student work, is then collected by department chairs and deans who organize and present it to visiting accreditation teams. Therefore, there is a need for a systematic and automated approach to link course level activities and assignments with program goals and institutional mission for assessment.

While assessment as a tool for improving student learning and educational programs offers great promise, existing processes for presenting outcomes assessment and collecting and summarizing student achievement are somewhat limited. In a 2008 report, Eduventures found that 76% of institutions surveyed identified difficulty in collecting and analyzing outcomes data as a "top five challenge" in implementing comprehensive assessment programs. There is a need for a more systematic process and an easier method for linking course level activities and assignments with program and institutional-level learning outcomes (Maki, 2004). Some institutions are experimenting with the use of ePortfolio systems to collect and organize student learning artifacts over the course of their tenure with an institution, and others use dedicated electronic outcomes assessment systems to collect and report on student achievement toward course, program and institutional objectives. However most institutions surveyed by Eduventures had not yet purchased an institutional software system for managing the outcomes assessment process

Although most universities have not purchased dedicated outcomes assessment systems, a growing number already own or license a Learning Management System (LMS) system. Today's LMS have the ability to capture and store every course activity, whether an exam, assignment, project, or discussion, along with the grades and evaluation of each of these activities. This capability allows the LMS to be used to facilitate the collection, analysis, organization, and reporting of course-level assessment data. The authors of this chapter initiated the use of a LMS system for outcomes assessment in an effort to improve the learning environment of students, to enhance the communication between program administrators and faculty, and to satisfy the reporting needs of their professional accreditation agency. This chapter:

- Examines the role of the LMS in facilitating the measurement of student learning outcomes,
- Discusses the technical approach used in adapting an LMS to measure student outcomes assessment,
- Discusses strategies for facilitating faculty adoption and use of the system,
- Reviews the challenges confronted and lessons learned from this case study,
- Discusses future directions in the use of an LMS for outcomes assessment.

## ELECTRONIC OUTCOMES ASSESSMENT

There is some confusion regarding the terminology associated with outcomes assessment. Terms such as learning outcomes, learning objectives and assessment are sometimes used interchangeably, and incorrectly. In addition, outcomes assessment is often interpreted differently by the various stakeholders in the academic environment. A student typically considers a course examination or project a form of evaluation or assessment of his or her individual course performance. An instructor or faculty considers these measures along with student interactions and course evaluations, typically in the broader context of his or her course. A dean considers enrollment, retention, and completion rates as indicators of faculty and program effectiveness while a policy maker might consider the impact graduates make to their respective communities as evidence of program effectiveness and value. Each of these stakeholder groups considers outcomes assessment from their various perspectives. While each set of needs is important, it does make it difficult to implement one process or method for collecting, analyzing and reporting assessment data and activities. Therefore, the following section first defines our concept of outcomes assessment and then discusses the rationale for using an LMS for outcomes assessment.

### Outcomes Assessment

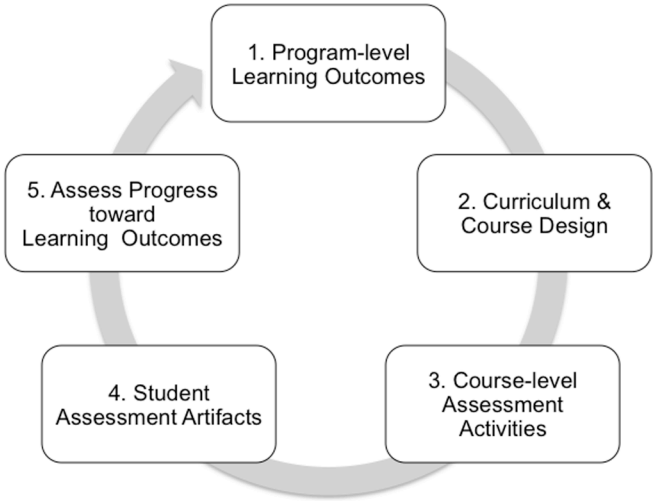
Otter defines learning outcomes as typically broad statements describing "what a learner knows or can do as a result of learning" (Otter, 1992, p. 2). Allan (1996) distinguishes between learning outcomes (broad consequences of learning) and learning objectives, which are more focused and measurable statements of future accomplishment typically subsumed under subject- or discipline-based outcomes. The Higher Education Quality Council (1993) supports this distinction, encouraging institutions to include institutional review policies that include and differentiate between learning objectives and learning outcomes. Palomba and Banta (1999) help to focus our definition on outcome measures by stating "Assessment is the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development." This definition of assessment is broad enough to incorporate varying institutional perspectives and focuses on the collection and review of various types of course data evidence with the intent of ultimately improving student learning.

A deeper understanding of the role outcomes assessment plays within higher education, along with accreditation requirements which specify the establishment of program-level outcomes assessment (AASCB, 2005; NCATE, 2002), have resulted in considerable discussion regarding how to best define, measure and achieve outcomes assessment. Typically, professional accreditation agencies such as the Association to Advance Collegiate Schools of Business (AACSB), the National Council for the Accreditation of Teacher Education (NCATE) and

Accreditation Board for Engineering and Technology (ABET) require evidence of student progress towards meeting program-level learning outcomes. This evidence can be provided through various measures, including knowledge-acquisition measures (Nicholoson, Barnett & Dascher, 2005), achievement measures (Miller, Seay & Chamberlain, 1991), student perception measures (Glynn & Rajendran, 1993), and employer and alumni perceptions (Nicholson, et. al., 2005). However the various measures and sources of data available present a challenge to colleges and universities as they determine which data to collect, how to collect it and how to report their findings. These factors have led to the inconsistent use of technology for outcomes assessment purposes (Conole and Warburton 2005).

Outcomes assessment requires accumulation of course activities from a range of courses over a period of time, then matching these activities to specific learning objectives for a specific degree program. This process is outlined in Figure 1 below.

*Figure 1. Linking Program-level Learning Outcomes to Course-level Assessment Activities*




Theoretically, the process starts with the development of program-level learning outcomes, which clearly articulate the mission of the academic program and institution and the consequences of program participation and learning for both the learner and the greater society or discipline. Course selection and curriculum design then focus on constructing a learning experience that supports the predetermined learning outcomes. The design of individual courses and assessment activities follow, the point where faculty make choices regarding course content (what is taught in each course) along with how they will assess student comprehension and mastery. Ideally, this work should begin with program-level outcomes in mind, asking how course-level activities contribute to achievement of program-level learning outcomes. Next, sources of artifacts used to assess student progress toward program-level learning outcomes should be collected, organized and archived. These assessment artifacts could include written papers and projects, quizzes and exams, homework assignments along with the notes and grades assigned by their various professors in their individual courses. While it is not necessary to collect every assignment or exam each student submits, when collected and organized by course,

program or outcome, they do provide potentially powerful insight into the abilities and understanding forming among students in a particular course and program.

Of course here lies the challenge. Prior to the introduction of electronic LMS and e-portfolio systems, the presentation of student work was a manual, paper-based process, requiring the physical collection of assessment artifacts, the organization and storage of these artifacts until a reviewer traveled to the site and sifted through notebooks or boxes of course material. Unless one is schooled in the techniques of document review, the ability to discern trends, strengths and challenges is limited by the papers submitted and the accreditor's ability to sift through these numerous materials. The broad adoption of LMS in particular means that many course assignments and activities are now occurring in an electronic format. If student course materials are submitted and stored in electronic formats, these assessment artifacts and information regarding corresponding assignments can be retrieved and displayed in electronic format as part of the outcomes assessment process.

## Outcomes Assessment and Learning Management Systems

Using a LMS for outcomes assessment is still in the early stages both from a technical and organizational perspective. A LMS can assist in the collection, organization and reporting of assessment artifacts, while promoting new online approaches towards the assessment of student learning. However, LMS have not yet included a set of tools tailored to the evolving requirements of outcomes assessment. The current technology does not aggregate data from multiple courses, departments or programs in a manner that aids reporting of student progress across courses and programs. While some common tagging methods for identifying and exchanging LMS content between systems exist (e.g., IMS standard), LMS tend to use their own data types and methods for the coding and storage of student assignments, complicating efforts to extract and repurpose student assessment artifacts. Currently, multiple systems are required to extract, classify and report on LMS assessment data.

Document management systems like Word and Adobe are used for collecting, presenting and sharing documents, reporting tools like Cognos are used for the extraction, transfer and loading of data from LMS databases to outcomes assessment systems, additional curriculum planning tools like LiveText and Task Stream are used for planning and defining program goals, and rubrics development tools are used for the evaluation of student work. These in-house solutions require educational institutions to hire expert IT staff to manage, integrate, and maintain a suite of software tools, and require complex training and faculty oversight. The technology required to conduct electronic outcomes assessment is thus expensive, confusing and tedious.

A fully integrated LMS with outcomes assessment tools could simplify this task as well as make most activities transparent to administrators, faculty and students. What is needed, according to Neil Allison, is a set of systems that can embed assessment in curriculum design by providing a set of tools to facilitate both summative assessment (after), and formative assessment (during) as part of regular course activity (Hampson, 2008). These future LMS should be able to extract student artifacts like assignments and exams from their databases and rubric-based evaluation forms and link them to program learning outcomes. These knowledge-driven intelligent automated systems would improve assessment quality without significant time involvement from the faculty and/or administrators.

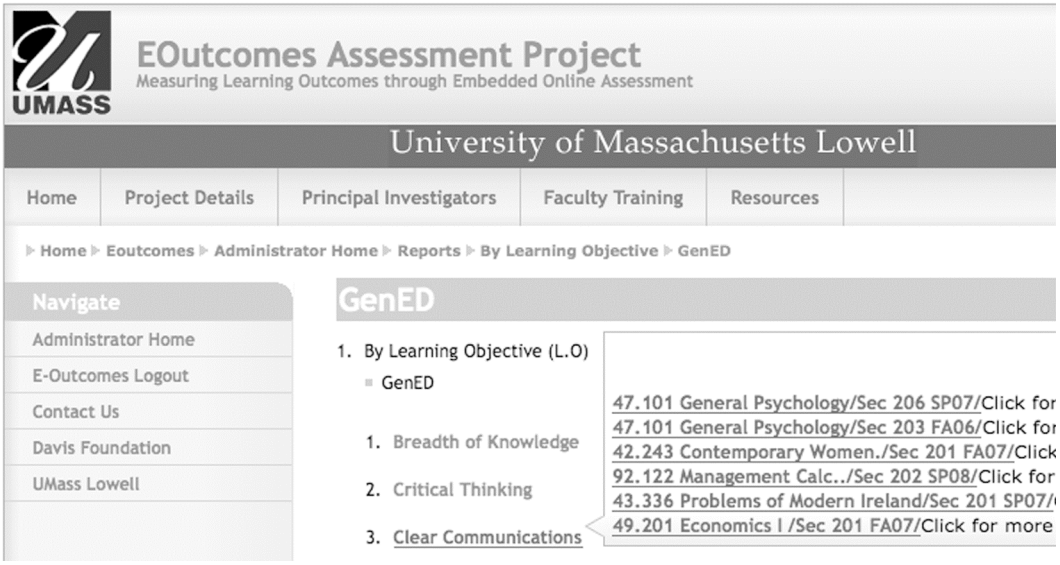
Several commercial outcomes assessment tools have entered the market over the last few years (see Appendix A). These systems target outcomes assessment activities such as planning, accountability, learning goals matrix development and reporting. They include four common components: 1) *Planning Tools* – which provide environment for strategic planning, creating learning goals and criteria for measurement; 2) *Tracking and Analysis Tools* – which provide customizable templates for defining learning objectives, rubrics, surveys, course evaluations and portfolios; 3) *Reporting Tools*– which provide customizable templates for reports, dashboards and institutional accountability; 4) *Collaboration Tools* – which include email, calendaring, document sharing and management, and conferencing capabilities for assessment teams to communicate and collaborate effectively. Some provide limited integration abilities with LMS while others have no integration. Most of the vendors were at the early stages of developing outcomes assessment software in 2006 when we started our eOutcomes project.

The key weakness of these systems is that they currently do not fully integrate with learning management systems (LMS) or other campus-wide student registration and reporting systems. The only exception to this is BlackBoard Learn, a relatively new system, which claims to provide integration with their Blackboard LMS data. Another problem with these tools is that they are not yet independently validated with faculty, staff and students at higher education institutions. No data is available on how successful these systems have been in measuring outcomes or in improving the quality of assessment in academic programs.

## THE eOUTCOMES CASE STUDY

The goal of our outcomes assessment project was to design and develop a systematic and automated approach to collect, organize and report learning outcomes electronically with LMS integration. A pilot study with twelve on-campus web-enhanced courses in business and general education was conducted on our campus over two years. Our vision was to implement an outcomes information system that would allow faculty and administrators to click on a program-level learning outcome, see a list of courses that addressed this outcome, then see the assessment activities and student assessment artifacts associated with each learning outcome (see Figure 2 for a screenshot of the eOutcomes System).

*Figure 2. eOutcomes System as viewed by Faculty*




## Method and Approach

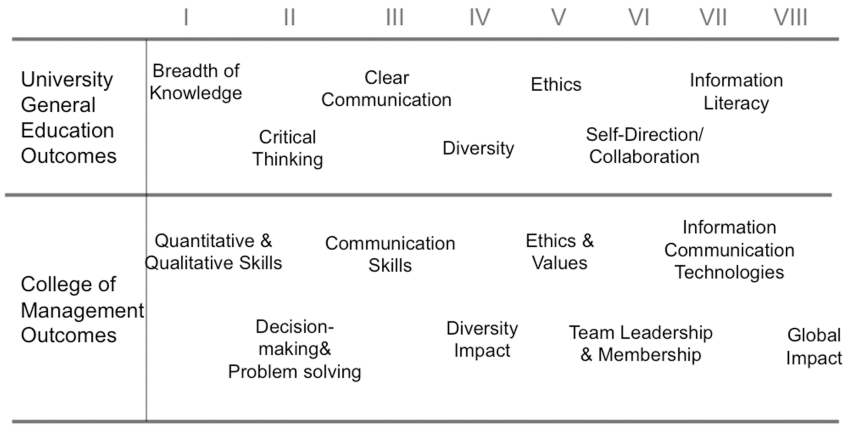
The integration of an LMS into an on-campus course without a reduction in class meeting time is typically referred to as web-enhanced or hybrid learning (Allen and Seaman, 2006; Ko and Rossen, 2001). The intent of this modality is to enhance on-campus course activities with online resources, assignments, communication tools and assessment activities. In order to collect, classify and report course-level student assessment activities to program-level learning outcomes, it was necessary for the course-level assessment activities to be conducted and recorded electronically. In this regard, use of the LMS provided increased student access to course materials and assessment activities while also serving to electronically store and record individual student activities and their performance on these activities. Prior to the start of research activities, the proposal was reviewed and approved by the University's Institutional Review Board which required the informed, written consent of all students and faculty participating in this study.

This project utilized an action research methodology as described by Kemmis and McTaggart (1988) and Stringer (1999), where the researchers worked with the subjects to change practice in regard to outcomes assessment. Action research was first used in industry settings in an effort to improve the efficiency of business processes and work teams (Glesne, 2006; Whyte, Greenwood & Lazes, 1991). This qualitative method engages the knowledge and experience of major stakeholders in the research process, incorporating their comments and feedback and modifying the treatment as required. The researchers serve as facilitators, introducing the treatment, problem or challenge, to the participants; facilitating a discussion around the topic and recording suggestions and potential solutions. The researchers assist the participants in implementing and evaluating the effectiveness of the solutions deployed. This cycle continues for the duration of the research project.

The major stakeholders included the faculty and students participating in the study, administrative department chairs and deans from the respective academic programs and the campus information technology unit that hosts the University LMS. The business and general

education curricula were selected because each program had developed an extensive set of program-level outcomes which included several common elements (see Figure 3).

*Figure 3. Comparison of Business School and General Education Learning Outcomes*




The researchers served as consultants knowledgeable in the design and deployment of web-enhanced courses; colleagues engaged in the teaching and assessment process and as facilitators, assisting stakeholders to articulate their respective needs in relationship to the development of an electronic outcomes assessment process. The researchers designed and modified both the electronic outcomes assessment process and the faculty training based on their respective expert knowledge and numerous conversations with study participants.

The data summarized in this paper were collected at the conclusion of the Fall 2006 and Fall 2007 semesters. Table 1 list the courses and student enrollments of those participating in this two-year project.

*Table 1. Project Course Offerings And Enrollments*

| Course Name | Enroll | Discipline | Sem. | Program |
|---|---|---|---|---|
| Contemporary Women Writers | 17 | English | FA06 | General Education |
| History of Crime & Social Control | 29 | History | FA06 | General Education |
| General Psychology | 35 | Psychology | FA06 | General Education |
| Business Finance | 155 | Finance | FA06 | Business Education |
| Marketing Principles | 98 | Marketing | FA06 | Business Education |
| Exploring the Universe | 103 | Physics | FA07 | General Education |
| Economics I | 39 | Economics | FA07 | General Education |
| Management Calculus (2 sections) | 71 | Math | FA07 | General Education |
| Organizational Behavior | 150 | Management | FA07 | Business Education |
| Operations Management (2 sections) | 67 | Operations | FA07 | Business Education |
| Financial Accounting (2 sections) | 217 | Accounting | FA07 | Business Education |
| Operations Management | 30 | Operations | FA07 | Business Education |
| **Total Enrollments** | **1011** | | | |

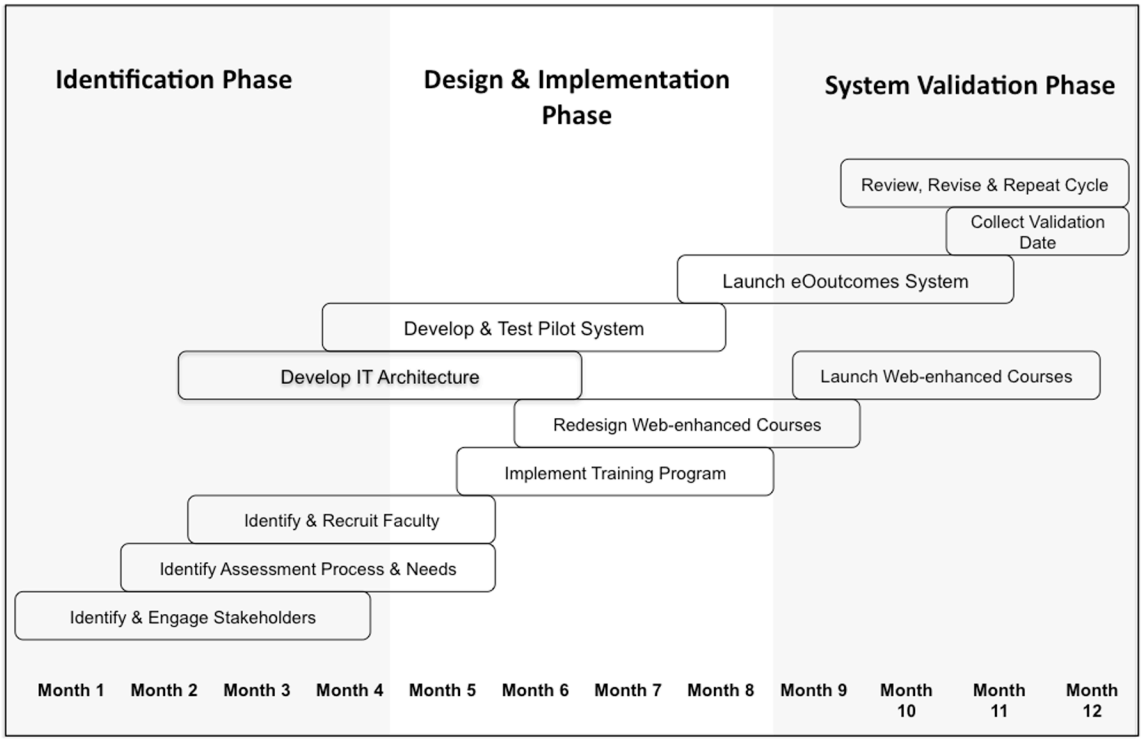
During the first year of this two-year project five faculty participated, two from the business school and three from the General Education program. Each faculty member participated in a summer training program and then developed a web-enhanced course site for the 2006–2007

academic year. During the second year of the project, an additional seven faculty participated in the project, four from the business school and three from the General Education program. The second year faculty also participated in a summer training program and then developed and offered a web-enhanced course during the 2007-2008 academic years.

## The eOutcomes System Life Cycle

While developing the eOutcomes system we used the system development life cycle (SDLC) process (outlined in Figure 4 below and discussed in the sections that follow). This allowed us to follow a systematic process of identifying, designing & implementing, and validating eOutcomes at our university. For user-centric systems, like eOutcomes, it is often better to have a structured methodology to avoid missteps and coordinate the design and development tasks properly amongst the members of a large design team.

*Figure 4. eOutcomes Project System Life Cycle Process*




SDLC uses a *systems approach* for problem-solving which basically states that complex problems need to be broken-up into smaller manageable problems using a systems' hierarchy and then the team develops a solution for each problem within the hierarchy of any enterprise system (Motiwalla and Thompson 2009). The structured or phased approach is designed to catch problems at an early stage before they become a major risk to the system implementation process. The SDLC process requires both technical and non-technical problem solving skills; therefore, design and implementation of systems like the LMS, must consider technology in context of the organization's business processes, culture, and people.

## Identification Phase

*Identification of Program-level Outcomes Assessment Needs* – this involved meeting with academic deans and department chairs to identify the evidence required to assess student progress to program-level learning outcomes. The business school outcomes assessment required evidence that demonstrated student ability to apply communications skills, quantitative and qualitative analytical skills, information technology skills, team leadership and membership skills along with an understanding of ethics and the impact of diversity and globalization on business organizations. The General Education program required evidence that demonstrated student ability to apply communications skills, information literacy skills, critical thinking skills, and self-direction and collaboration skills along with an understanding of ethics, the impact of diversity and familiarity with several different areas of knowledge. The evidence typically collected at the program level included student case studies, papers, projects and exam performance.

*Identification of Course-level Assessment Activities* – this involved meeting with participating faculty to identify the various types of assessment activities each used in their respective courses. This phase also required a discussion with faculty regarding how these course-level assessment activities contributed to program-level learning outcomes. The point of this conversation was two-fold. First, it assisted the researchers in considering how to best translate traditional classroom assessment activities (e.g., papers, exams, presentations) to electronic assessment activities in the LMS. Second, it assisted faculty participants to think about how these classroom activities aligned with program-level outcomes assessment. These conversations occurred at the annual faculty training sessions and in smaller, one on one discussion with the researchers.

*Identification of Technical Design Requirements and Challenges* – this involved meeting with IT staff who operated the University LMS. These staff were familiar with both the functional operation and use of several LMS course tools and the ability to collect and extract data from the LMS. While the researchers were both experienced online instructors, familiar with the various LMS course tools, the ability to collect and extract data from the LMS was dependent on the IT staff's knowledge, ability and willingness to provide root level access to this data. This latter issue, the ability to find and extract data from the LMS, proved challenging and resulted in the decision to design an external, electronic outcomes assessment system for the classification and reporting of assessment data.

## Design and Implementation

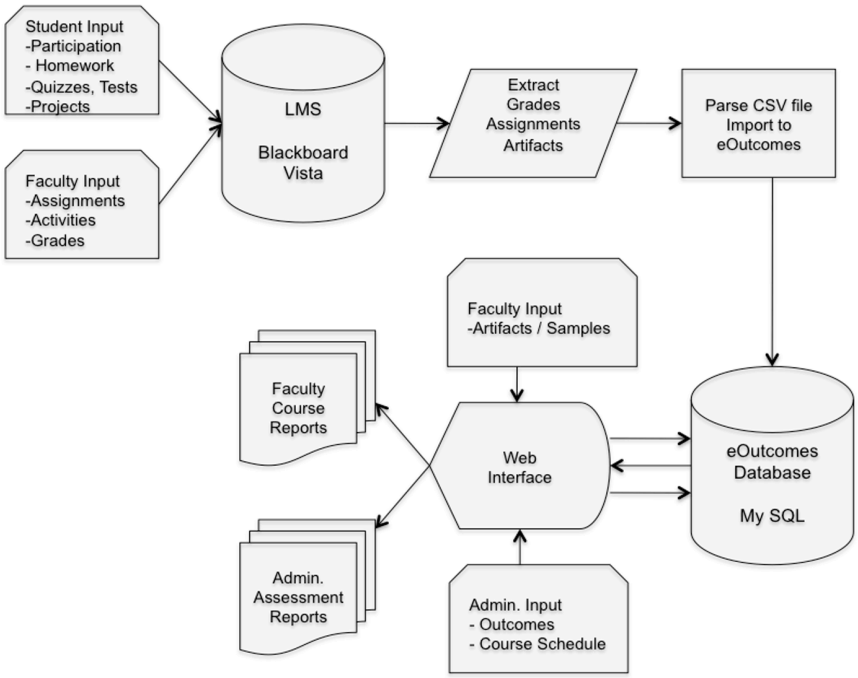
The design and implementation of eOutcomes was an ongoing iterative process during both the first and second years of the project. The design of the system was followed each year by the summer faculty training program and the deployment of web-enhanced courses in the subsequent Fall semesters. Revisions to our electronic outcomes assessment system, approach to training and deployment of web-enhanced courses occurred along a similar timeline.

### Database Development

During the first year we created an initial design and development of the electronic reporting process and system. Working closely with IT staff, the researchers developed the eOutcomes architecture, as shown in Figure 5. While the researchers initially planned to classify course-level assessment activities in the LMS, the LMS design at the time, along with concerns that this work might impact other users of the LMS, precluded the modification of LMS code to accommodate this approach. Additionally, the manner in which the LMS coded and stored student assignments

prevented the researchers from extracting individual student assignments (as evidence of student progress toward learning outcomes) from the LMS. This meant that an external, electronic outcomes assessment database and a method for extracting course-level data from the LMS would have to be developed.

*Figure 5. eOutcomes Database Architecture*




An external database was developed using MySQL, and a web-interface for faculty and administrators facilitated the classification and reporting of student, course and program level assessment activities. A batch process was executed daily to extract student and course level data from the LMS, using the Gradebook Report available in Blackboard Vista. This report included student performance data along with a record of all course assignments. This daily data extract was parsed using a custom Perl script and then imported into the eOutcomes system. If any graded activity (e.g., exam, quiz, project, assignment, discussion thread) in the LMS changed , it was updated in the eOutcomes system during the next batch process. The eOutcomes system was then accessed by faculty to classify course-level assessment activities according to program-level outcomes. Faculty also uploaded electronic samples of student work to eOutcomes, providing additional evidence of student progress toward program-level learning outcomes.

**Faculty Development**

To ensure successful deployment, we conducted a two-day summer training workshop for each set of participants. The curriculum examined the development and assessment of learning outcomes, an introduction to the LMS course tools, and training in how to develop a web-enhanced course materials and electronic assessment materials (available online at http://eoutcomes.uml.edu/eoutcomes/resources.html). Participants were asked to bring their course syllabus and related materials to the training and received hands-on assistance from

project staff. During each training session, participants raised new questions and challenges in regard to moving their specific course into a web-enhanced format:

- How do I manage a high-enrollment lecture class online?
- How do I reduce cheating on online exams?
- Do students have to submit all materials electronically?
- How do students submit Math problems online?
- If I put my materials online, won't the students skip my class?

These questions and others had to be answered in order to facilitate faculty transition to a web-enhanced model, thereby increasing the opportunity for electronic outcomes assessment. Questions like these *posed technical challenges* (e.g., What format should student papers be submitted in?), *pedagogical challenges* (e.g., How do I design and manage web-enhanced course activities?) and *commitment challenges* (e.g., Is electronic outcomes assessment worth all this extra work?). In response to faculty requests, we expanded the training program to a third day, later in the summer, when faculty could come back to campus to discuss the challenges they encountered while preparing web-enhanced course materials. We provided technical support throughout the year and worked with the LMS/IT staff to answer the more difficult technical questions.

During these training discussions one experienced, tenured faculty member shared a frank and surprising observation, he said "You know, I hadn't really thought a lot about outcomes when I designed my past courses…I know what I need to cover, I structure the course around the content, then design a test and assignments to make sure the students are learning the material…but I don't really think about programmatic outcomes." Perhaps this comment isn't really that surprising. In fact it underlines the challenge in moving higher education toward outcomes assessment. For the most part, faculty focus on the courses they teach and the students in these courses, while department chairs, deans and administrators take responsibility for organizing and conducting programmatic assessment activities. In the traditional, paper-based assessment system, administrators may request copies of course materials once a year or less, limiting faculty engagement in the process. This participant's comment suggests that the redesign effort required to move paper-based assessment materials into an electronic, web-enhanced format as part of this project helped him to think more deeply about the relationship between course-level assessment activities and program-level learning outcomes.

## System Validation

While several commercial electronic outcomes assessment tools exist on the market, no vendor independent study examines their acceptance and success rate among college faculty and administrators. Clearly, college administrators who are responsible for outcomes assessment reporting can recognize the value of a system that improves and facilitates the current manual process. However faculty who are somewhat removed and uninvolved in outcomes assessment may not see the need or value in an electronic process. Since successful adoption of an electronic outcomes assessment tool requires the support and participation of both faculty and administrators, we examined faculty experiences and perceptions regarding the use of an LMS for outcomes assessment. Three research questions guided our validation study:

1. Which LMS tools do faculty use for student assessment purposes in web enhanced courses?

2. Do faculty perceive a benefit in the use of a LMS for linking course-level and program-level assessment activities?
3. Does electronic outcomes assessment provide some type of cost benefit over traditional, paper-based methods for measuring outcomes?

Question one and two were examined through an online survey of participating faculty and through discussions with faculty after deployment of web-enhanced course activities. The researchers interviewed all faculty participating in the project at least once outside of the training sessions to discuss their individual use of the LMS for outcomes assessment activities. Question three examined whether or not the embedding of outcomes assessment within the LMS facilitates efficient classification and reporting of program-level assessment data for accreditation purposes. The researchers interviewed participating faculty and academic administrators to develop a sense of the faculty usage and interest in outcomes assessment system and the economic consequences of implementing an electronic system.

## FINDINGS

Faculty participants were surveyed regarding use of the LMS in their respective web-enhanced courses (at the end of each semester) and their use of the eOutcomes system (toward the end of the study). This data is summarized in Appendix C and discussed in more detail below. Faculty feedback regarding how each used the LMS assisted us to better understand how assessment artifacts are collected and stored in the LMS. Use or non-use of an LMS tool (e.g., discussion forum, quiz or exam tool) on the part of the faculty plays a significant role in determining how effectively the LMS can serve in the collection and organizing function of the outcomes assessment process. Faculty feedback regarding their perceptions of the utility and functionality of the eOutcomes system helped us to refine the systems interface and functionality. Feedback regarding faculty use of both the LMS and eOutcomes system helped us to understand the time commitment required by faculty when involving them in the outcomes assessment process.

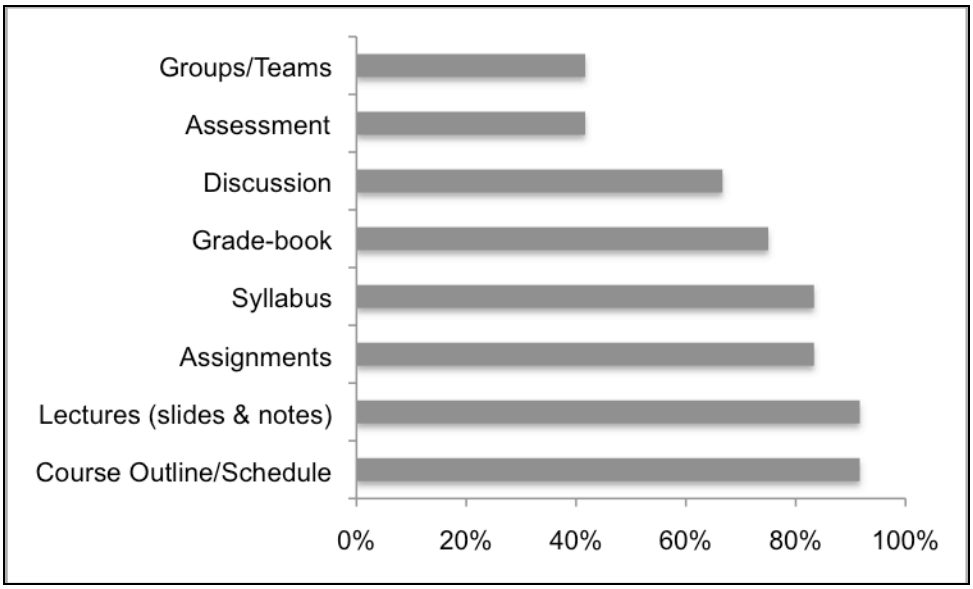
### LMS Use by Faculty

The LMS in use at the time of this study was Blackboard Vista 3.x. Like many LMS, Vista has a common set of course tools including Assessment tools (quizzes, exams, surveys), Assignment tools (for posting/collecting homework assignments), Communication tools (discussion forum, chat, email), Content tool (for presenting/sharing lecture notes, presentations and related material), a Gradebook tool, an Outline/Schedule tool, a Syllabus tool, and a Team tool (for grouping students for course related activities). All participants in this study received Vista training prior to participation in this project. Project training activities focused on examining how faculty might use these various LMS tools in a web-enhanced course to facilitate the collection and organization of student assessment artifacts (e.g., papers, exams, presentations, homework). Participants were asked to introduce a minimum of three LMS tools into their first semester web-enhanced course. A majority of participating faculty (60%) placed more than 50% of their course material and activities online in the LMS.

As demonstrated in Figure 6, nearly all courses used the Outline/Schedule, Lecture Notes, Assignment and Syllabus tools, followed by use of the Gradebook, Discussion, Assessment and

Group/Teams tools. This is consistent with an earlier University of Wisconsin study which found that faculty use LMS primarily as an administrative tool to distribute course materials and manage quiz administration (Morgan, 2003).

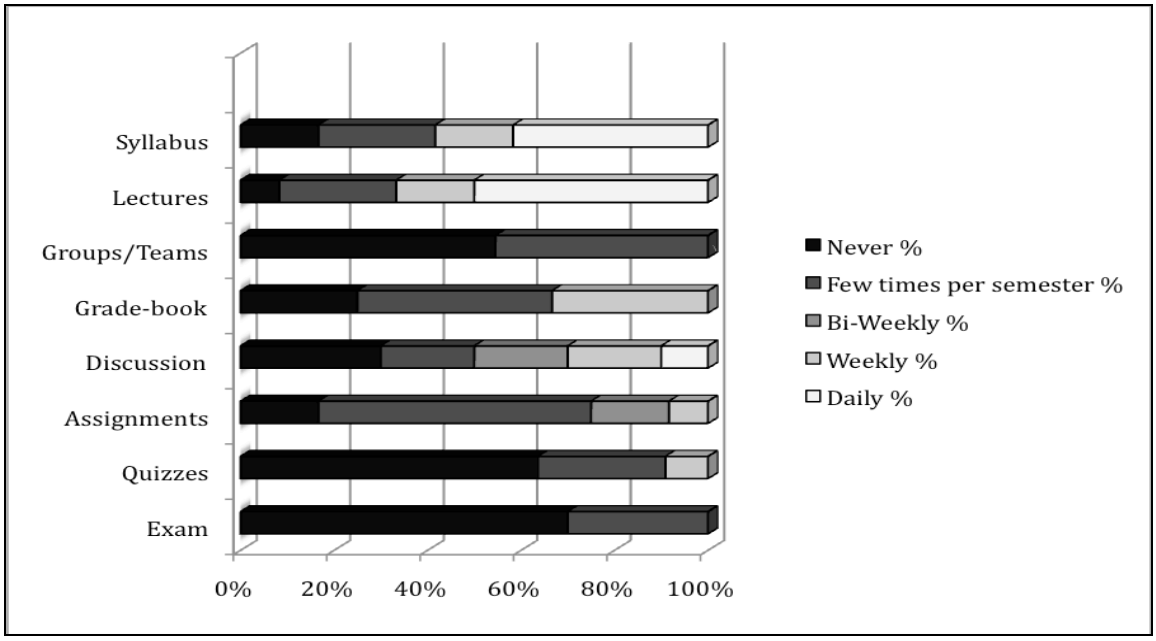
*Figure 6. Use of online course tools within participating courses (N=12)*




The range of tools used by faculty participants suggested that the LMS could be used as a reliable source of student assessment artifacts, evidence of student progress toward course-level learning objectives. The use of the Gradebook tool in 9 of the 12 courses supported our ability to extract student performance data from the LMS into the eOutcomes database. However use of a tool in the LMS by faculty, did not necessarily mean student work would be stored in a universal electronic format that could be extracted from the LMS and then shared as evidence of student progress. Further conversations with faculty indicated that a range of assignment types were being used by faculty in the LMS. Assignment types ranged from homework responses posted in a discussion forum, to online quiz responses, to the posting of online papers and presentations. While collection and organization of assessment activities in the LMS was critical to our approach, we also needed a universal format for displaying student-created content as evidence of student progress. Since the LMS stores student artifacts in different formats depending on the manner of submission (e.g., as a discussion thread or as an attachment), we ultimately determined that faculty would need to save sample student work as Adobe PDF files (using the "Print to PDF" function) in an external database.

In addition to understanding which tools faculty used in the LMS, we also examined how frequently they used these tools (Figure 7). A review of faculty usage of LMS tools quickly indicates that some LMS tools were used more frequently than others. The Lecture and Syllabus tools were used on a weekly or daily basis in a majority of courses while 60% to 70% of participating courses never used the Exam or Quiz tool. This finding has important implications for electronic outcomes assessment – if assessment activities do not occur in the LMS, you cannot extract evidence of student progress from the LMS.

*Figure 7. Frequency of LMS Tools as used by faculty in each web-enhanced course (N=12)*




The major obstacles identified by faculty toward using the LMS for exam and quizzes were concern over cheating, lack of sufficient computer lab space for large section classes and difficulty in presenting or recording content electronically (e.g., showing student work on math exams). In most web-enhanced courses, faculty were reluctant to offer unmonitored online exams. While the LMS software supported some online exam controls (e.g., random-draw questions, password protection, time limits, lock-down web browser) faculty generally required students to take exams on campus using paper and pen.

Exams and quizzes are however only one type of assessment activity. Homework assignments, discussion postings, student projects and other activities also assist faculty and programs in assessing student progress. Over 80% of the courses used the Assignment tool to collect and manage student assignments, 70% used the Discussion tool and 45% used the Groups/Teams tool. These faculty reported a generally favorable reaction from students regarding the use of these online tools in their web-enhanced courses and a majority of faculty (81%) agreed or strongly agreed that use of the LMS contributed to the success of their students in participating courses. Ultimately, the use of these tools in our web-enhanced courses has helped in collecting and organizing assessment materials for faculty and provided electronic resources for our outcomes assessment process.

## Faculty Perceptions regarding eOutcomes

In regard to the use of the eOutcomes System, the majority of faculty indicated that the system was easy to use (80%) and that the system made the process of capturing and measuring outcomes assessment easier (73%). However, despite their participation in the project and general agreement that the eOutcomes system facilitated the outcomes assessment process, only 54% indicated that the system was a useful tool for capturing and measuring learning outcomes. Our

sense of this discrepancy is that some faculty did not recognize the administrative value of consolidating course-level data within one system for program-level analysis. Despite this one discrepancy, 63% of the faculty indicated they would use the system in place of manual, paper-based outcomes assessment and 62% agreed that other faculty would find it useful. We conclude that faculty generally agreed with the project investigators that this project leveraged technology and an appreciation for outcomes assessment in order to strengthen the teaching and learning practices at the University.

## Cost Impact

Our discussion of cost impact and savings is somewhat limited by the technical challenges faced in attempting to integrate with the LMS (and the accompanying need to develop an external eOutcomes system) along with the effort required to train faculty in both the use of the LMS for web-enhanced courses and in the eOutcomes process. If we had fulfilled our original goal of conducting electronic outcomes assessment (including the organization, classification and reporting of student assessment artifacts) within the LMS, we would not have spent technical time on the design and development of an external eOutcomes system. Additionally, faculty would only be trained in the use of the LMS and would not require additional training in the use of the eOutcomes process. This was the streamlined process we originally envisioned.

Unfortunately, the design of the LMS required an external eOutcomes process which necessitated additional technical and faculty development effort. Despite the development challenges encountered, participating faculty generally found the electronics outcomes process agreeable and preferred to a manual process, where they would have to collect, copy and organize physical assessment artifacts. A conversation with the Dean of the Business School and the Director of Undergraduate Education suggests that there are cost savings in terms of the time spent preparing paper-based assessment materials. The Director reports that he spends days reviewing and organizing the physical assessment artifacts handed in by faculty, if they are actually handed in. He also reports the need to "remind" faculty regularly that these materials are due (or overdue, as the case may be). From their administrative perspective, there is a significant savings in time associated with the electronic batch acquisition of assessment materials. In addition, the dashboard and graphic reporting tools built into the eOutcomes system eliminated several days of manual data entry as the Director transferred each courses' coversheet data into his own Excel spreadsheet. Faculty also reported additional areas of savings, including:

- Supply savings – less Scantron sheets and paper for exams, less duplicating of course materials
- Proctor savings – less time spent scanning, reviewing and reporting exam grades (less room for error)
- Faculty time savings due to:
    - online grading exams, many are auto-scored
    - online grading quizzes, many are auto-scored
    - no longer required to fill out assessment spreadsheets
    - no longer required to collect samples of student work making copies
- Overall reduction in usage of paper, data re-entry time and recording errors

## CONCLUSION

The demands of learning outcomes assessment increasingly impacts all institutions of higher education, however emerging information technology tools can facilitate the process of collecting, organizing and reporting campus progress toward meeting program learning outcomes. We have shared this case study example in the hope that other institutions will find our approach and methods beneficial and adaptable to their institutions. Based on this research effort, we share the following lessons critical to supporting implementation of an electronic outcomes system:

*Develop a clear understanding of your outcomes assessment process* – as discussed earlier in this chapter, students, faculty, administrators and external stakeholders each have different perspectives regarding outcomes assessment. It is critically important that program stakeholders have a clear understanding of expected program outcomes, accreditation requirements and the relationship between course-level assessment activities and program-level outcomes assessment. While the assessment cycle shared in Figure 1 is intuitive, our experience suggests faculty do not typically integrate program-level concerns into their course-level activities. Before any technology plan is developed, faculty need to understand and value outcomes assessment.

*Sustainable commitment from senior administration* – in order to secure faculty involvement, administrative staff and technical support the executive administration must not only support the project verbally but also make a sustainable financial commitment in terms of equipment and staff time. Electronic outcomes assessment crosses institutional boundaries, requiring faculty to work with IT staff, curriculum staff and administrators. Cross-boundary collaboration typically requires the encouragement and support of senior administrators.

*Faculty commitment & support* – we found that in order to realize the efficiencies of an electronic outcomes assessment process, faculty had to make a concentrated commitment to using the LMS for the organization, collection and grading of the majority of course assessment activities. This meant time developing electronic course materials, changing how they graded course materials and time to rethink past assessment practices. In addition, their willingness to learn new processes and to take risks with their courses and peers is important. Certainly, the incentives the grant supported (i.e., Tablet PC and a development stipend for each participant) helped encourage faculty to take this risk with us.

*Technical Support for faculty* – the process of converting course content into online format, especially beyond posting lecture notes, is complex and difficult. Creating and assessing online assignments, quizzes and exams requires considerable technical support in the early stages of the project as well as over the long-term. When last minute problems with exams and grades occur, faculty demand immediate resolution. Technical support staff must be in place to assist in resolving these technical issues or both students and faculty will disillusioned with the project.

*LMS, IT Services support & involvement* – one of the key reasons this project succeeded was due to the support and commitment of the UMass Online technical staff and administration. They were willing to take risks in providing access to the online course data on an ongoing basis. There were several challenges in the early stages of the project but we were able to overcome and streamline the data transfer from Vista to eOutcomes system.

The development and use of web-based assessment activities to facilitate program-level outcomes assessment requires an additional time commitment on the part of faculty and, possibly, students. Faculty must learn to use the various LMS tools for web-based assessment activities and may also need to redesign assessment activities to facilitate electronic submission. Additionally, while typically focused on course-level teaching and assessment, program-level assessment requires faculty to think about how course-level activities relate to higher level, program outcomes. In some instances this may also lead to the redesign of course syllabi and course activities, a commitment of additional time and effort. However trends in online education suggest that more and more faculty are developing web-enhanced courses, despite the effort, in order to increase student access to course materials. If this effort is expanded to include the electronic collection of student assessment activities and LMS developers integrate outcomes assessment tools into their systems, the ability to provide real-time reporting on student progress toward program and institutional outcomes can be realized while ultimately saving faculty and administrative staff time.

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## APPENDIX A

The following is a list of key software vendors in the outcomes assessment area today.

- *LiveText*: LiveText has three sets of tools 1) Evidence -- which gathers student data from courses or programs, 2) Assessment – tools like rubrics, surveys and peer-evaluation forms for evaluating performance against learning outcomes, and 3) Analysis – report generation tools to present data in different formats for various stakeholders. Supports three categories of stakeholders 1) Students – allowing them to create e-portfolios, look at instructor feedback and collaborate in teams, 2) Instructors – allowing them to create course templates, assess student learning and develop course and e-portfolios, 3) Administrators – allowing them to create assessment reports, self-studies and program assessment plans and manage other accreditation requirements. For more information visit http://www.livetext.com.

- *Tk20 CampusTools:* Provides a process for data collection, assessment planning, and comparison tools to link course activity to learning goals, ability to generate a variety of reports for compliance, analysis, and program improvement. Tk20 also provides survey and assessment rubric tools, faculty profiling tools, customizable reporting tools.For more information visit http://products.tk20.com.

- *Task Stream:* A learning achievement and accountability management system provides Web-based tools for capturing and analyzing institutional processes, student learning data from classes, programs and institutions and provides analysis and reporting tools. Accountability Management focuses on administrators to aid in measuring institutional effectiveness while the Learning Achievement Tools focus on faculty and students ability to develop course artifacts, rubrics, surveys and e-portfolios linked to learning objectives. Provide reporting tools which aggregate and present data analysis for administrators and faculty. For more information visit http://www.taskstream.com.

- *TracDat:* Enterprise-wide system for managing assessment process. Provides tracking tools that integrate data at program and course levels. Aids alignment among learning goals, course and student activities with tools for curriculum mapping, rubrics and surveys. Includes reporting tools to assess progress toward course and program goals. For more information visit http://www.nuventive.com/.

- *Blackboard Learn:* The Learn platform is from Blackboard, Inc. the same company that provides LMS software for e-learning. A relatively new software that provides support for outcomes assessment with multiple data collection measures on student progress. It provides tools for planning, assessment, accreditation and reporting. Includes collaboration tools for managing a document repository. For more information visit http://www.blackboard.com/learn.

## APPENDIX B

**Faculty survey responses regarding use of the Vista LMS and the eOutcomes system (N=12)**

| **Faculty Use of the Learner Management System (LMS):** | **Faculty Participants' Responses** |
|---|---|
| Total course materials placed online | 60% posted more than 50% of materials online |
| Tools used most frequently by faculty | Syllabus, Lecture Notes, Grade-book & Discussion Forums |
| Tools used regularly by faculty | Assignments & Discussion Forums |
| Tools used in-frequently by faculty | Assessments & Teams |
| Tools never used by faculty | Chat Room |

| **Faculty Perceptions of Student Use and Impact of the LMS:** | **Faculty Participants' Responses** |
|---|---|
| Tools used frequently by students | Syllabus, Lecture Notes, |
| Tools used regularly by students | Assignments Grade-book, & Discussion Forums |
| Tools used in-frequently by students | Teams |
| Tools never used by students | Assessments & Chat Room |
| Student reaction to use of Syllabus, Lecture Notes and Grade-book | Favorable or Highly Favorable |
| Contributed to student success | 81% agreed LMS contributed to student success |

| **Faculty Perceptions regarding use of eOutcomes System:** | **Faculty Participants' Responses** |
|---|---|
| Overall usage | 84% used eOutcomes System more than once/semester |
| User interface | 80% agreed that interface was easy to navigate |
| User prompts | 82% agreed that user prompts were easy to understand |
| Process of capturing learning outcomes | 60% agreed that it met their expectations |
| Process of capturing learning outcomes | 72% agreed that the time it took to accomplish tasks in the system was acceptable |
| Process of capturing/measuring learning outcomes | 73% agreed that it made the process easier |
| Usefulness of system | 54% agreed that the system was a useful application for capturing/measuring outcomes |
| Instead of manually recording learning outcomes | 63% agreed they would use eOutcomes system |
| Future use in other colleges | 62% agreed other faculty would find it useful |