Proposed Model for Evaluating C/LMS Faculty Usage in Higher Education Institutions

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Abstract

Course/learning management software accessed by students via the internet is now commonly offered to faculty in nearly all institutions of higher education to support instruction. However, the measurement of the usage of this software is problematic and often relies on incomplete data, simple counts or ad hoc surveys, and estimates based on guesswork. This paper proposes a fourteen-step model to measure course/learning management system usage. The model, metric and software methods for its derivation can be applied across different C/LMS software to provide a reliable means of comparing usage across different systems and institutions and thus overcome a serious barrier to administrative decision-making and further research in this area.

Background

With the advent of the Internet in the 1990s, software to support instruction in institutions of higher education has been developed and refined into proprietary systems such as Blackboard (Blackboard, 2007b), WebCT (WebCT, 2007), Desire2Learn (Desire2Learn, 2007), Angel (Angel, 2007) and open-source systems such as Sakai (Sakai, 2007) and Moodle (Moodle, 2007), among others. Blackboard, touted as the most widely used of the proprietary systems, indicated in its annual report for 2006 that it had secured over 3,400 clients for its system, and recently acquired its closest competitor, WebCT, which added another 1,300 clients of various types (Blackboard, 2007a). Software such as Blackboard can generically be referred to as a Course/Learning Management System, or C/LMS.

These software systems, and other systems with similar capabilities developed locally by some institutions for their own use, typically support instruction with a variety of services, including the electronic distribution of course syllabi, course content in text, audio, and video formats, grades and instructor's feedback to learners; they provide the ability for instructors to post hyperlinks to web sites that provide instructional content; they provide "forums" for the exchange of ideas in "discussion boards" or real-time chat rooms, as well as facilitating instructor-to-student(s) e-mail and perhaps student-to-student e-mail; and they may provide facilities for students to submit work assignments electronically, thus facilitating distance education courses in which students are not physically present in a classroom. In addition, many of these systems provide the means to administer quizzes and tests online, in a variety of forms, and to automatically determine grades for these items. In short, these systems provide the means for instructors to manage the "content" of a web site accessible to students in their courses without the need for the arcane technical expertise to actually code in HTML or an HTML editor, as would be required to support an independent web site to accomplish these functions. Further, instructors are empowered to easily activate or deactivate features to enrich the student

learning experience, without the requirement to master anything more than an understanding of simple operations.

Goal and Importance of the Research

It is of considerable interest to administrators in institutions using a C/LMS to be able to assess the actual extent of faculty usage of the C/LMS, because the acquisition or construction of such a system and its annual cost of operation are substantial. The need for a reliable index of the extent of usage of a C/LMS becomes apparent when one considers the difficulty of assessing to what extent a C/LMS is actually used within an institution and especially between different institutions. MIT conducted a major survey of nine of its peers for the 2004/2005 academic year concerning C/LMS usage. (MIT, 2006) These extracts of the final MIT survey report are particularly insightful because they note the difficulty of discerning types of C/LMS use:

> "Significant use" was defined as courses that use the C/LMS for meaningful instructional activity and not just for administrative purposes. While this was difficult to estimate, five institutions indicated that at least two-thirds of courses met this definition. Princeton and MIT estimated that about 50% of their courses made "significant use" and three others [institutions] did not wish to estimate. (p. 3)

The use of the word "estimate" is noteworthy here. Even more revealing is the fact that the survey noted:

> The "significant usage" metric turned out to be problematic even with specific examples, because, from the C/LMS point of view, there was no regular way to track how the faculty used the C/LMS in each course. (p. 10)

And further,

> For C/LMS usage, they [10 institution respondents] estimated an average of more than 90% of all students use one, but only an average of 69% make "significant use" of a C/LMS. Given that institutions did not have concrete numbers on "significant use," this clearly was a rough estimate that was not easily calculated by all respondents. (p. 11)

Because there is no standard metric for significant instructional use of a C/LMS, cost comparisons in which the intent is to assess operating costs per student are largely a matter of guesswork and ad hoc interpretation. The MIT study found that:

> Based on rough verbal estimates the 2004/2005 C/LMS operating costs ranged between $135,000 for Middlebury College to $1,330,000 for Berkeley with MIT at $547,550. …operating cost per student ranged from $24 per student at Yale to $152 per student at Princeton… (p. 5)

And the study noted that:

> The answers to the cost questions were almost always rough verbal estimates and not based on in-depth costs analyses by the respondents. (p. 4)

While the MIT study focused on comparing peer institutions, a similar problem exists in attempting to measure and compare C/LMS adoption levels, and calculating per-student support costs within different units of an individual university.

Related Prior Work

Various aspects of C/LMS adoption, implementation, support, and usage have been the subject of numerous studies. Zellweger-Moser's intensive research explored faculty adoption as affected by various supports critical at various stages in the process (Zellweger, 2005), (Moser, 2007), while McQuiggan examined transformations in teaching assumptions initiated by the use of C/LMS. (McQuiggan, 2007), and Lane (Lane, 2007) determined that the manner of C/LMS usage was largely shaped by the nature of the product as introduced to faculty. Kincannon earlier studied the reaction of faculty to use of C/LMS and determined that faculty expressed dissatisfaction at the time demands imposed by using a C/LMS (Kincannon, 2002). Amrein-Beardsley, et. al (Amrein-Beardsley, Foulger, & Toth, 2007), Allen and Seaman (Allen & Seaman, 2006), (Allen & Seaman, 2005) for the Sloan Consortium, the Georgia Vista Implementation Enterprise Wide study (View, 2005), Harrington (Harrington, Gordon, & Schibik, 2004), and Morgan (Morgan, 2003) all attempted to gain insight into C/LMS usage via student or instructor-supplied data, and to assess the level of faculty adoption of C/LMS via the use of surveys, determining that 96% of the largest institutions of higher learning were, as of 2006, using C/LMS to support online learning in addition to in-class courses. Vonderwell, et. al (Vonderwell, Liang, & Alderman, 2007), Cramer, et. al (Cramer, Collins, Snider, & Fawcett, 2006), Mandinach (Mandinach, 2005), Tobin (Tobin, 2004), Shiratuddin (Shiratuddin, 2001), and Bork (Bork, 2001) attempted to evolve methods for the assessment of student performance, or propose reasoned suggestions for the improvement of performance, when C/LMS software was involved in the process of education. Yet a glaring omission exists in the empirical measurement of the actual extent of usage of C/LMS by faculty derived from the databases supporting a given C/LMS, that is, measuring the extent of faculty usage of the C/LMS as evidenced by the contents of the database supporting it.

The lack of adequate means of assessing C/LMS usage has prompted some researchers to propose the application of data warehousing technology to the problem of providing a base of readily accessible raw faculty and student C/LMS usage data. Van Dyk and Conradie (Van Dyk & Conradie, 2007) proposed such an approach in 2007 in support of action research (p. 7), defined by ZuberSkerrit (p. 23) as "a critical enquiry by academics themselves into their own teaching practice, into problems of student learning and into curriculum problems." (ZuberSkerrit, 1992) The prototype data warehouse they proposed was intended to be used directly by instructors who were interested in studying the relationship between learning styles as defined and measured using the Felder index of learning styles (Felder & Silverman, 1988) and student interaction with the C/LMS, and potentially conducting other similar ad hoc studies. Their prototype data warehouse was formed according to established dimensional techniques and included data on students, obtained from the institution's student information system, and "clickstream" data describing student interactions with the C/LMS, obtained from access logs.

Were data warehouses such as suggested by constructed by a number of institutions Van Dyk and Conradie actually implemented by various institutions, it is conceivable that they might be used to develop a better understanding of some of the relationships between student learning outcomes and C/LMS interaction. However, this does not necessarily resolve the problem faced by decisionmakers in institutions of higher education in distinguishing "significant usage" of the C/LMS or in comparing usage between various teaching units within the institution, it simply makes raw data that might be used in some way more accessible. Further, unless many institutions using a variety of C/LMS systems all construct data warehouses along similar lines,

data warehousing technology will not necessarily produce results with any more degree of consistency than currently exists with survey-based study methods.

We propose that, rather than attempting to persuade multiple institutions to implement a common database, data already being captured by C/LMS systems be interpreted in light of a common model. This common model provides a standard metric to rapidly and consistently assess C/LMS usage across various areas internal and external to a given institution. The metric encompasses the common features and functionalities supported by contemporary C/LMS software and reduces the measure of usage of these features and functions in each course supported by the C/LMS to a manageable quantity of readily understood categories or scaled value. After definition of such a metric in terms of functions supported by all C/LMS software, methods can readily be developed to determine the metric value for each course supported by a given C/LMS directly from its underlying database. Whether data warehousing techniques or direct access and interpretation of the data is used in the determination of the metric is immaterial, and in a given situation whichever software approach is used should be determined solely by whatever course of action is locally expedient and supportable. In fact, it could reasonably be argued that once a metric has been established, and software to derive it constructed for one implementation of a given C/LMS, that software could be installed in any installation using the same C/LMS and would more reliably produce the metric there than an attempt to derive it using an alternative set of queries developed locally.

Proposed Model

The need for a workable metric for measuring the usage of a C/LMS, to make it possible to compare usage between units of a university and between universities, drove the development and proposal outlined in detail in Appendix A, which implements a proposed model for the derivation of a simple metric expressed as a number from 0 through 13. The formation of this model proceeds from the definition of five overall "levels" of possible C/LMS use. These five levels span the continuum from no use of the C/LMS by and instructor (Level 0) through a level which currently exceeds the capabilities of most C/LMS systems using the technology currently available to many institutions (Level 4).

The initial level of use defined in the proposed model is the null situation of C/LMS use, that is, non-use. It is identified as Level 0 and results when the instructor for a course simply does not create a web site for the course using the C/LMS or does not activate student access to the C/LMS for the students in the course if a course is automatically created in the C/LMS.

Distribute course syllabus
Distribute reading materials
Identify hyperlinks for readings
Summary: With no menu selection cleanups some selections are empty resulting in "Empty folder" responses to students and potential confusion. Buttons may not renamed from default names and reading materials may or may not be organized in a meaningful way. *Level 1 is further subdivided into four increasingly capable "intensity of use" gradations as indicated in Appendix A.*

Table 1 – Attributes of Level 1 C/LMS Instructor Usage

Level 1 usage of a C/LMS by an instructor is described by Table 1. This level is typified by instructor usage of whatever default set of access "buttons" is defined for the course web page and activation of the course web page for access by students. Typically a template may be followed by the C/LMS course creation process resulting in the provision of buttons labeled similar to "Course Information", "Staff Information", "Course Documents", "Tools", and so forth. These names are typical of a default course creation process for Blackboard, one of the most widely used proprietary C/LMS products. In Level 1 usage an instructor may simply post documents at one or another of these already-available menu selections without regard to their meaningful sequence for course content. Further, by not removing unused access button selections created by the default course setup process, potential for student confusion about the use of the site is ignored. Four gradations of "intensity" of instructor use are defined within this level by the detailed proposal presented in Appendix A.

All of Level 1 usage, including menu tailoring
Students can submit some work electronically
Some grades can be accessed by students online
Summary: Student submission of work is facilitated by use of a digital dropbox or specific assignment features for electronic submission. The instructor makes some grades available online limiting student access to their own grades only. Aggregated grade performance may be provided so individual students can assess their own performance relative to others. *Level 2 is further subdivided into four increasingly capable "intensity of use" gradations as indicated in Appendix A.*

Table 2 – Attributes of Level 2 C/LMS Instructor Usage

Level 2 usage of a C/LMS by an instructor is summarized in Table 2. To achieve this level, the instructor has utilized the features of the C/LMS to maximize student ease and reliability of access as described in Level 1, intensity 4, in Appendix A. The instructor has learned how to use additional features of the C/LMS that enable submission of some completed work by students electronically. The instructor may be using the "gradebook" feature of the C/LMS to make individually assignment grade and instructor feedback accessible in a consistent format and location, as well as aggregated grades so that each student can compare their own performance with an indication of perhaps a class grade average for the work. Achievement of this level of C/LMS usage is often considered the minimum necessary to adequately support distance education courses, that is, courses in which students are never expected to be physically present. Four increasingly more capable gradations of "intensity" of instructor use are defined within this level by the detailed proposal presented in Appendix A.

All of Level 1 and 2 usage
Students can take some quizzes and tests online, with some scores provided immediately possibly with "feedback" answers for incorrect items
Instructor may require students to participate asynchronously in "discussion boards" moderated by the instructor or teaching assistant
Summary: Students can interact with course content to receive various forms of learning feedback not achievable without the use of a C/LMS. Combined with instructor-to-student e-mail communication, this level of usage is usually considered fully capable of supporting distance education in the contemporary environment. *Level 3 is further subdivided into two increasingly capable "intensity of use" gradations as indicated in Appendix A.*

Table 3 – Attributes of Level 3 C/LMS Instructor Usage

Level 3 usage of a C/LMS by an instructor is described in Table 3. With this level of usage the instructor has implemented C/LMS features described in Levels 1 and 2, and in addition may provide some or all quizzes and testing in a sequential or iterative manner via the C/LMS, with immediate feedback for some of these that may include remedial guidance for incorrect student responses. These software-mediated interactions may improve the individual student learning process. Instructors may engage students asynchronously[1] in discussions in which the instructor posts a question or discussion "thread" and students are required over some period of time to

[1] According to Allen and Seaman (2005) asynchronous interactions can take place at the student's own pace typically over a period that may extend to days, as opposed to synchronous interactions which must occur with all students present (or online) at the same time. Traditional in-class discussions occurring during a designated class meeting time in a designated classroom meeting space are synchronous. (Allen & Seaman, 2005)

read the instructor's posting and the responses of other students and provide their own contribution in postings they make. This type of discussion, and the requirement for all students to contribute their own perceptions and reasoned comments, has the ability to draw shy or quiet students into the discussion, who might otherwise not be impelled or compelled to contribute in a classroom discussion due to their own shyness or time constraints. Typically the use of this feature imposes a time demand on instructors or teaching assistants, since the content of student responses must be checked and the discussion guided in a "moderation" process, and the level and meaningfulness of each student's participation must usually be assessed for grade credit.

Two increasingly more capable gradations of "intensity" of instructor use are defined within this level by the detailed proposal presented in Appendix A.

All of Levels 1, 2, and 3 usage
In-class lectures and student participation are recorded in audio and video and made accessible to students (including distance learning students) for review
Students can see and hear what is occurring in the classroom at a distance in real time
Students can see and hear what is occurring in the classroom at a distance in real time and can participate in discussions and activities as if they were physically present in class
Summary: Students can interact with course content to receive various forms of learning feedback not achievable without the use of a C/LMS. Combined with instructor-to-student e-mail communication, this level of usage is usually considered fully capable of supporting distance education in the contemporary environment. *Level 3 is further subdivided into two increasingly capable "intensity of use" gradations as indicated in Appendix A.*

Table 4 – Attributes of Level 4 C/LMS Instructor Usage

Level 4 C/LMS usage is defined with a view to technological developments now on the horizon which may in the future make it practical to extend the feature range and reach of generally-available C/LMS software. Some institutions currently support capabilities that make it possible to record lectures and classroom activities for web-based review by enrolled students, but these systems are local developments which require a degree of technical support not generally available. Similarly, real-time viewing of courses conducted at a distance is supported by some vendor products such as Wimba (Wimba, 2007) and Adobe Connect (Adobe, 2007). Real-time distant learner student participation in class sessions and activities is beginning to become

available using instant messaging. These new developments are recognized in the proposed model as extending C/LMS usage to Level 4, which is defined in two increasingly more capable gradations of "intensity" of instructor use by the detailed proposal presented in Appendix A.

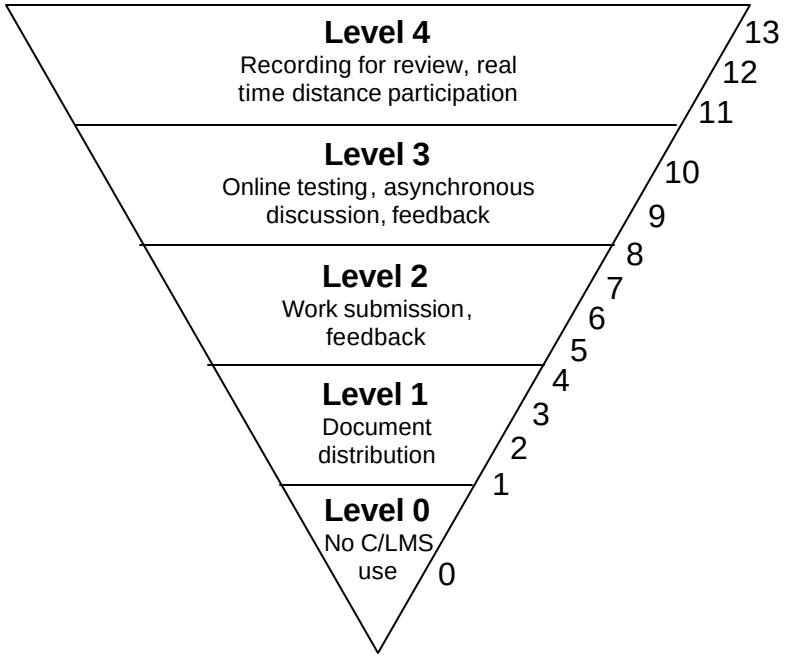

Figure 1 – Proposed model depicted as an inverted pyramid, with "usage intensity" values indicated

Figure 1 portrays the five levels of the proposed model as an inverted pyramid. This illustration suggests how each higher level assumes that the features and functionality of lower levels has been implemented. In this depiction Level 0 assumes that a C/LMS is available but is simply not being utilized for a given course.

Discussion

Appendix A proposes a metric with the suggested name "usage intensity" resulting from the proposed model which takes the form of a number from 0 through 13, defining a 14-point scale. This metric is proposed as a starting point for development of software to extract relevant measures directly from the database supporting a C/LMS with the intent of refining both the metric and the software to produce it. This effort would begin with analysis of the database supporting a generally-available and widely used product such as Blackboard, as implemented and currently utilized in a major institution of higher education. Methods to produce the metric will be constructed based on content analysis of database tables, in comparison with the known feature usage of the top 10% of current courses for which the database contains the most entries, on the assumption that these courses will represent the greatest extent of C/LMS feature usage. Known feature usage will be examined by actual inventory of the web sites of these courses. The metric produced will be judged as to its efficacy and accuracy in portraying C/LMS based on this criteria.

The goal of this effort was to propose a model that could be applied by any institution using any C/LMS package to unambiguously and accurately assess its usage across the entire institution. The provision of such a metric could alleviate the high degree of imprecision that currently exists in making such usage assessments and facilitate more accurate correlation of learning outcomes to C/LMS usage. Such an improvement could serve the purposes of administrative and academic resource allocation decision-making, helping to provide answers to questions such as these:

- Is the C/LMS being used consistently in the same course as taught by different instructors? If not, what courses show the greatest degree of disparity, and why>
- Is the C/LMS being used to a consistent degree across various courses with seemingly similar types of subject matter, for example, between a chemistry course and a biology course? What factors might justify this difference, or should some greater degree of consistency reasonably be expected to enhance the student learning experience?
- Is the C/LMS used to the desired degree of consistency between major units of the university, such as colleges? If significant differences in usage are revealed, are they reasonable or should some greater degree of consistency be expected?
- Is there any correlation between higher usage of the C/LMS, as indicated by the proposed metric, and student performance (grades) and retention rates? Knowing the metric for each course taken by a given student across the student's career could produce the data needed for longitudinal studies, supplying a variable heretofore unavailable.
- Should the cost of the C/LMS be borne as a general university-wide overhead item, or should its cost be apportioned equally across academic budget units that use it, or proportional according to degree of use, or inversely proportional according to use? The latter scenario would penalize units that did not make as much use of it as others, perhaps spurring encouraging additional use though the force of the budgeting process.

All of these possible benefits can arise from the implementation of a consistent model for C/LMS usage and the resulting metric within a given academic institution. The potential also exists, however, for widespread adoption of a consistent metric across multiple academic institutions, to which we allude in our conclusions.

Beyond traditional classroom usage, C/LMS can also be used within a completely online course or degree program. This area raises a new series of questions relating to comparisons of traditional in-class and purely online usage of a C/LMS. Questions that Allen and Seaman (2005) raised in their report for the Sloan Consortium on online education in the United States can also be applied, not just to online education in general, but also to the use of C/LMS in online education:

- How closely do an institution's online offerings match those of their face-to-face offerings?
- Have institutions selected a small number of areas to experiment with online, while leaving the bulk of their offerings as face-to-face only?
- Is online concentrated only among non-degree electives and not part of the core curriculum? (Allen & Seaman, 2005)

These and other questions relating to comparisons of in-class course and purely online course usage of a C/LMS can be more adequately informed with the adoption of the proposed model and metric.

Conclusions

Course/learning management software accessed by students via the internet is now commonly offered to faculty in nearly all institutions of higher education, but the measurement of its usage even within a given institution must currently rely on incomplete data, surveys, or guesswork. A model integrating usage of C/LMS features can lead to a metric that characterizes usage in summary form and is produced automatically by software from the database supporting the C/LMS. The metric could be useful in a range of administrative determinations leading to more consistent use of the C/LMS across a given institution, by revealing areas in which a high level of C/LMS usage could serve as examples for areas in which lower levels of C/LMS usage are detected.

The impact of a consistent model and metric could be much greater, however, since its application is not necessarily limited to individual institutions of higher education. The proposed model, metric and software methods for its derivation could be applied across different course learning and management systems to provide a reliable means of comparing usage across different systems and institutions. While each different C/LMS is supported by a different database structure, analysis guided by the model and metric derivation processes could result in the accurate derivation of metric values regardless of system differences, because the model is stated in terms of features, not the specific ways in which features are programmed in one system or another. The standardizing influence of such a metric could overcome a serious barrier that presently exists to comparative analysis, executive administrative decision-making, and further research in academic institution and student performance and retention.

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Appendix A

Metric Definition: A Proposed Model for Evaluating L/CMS Faculty Usage in Higher Education

Intensity	Characterization	How instructors/students use the C/LMS	Instructor knowledge required
Level 0 No usage of C/LMS by instructor, students have no reason to visit the C/LMS course web site			
0	No Blackboard use	Instructor does not activate the default web site that is automatically created for every course. Site is unavailable to students.	No C/LMS knowledge or interest
Level I Instructor makes documents available at the C/LMS course web site (instructor and student convenience of access)			
1	Minimal document-provision site	Instructor uses the course site to distribute Word or .pdf documents or hyperlinks using only the menu buttons set up in a default site. Only some buttons are used in this way, but all of the default buttons remain active and visible, and some have no contents (a student gets a "Folder empty" or "No contents" message if he/she clicks on them). Students can obtain course documents from the site by exploring document placement and they must spend time exploring empty buttons, with consequent potential for student confusion. Some potential for student questioning about the correct use and interpretation of the site.	How to use an "edit button" features, how to upload a document, and/or how to insert a hyperlink. **Total instructor training investment time: 15 minutes.**[1]

[1] Instructor training times are estimated in this proposal based on person training experience. Actual training time to be assessed as a part of the proposed study.

Intensity	Characterization	How instructors/students use the C/LMS	Instructor knowledge required
2	Minimal document-provision site, but slightly more productive for students than a minimal site	Instructor uses C/LMS site to distribute Word or .pdf documents or hyperlinks and changes some button names to customize them; unused active default buttons are still empty. Student can obtain course documents from the site without confusion as to what buttons contain what material, but will still spend time exploring empty buttons, with possible confusion about them.	All of the skills for intensity 1, plus using a "Control Panel" and/or a "Manage Course Menu" to modify, add or remove buttons. **Total instructor training investment time: 30 minutes**
3	Minimal document-provision site, visually appealing and welcoming	Instructor uses site to distribute Word or .pdf documents or hyperlinks and changes some button names to customize them; unused active default buttons are still empty. Student can obtain course documents from the site without confusion as to what buttons contain what material, but will still spend time exploring empty buttons, with possible confusion about them. Instructor has provided a graphic banner for the course home page, to make the site more visually attractive, and composed a welcoming announcement.	All of the skills for intensity 2, plus how to locate and designate a provided graphic banner and how to compose an announcement. **Total instructor training investment time: 45 minutes**
4	Competent document-provision site	Instructor uses site to distribute documents or hyperlinks; changes some button names to customize them, applies a graphic banner and welcoming message; no empty buttons remain active and visible. Students can conveniently obtain needed documents from the site.	All of the skills for intensity 3 plus additional actions on the part of the instructor would be to hide or eliminate unused default menu buttons/folders. **Total instructor training investment time: 1 hour**

Intensity	Characterization	How instructors/students use the C/LMS	Instructor knowledge required
Level II Documents available at site, students can submit completed work electronically; can continuously see at least some grades online; *this is a "student work turnaround" site usage minimally capable of supporting some distance learning.*			
5	Minimal student work-turnaround site	Students can get course information and assignments from the course site, and can also submit work electronically to the site.	Instructor knows how to set up a button to let students access a "digital dropbox" function, knows how to retrieve items from the dropbox to access and grade them. **Total instructor training investment time (including Level 1): 1.5 hours**
6	Adequate student work-turnaround site	Students can get course information and assignments from the course site, but can also submit some work electronically to the course web site. Students receive assignment-specific feedback from instructors electronically, and a major convenience to the instructor is provided in that submitted work is directly associated with each individual student via a gradebook rather than an "everything in one heap" digital dropbox or via e-mail attachments.	Instructor knows how to put assignments into individual "turnaround" shells, limiting students to one submission of each assignment; can explain the process of obtaining and submitting assignments to students, and knows how to obtain each submitted assignment via a gradebook. At this usage intensity the gradebook is not used by the instructor to store grades for assignments, so grades are not accessible to students online. **Total instructor training investment time including Level 1: 1.75 hours**
7	Informative student work-turnaround site	Students get course information and assignments from course site, and also submit work electronically and see grades for assignments submitted electronically.	All of the above skills, as well as knowing how to post grades into the gradebook **Total instructor training investment time: 2 hours**
8	Highly informative work-turnaround site	Students can get course information and assignments from the course site, and can	All of the above, as well as knowing how to set up columns and possibly insert categories

Intensity	Characterization	How instructors/students use the C/LMS	Instructor knowledge required
		also submit work electronically to the site and see their grades for all assignments using the C/LMS web site.	and weights for all graded items for the course, and actually post those grades into the course site. In other words, the instructor uses the C/LMS gradebook to record grades for all quizzes, homework, and projects, including work not submitted electronically. **Total instructor training investment time: 2.5 hours**
Level III Students can interact with subject matter, instructor, and other students in ways that are not possible without a C/LMS; *this is "student work turnaround" site usage generally accepted as fully capable of supporting distance education well.*			
9	Highly meaningful turnaround site with electronic testing	Students take at least some quizzes or tests online, either proctored or away from the classroom; for many types of online tests students are provided with scores immediately after completing the test, and may be provided with feedback tailored to correct and incorrect answers, making quizzes into more of a learning experience.	All of the above skills are required, and in addition the ability to create test questions, deploy tests, and view test scores in the C/LMS gradebook **Total instructor training investment time: 5 hours**
10	Highly meaningful turnaround site with asynchronous online discussions	Instructor posts discussion topics, students respond to it and to other student's postings; instructor moderates and judges the extent of each student's participation. Students benefit from asynchronous discussion in which each student has more opportunity to express himself or herself. This intensity of C/LMS use is fully capable of supporting distance education courses with inspired and dedicated instructors who maintain contact with students.	How to provide a discussion board, create forums, initiate student responses, gather and judge student responses, moderate the discussion; eventually conclude and shut off the discussion forum. The topic of creating, managing, and grading discussion boards requires additional training on its own, beyond the intensities above. **Total instructor training investment time: 6 hours**

Intensity	Characterization	How instructors/students use the C/LMS	Instructor knowledge required
Level IV Students can interact with the course locally or at a distance beyond the capabilities of text-only and e-mail interaction in a real-time mode.			
11	Highly meaningful turnaround site with asynchronous online discussions plus web-based one-way viewing/reviewing of course session	In addition to all capabilities of intensity 10, students can review and listen to the conduct of the class lecture after the class session concludes.	Not supported by many C/LMS implementations
12	Highly meaningful turnaround site with asynchronous online discussions plus web-based one-way viewing of course session as they occur, and also reviewing via recording at later times	Student can view and hear what is happening in the class in real time, as well as later review recorded proceedings.	Not supported by many C/LMS implementations
13	Highly meaningful turnaround site with asynchronous online discussions plus interactive viewing and participation in class sessions	Student can view and hear what is happening in the class in real time, can participate in the class session (can view people physically present in class, and can be seen and heard by them), as well as later review recorded proceedings.	Not supported by many C/LMS implementations