The Afterlives of Courses on the Network:

Information Management Issues for Learning Management Systems

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The large-scale deployment of what have been variously called course management systems or learning management systems is well under way throughout higher education. These systems—and I will use the generic "learning management systems" (LMS) rather than the more constraining "course management systems" in this bulletin—include familiar commercial products like Blackboard or WebCT, various locally developed systems, and software emerging from multi-institutional collaborations like the Open Knowledge Initiative. After a period dominated by early adopters at the level of individual faculty, departments, or schools within colleges and universities, we are beginning to see the capabilities of these systems extended to every class that wants to use them. Some institutions are attempting to establish new norms of institutional culture: virtually every class offered at the institution will make at least some use of the LMS. Institutions are using LMSs both to supplement traditional classroom-based courses and to support a range of alternative formats, including distance education programs and fully or partially online courses for in-person students. In the effort to make these systems into part of the institutional technology infrastructure, LMSs are also being integrated with other core institutional information technology systems, such as registration and student records, identity management and authentication, or human resources.

Specific details of individual LMSs are not important for this discussion. Essentially all of these systems either currently include or will soon incorporate a core set of key features: the ability to support online discussion groups; capabilities for faculty to post materials (such as lecture notes, problem sets and answers, or readings and references) for use by the class; provisions for faculty or students to post papers and other materials for review and comment; and the ability for students to submit homework assignments to faculty members. The LMS may also include features such as management of enrollment and attendance records, grading, the ability to administer tests interactively or exercise sets, and the like. The LMS also generates management data in the form of access and usage logs.[1]

At a general level, learning management systems display two key characteristics that are typical of the "digitization" of communication or interaction. First, communication leaves a trail, which can subsequently be reviewed, either by the participants or by other parties, and potentially referenced, annotated, stored, and transmitted. This is very different from traditional classroom lectures and discussions, which were typically ephemeral; you were either present in the classroom, or at best you could rely on the memory, notes, and descriptions of someone who was present. An LMS facilitates and captures communication as new digital content and also provides tools for the aggregation, organization, and annotation of content from a multiplicity of sources.

Second, because this collection of content is on a network, the network serves as an amplifier: in the absence of a decision to specifically restrict access to the content in an LMS, this content is available worldwide for functions including viewing, copying, and indexing in Web search engines. An action traditionally as ephemeral and spontaneous

as making a statement in a class—even if the faculty member in charge permits anyone, registered or not, to sit in on the class, thus rendering it to some very modest and theoretical extent a public forum—is very different from making that same statement on a publicly accessible, permanently maintained page on the World Wide Web. Assumptions and analogies based in the face-to-face classroom are at best a problematic guide for how people should act and what they should expect when similar interactions are carried out in a learning management system.

In the eagerness to implement and institutionalize LMSs, most institutions with which I am familiar have paid very little attention to the information-management policy issues surrounding the deployment and use of these systems. This is likely to cause significant problems as issues arise, perhaps sometimes in very public ways or in legal settings, which will have to be addressed in the absence of carefully and thoughtfully crafted institutional policies. All of our prior experience with the records of relatively informal communications processes in higher education (think of electronic mail as a prime example) have illustrated the dangers of making policy reactively and under the pressures of legal or public relations crises. User intuitions, assumptions, and behaviors concerning e-mail, often based on analogies with other communication media, frequently have contrasted sharply with the realities of the persistence of e-mail and its role as a formal record. We have also seen the hazards that an absence of policy can create. The experience with e-mail underscores the need for education to accompany the development of policy.

The purpose of this Research Bulletin is to highlight and frame some of the key policy issues that I believe higher education institutions need to discuss and address, systematically, deliberately, and through broad consultation throughout their institutional communities, as an integral part of their commitment to LMS technology. As of fall 2002, however, there are very few model policies or best practices to reference. Indeed, not much work has been done in defining the questions institutions need to ask. At a very high level, there are four key policy questions:

- How long does a class site remain a living document, and when does it become frozen as a record? During its lifespan, who can change or annotate the living document?

- What is included in the "record" of the class that is stored in the LMS?

- How long is this record kept?

- Who has access to this record, and under what circumstances?

These are not idle or theoretical questions. Many members of the academic community may legitimately seek long-term retention of course records and continued access to these records for a host of reasons: grade appeals, teaching portfolios, learning materials, preparation of new classes, or the advance of scholarly communication, to name only a few. The ramifications of these questions, however, are extremely complex and far-reaching and will take us into questions about student and faculty intellectual property rights; implied (or explicit) agreements between institutions and their faculty and

the students participating in classes; institutional records management policies; the documentation of scholarship; authentication and identity management; and the roles and responsibilities surrounding the operation and management of learning management systems.

Highlights of Information Management Issues

If we examine the materials that a learning management system might house for a given class, it can include some or all of the following types of material:

Faculty-created material. This might include lecture notes, the syllabus and reading list, problem sets and their answers, audio or video recordings of lectures, and similar materials. These materials are typically covered under institutional policies related to faculty intellectual property and course materials, which are essentially part of the contract between the faculty member and the institution.

The nature of these institutional policies was a matter of considerable debate, and in some cases controversy, over the past decade or so, but has been fairly clearly addressed by now at many institutions. Nevertheless, uncertainty remains about how to categorize faculty-contributed material on a course site within the taxonomies established under faculty intellectual property policies, particularly as our understanding of course sites becomes more sophisticated. Also worth noting is that ownership of this material is typically much more a matter of policy (contract) than of copyright law. Multiple or joint authorship among faculty—including faculty from multiple institutions—is commonplace and likely to become more so.

Finally, it is important to recognize that many of the key problems involving these materials may entail the institutional rights to use, archive, and provide access rather than questions of ownership, and many policies on faculty intellectual property don't address these questions. For example, under institutional policy, a faculty member may clearly own certain content placed on a course Web site, but concern might arise over whether the institution has the right to store a copy of that material and provide various individuals permanent access to it.

Student-created material. This category could include answers to homework assignments, term papers, or class projects produced by individual students or by groups of students working together. Ownership of this material is highly problematic; most often (and certainly in the absence of other clear institutional policy) it rests with the student or students who created it. In course contexts, there may be an expectation or requirement (which may or may not be made clear in advance and may or may not be recognized affirmatively by the students) that their copies of their work can be saved in the course management system and shared with other parties, which might include other students in the class, or potentially much larger audiences, including the general public in some cases.

Commingled student and faculty material. This material might include discussion lists involving students, faculty, and perhaps others (other faculty or outsiders who might contribute to the discussion). It might also include audio or video records of in-class discussions involving students, faculty, and others including visiting speakers or informal auditors. Rights to this material are complex, and in many cases there is no attempt to obtain clear permissions to capture it or provide access to it in any particular way.

Other miscellaneous institutionally generated materials. This category can include literature guides created by institutional librarians or documentation on computing facilities prepared by institutional information technology specialists. Other examples include materials related to the course catalog, departmental requirements for qualifying exams, or rosters of students, instructors, and teaching assistants. Ownership for this type of material is usually covered by institutional policies about faculty or staff intellectual property.

Externally owned material. This might include copyrighted material like journal or newspaper articles, film or video segments, or excerpts from books. Some of this may be part of class reserve readings in electronic form, or it might constitute the equivalent of a course reader. This type of material typically has either been licensed or otherwise cleared for use by the professor or by other institutional groups such as the library or the bookstore for use in the course, though it may have been cleared for a specific and limited audience (such as registered students) and possibly for a limited time (the semester of the course only). Alternatively, the faculty member might have believed that his or her use of the material was covered under copyright exemptions that deal with the use of materials in classroom settings, and thus no permissions or licenses were necessary.

Management data. Management data are generated by the interactions of students, faculty, and others with the LMS itself—data on interactive use of quizzes, or simply access and usage logs for the course materials. Ownership of this material is a fairly murky topic—most likely the institution owns it. What's likely to be controversial, however, is not so much ownership as retention, access, and confidentiality, which will be discussed later.

This is a complex and daunting array of materials, and a number of comments are in order. First, in reviewing the several types of material, I have made comments about ownership, and this may not be the key issue. The critical requirement is that the institution have the right, perhaps nonexclusive, to use and reuse the material in various ways. Understanding ownership, however, helps clarify where arrangements for rights need to be made. Second, it is much easier to sort out rights problems early, when material is created or enters the system. For example, it might be relatively easy to get students to sign an agreement as a condition of enrolling for a class but impractical to find students and negotiate agreements with them a year after they have completed the class, when the faculty member and the institution realize that they want to archive student materials or reuse student work in the course site for a subsequent class. Third, the entire matter of clarifying ownership and usage rights may seem unnecessarily bureaucratic and contrary to the academic values that the institution seeks to foster in

the classroom; indeed, it may exercise a chilling effect on class enrollment and participation. Clarity about these matters, however, will be essential sooner or later (when some controversy or litigation occurs). Sorting them out retrospectively will often require shutting down and destroying the entire course site.

Externally Owned Copyrighted Material

Questions about externally owned, copyrighted materials highlight a number of the potential problems of retention and reuse of course sites. As part of an electronic reserves process, libraries sometimes arrange usage for copyrighted materials. If the library knows the parameters for rights clearance (access by what group and for how long), it can attempt to negotiate the appropriate agreements. The parameters, however, might be much more complex than simply the students enrolled in the class, for the duration of the class. Broader and longer-term access might incur a much higher license fee. In some cases, permanent access for incorporation in a permanently archived course site might be impossible to negotiate. Requiring that an institution be able to save a permanent record of a course, including all of the externally owned copyrighted material used in that course, might mean that many of those materials cannot be used in the course. These realities must be factored into any policy formulation.

Faculty need to understand when they can appropriately apply copyright exemptions covering "classroom" teaching in this context. Faculty might assume provisions covering traditional face-to-face class situations extend to course web sites; this is not always true, and often unclear. In particular, if the material is part of a longer-lasting record these exemptions may not apply. Answers to questions about audience and duration (discussed later) are critical in obtaining good legal advice from the institution, particularly given the complex changes introduced by the recently-enacted TEACH Act.

Also important is for institutions to educate faculty about the limitations of exemptions associated with classroom use of copyrighted materials due to the amplifier effects of the networked environment. Learning management systems create reusable records of classroom activities. Actions that might go unnoticed and unchallenged in face-to-face classroom teaching can become extremely visible and hence subject to legal challenge when captured in a class Web site that is accessible to a global audience through the Internet. Even if access is restricted, it is subject to legal discovery as part of a systematic review of institutional practices in the context of a lawsuit.

In a real sense we can expect LMSs to force institutions and faculty to deal with the use of externally owned copyrighted material in a more scrupulous and systematic fashion. They will also need to grapple with the problem that it may not be possible, or at least not practical, to include some copyrighted materials as part of a lasting record of a course. In an LMS, externally owned copyrighted materials may become ephemeral components that cease to be available outside of a specific, very constrained time window. Or they may be accessible by very limited communities relative to other materials stored in the LMS.

The truly explosive—and apparently most commonly neglected—issue is student-created materials. For published, copyrighted materials used in a course, it may be very reasonable simply to substitute citations for the material when the course site is archived. But for many classes, student contributions form a part of the core record of the course. They must be included; since they are unpublished, and otherwise unobtainable, citation isn't sufficient.

In the absence of other policy, one expects that students own their writings under copyright law. There is a well-established expectation that students will turn in a copy of their work (a homework exercise or term paper, for example) to the faculty member as part of taking a class. This does not give that faculty member the right to make and redistribute copies of the material, however.

A key distinction needs to be drawn between identity and content. In a class where all students are expected to contribute to online discussions and to post their term papers for other students to comment upon, associating student names with their contributions is tantamount to making the list of students (and much more about these students) part of the permanent record. It is possible to "anonymize" the record of the class, at least for some purposes, by simply substituting the names "Student #1," "Student #2," and so on. But if the class record is available to others beyond the members of the class, students might want real credit for the materials that they contribute.

There are two approaches an institution might take to this question of archiving and reuse of student work. One is course-specific. As part of the course requirements, the instructor might include a statement saying that students agree to incorporate their work into the course Web site, for subsequent preservation by the college or university and for subsequent access by some group of people (perhaps just other class members and faculty, or perhaps the general public). Institutions will need to decide whether they need some affirmative agreement on file from the students to protect themselves, or whether registration in the course will constitute agreement. If an explicit agreement is required, these agreements are institutional records that need to be carefully archived and preserved. Faculty and institutions will need to do some serious soul-searching here. Is it reasonable to require undergraduates to agree that their term papers will become part of a permanent and publicly accessible intellectual record? Is it reasonable to require class members to be prepared to share their work with other class members under the instructor's guidance? Can a faculty member choose to conduct a specific course entirely in public view on the network and set this as a ground rule for course participation? Institutions and faculty will also need to decide whether students should be allowed to opt out of class norms or whether they are truly requirements. If students are permitted to opt out, institutions will need to carefully manage departmental or faculty pressure that might discourage students from exercising these rights.

A second approach is to embody such agreements in broader policies related to students, so that matriculation at an institution explicitly requires agreement with these policies. In this case, students and institutions would not conduct negotiations on a course-specific basis. Again, questions about the need and ability to document informed

consent by students will require consideration. There are delicate middle grounds. For example, institutional policy might give individual faculty members the ability to mandate requirements on a class-by-class basis, but the need might still exist to document and communicate these requirements for each class.

The final issue is that of institutional culture. If, due to the culture of the institution or of a specific department, most classes expect students share their work broadly and require students to agree to such conditions before completing courses in their major, it would almost certainly be more appropriate to reflect these rules in overall student policies that are made clear to any and all potential students rather establishing them transactionally on a course-by-course basis.

Note that interesting policy parallels are raised by the introduction of plagiarism-detection systems at certain institutions. In some cases, students are expected—either on a class-specific basis or as institutional policy—to submit their work to a plagiarism-detection service. This may include giving that service the right to add students' work to a growing database of original work, which can be used to check future student work for plagiarism. Again, students are expected to be prepared to make their work available for institutional purposes as a condition of attending the institution or of taking certain courses. These expectations need to be communicated clearly to the students.

Institutions will have to determine what is legally possible in terms of requirements on student work. Some of this will be determined by federal and state laws dealing with privacy and student records, laws which may leave less room for negotiation than what is possible in the construction of policies about the use of works to which students hold copyright. Even so, other considerations should be even more important, in my view. Institutional choices about the degree of control students can exercise over their work, about the extent to which they can retain privacy while engaged in academic life at the institution, and about expectations and norms are a fundamental part of establishing the academic and intellectual culture of a campus. These choices also define the way that a campus community is formed and how it chooses to relate to the broader global scholarly community. Some campuses may choose to be very sheltering and inward-focused; others may chose to expose their work systematically and routinely to the world. Other complications will inevitably follow. For example, a student paper that is part of a publicly accessible course site might be construed as prior publication by some journals or conferences.

While policies related to student work are perhaps the most crucial issue, they are not sufficient. Signs on classrooms saying that anyone who attends a class in the room agrees to have their likeness and comments recorded, preserved, and shared with the world may also be necessary to protect institutions' use of audio or video records of class sessions. Something broader than student policy may be necessary because of the potential presence of students who are auditing the course or other incidental participants. The same considerations may also apply to participation in class discussion lists by visiting lecturers.

Having surveyed the kinds of material that can be part of a course site, we now turn to questions of access and retention of these materials. We can easily identify a number of interests in access to these course materials, each with very different time horizons.

1. *Access for operational class purposes.* Clearly, the site needs to be accessible for enrolled students and supervising faculty (plus some others, perhaps, such as supporting librarians, auditors, and the like) while the class is ongoing. This is more complex than it may first appear, given that there will be students that drop out, take incompletes, repeat the course, and so on. It is not always clear when a class really ends. Similarly, it is not always clear when a class starts, from the point of view of the course site. Is it when the shell of the site is set up, when it's officially approved, when registration begins, or at some other point?

2. *Post-course faculty use.* The faculty member may have interests in the course site that persist beyond the conclusion of the course for a number of reasons. The course site may be critically important documentation of the quality of teaching by the faculty member, becoming part of the future "file" of a faculty member for consideration in tenure and promotion. The faculty member may also want to retain a record of the class as a way of defending his or her grading actions in response to challenges. Finally, the record of a class may be a very valuable resource to a faculty member preparing to offer the class in the future. It may also be helpful for other faculty members preparing to teach the same or a similar class, or for librarians planning electronic reserves or reading lists for similar classes. Note also that as long as a class site continues to be available, the faculty member responsible for it may have an interest insofar as it reflects the quality of the faculty member's teaching and scholarship. This may give rise to a desire to correct errors, update references, tidy up politically incorrect statements, or make other revisions.

3. *Post-course student use.* Students who took the class might want—or even expect—continued access to the class site, much as they have historically kept lecture notes from a class to prepare for qualifying or comprehensive exams, or as reference material for more advanced classes that build upon the class in question. The class site might also become an important resource for other students who were not enrolled in the class. Transfer students might want to review what is covered in more basic courses at an institution. Students might want to review prerequisites for more advanced classes or use course material to prepare for qualifying exams at the graduate level. This issue touches on institutional culture and student expectations. If faculty want to encourage students to reflect and participate—rather than take down extensive notes in class—and are looking to use the course site to provide this review and reference material so that students do not need to transcribe it, then institutions must be clear about what students can expect to have after the class ends.

4. *Institutional record.* The institution—at the institutional, departmental, or school level—may want to keep the class site as a record (permanent or temporary) in

the same way that some institutions currently preserve syllabi, course catalogs, and grade records. This might document what was being taught in the class in a given year and the achievements of the students enrolled, for example. Note that the boundaries between institutional and faculty records (item 2) can be quite ambiguous; institutions might well require faculty to retain class sites as faculty records.

5. *Course reuse.* The class site can represent a record of scholarly inquiry that might be used for subsequent repetitions of the same class, for related classes by students at the same institution, or by students and scholars at other institutions worldwide. At the graduate level, or in classes that explore the frontiers of knowledge more generally, there are well-established academic practices of sharing lecture notes and similar materials; course sites are a further elaboration of this tradition. Course sites may become a new form of scholarly communication, either with limited or worldwide scope. It is not clear whether these are really permanent or should have a limited lifespan. The situation here is complex and highly variable. It is quite reasonable to think of an instructor of a course on "research topics in X" wanting to make extensive reference to previous course sites in the same series and wanting students in the current course to have access to student papers from last year's course in the same area. But it is not clear that someone teaching an elementary course in a given area with a relatively fixed curriculum will want his or her students to have access to every course site on the same subject from the previous five years. For some class sites that are disseminated globally as works of scholarly communication, the class might be subject to some form of editing or publishing process prior to release, and perhaps not all of the materials that were available to class participants are generally available. The Open Courseware Initiative at MIT is following this approach.

All of these dispositions of course sites after operational needs of the course are fulfilled represent reasonable alternatives, although some will be more technically and organizationally demanding than others to implement. Institutional policies will establish a framework of possible choices and designate the loci of decision making among these choices; these policies may also establish a baseline of required actions, particularly in the area of keeping formal records.

In all cases, a clear definition is needed of when and how a course site ceases to be "active" and makes the transition to a record. In other words, when is the course that the site supports really finished? Beyond this definition, pertinent questions include those concerning the nature of the ensuing record, who manages this record, how long it is kept, and who may use it for what purposes. Clarity is vital for expectations about the strength of the integrity of the record as well as who can change it, at what points in its life cycle, and for what reasons (and how such changes are documented).

Recognize the connection with the rights clearance issues discussed earlier. Institutions must make choices when the course is initially planned in order to clear the necessary rights for the resulting record, or these rights must be obtained for the broadest case

among the possible downstream uses in order to avoid the difficulties of clearing rights retroactively. For some uses of course sites as records, externally owned content and management data such as usage logs might not be necessary (or even desirable), meaning that rights for these materials might not be an issue. If the record of the course is to become a public part of the record of scholarly communication (and particularly if the active course site was not public while the course was in progress), some formal editorial and "publishing" process may be desirable to review and vet the materials on the course site. In addition, the course record may be published in a different medium or form from that of the learning management system, since many of the LMS functions might not be needed for the course record to function as scholarly communication. For example, there would be no further contributions to the discussion in the published version, and readers might not be permitted to comment on class papers. Item 3 (above) can also be reasonably viewed as a specialized version of item 5 with stronger access controls applied to the course record.

Items 2 and 5 are faculty-driven reuse of course sites; they differ in that item 2 is a relatively private matter and item 5 is a much more public form of reuse. Most institutions will likely want to provide their faculty with maximum flexibility to make these decisions; the primary goals of policy making would be to protect and empower the faculty and the institution by making sure that questions involving privacy and rights are managed appropriately. Items 3 and 4 likely involve more direct institutional policy definition, and if policies are put in place at the institution in these areas, they are likely to be applied fairly uniformly across course sites. Choices about item 4 are fundamentally records-management decisions. Choices about item 3 speak to how the institution thinks about the role of course sites in the educational experience and to the relationship between the institution and its current and former students.

These various afterlives for course sites as records raise several practical issues. One example is identity management and authorization. If a course site is to be accessible to students who participated in that course on a long-term basis as reference material, it will be necessary to identify which students were enrolled in a specific section of a specific class during a specific semester, perhaps decades later, when the institution has moved to a new student records system and a new course-numbering scheme, and when the students involved have long graduated. Most current identity-management and authorization systems will likely have a great deal of difficulty with such requirements.

A second group of issues involves the technical feasibility of archiving records of classes over long periods of time against a backdrop of evolving and changing LMS software, as well as other technical standards for objects such as electronic documents and images that might be stored in an LMS. This will certainly be complex and problematic, and experience in this area is very limited today. Course records are complex, highly structured collections of interrelated objects, and there currently are no widely adopted representations of these records independent of the rather specialized and often proprietary systems within which they exist.[2] If we think about processes that alter the class site in various ways as it is transformed into a record and put to uses beyond supporting the class, structural tagging of various components of the course site (as

student contributions, for example) may facilitate the development of tools to help automate these reuses.

Functionality within an LMS for long-term preservation may well be missing, even if the institution stays with the same vendor over the long term. Typically these systems are more concerned with making smooth transitions from one software release to the next, not with being able to re-import archived 20-year-old course sites. Changing from one LMS system to another will likely introduce additional complications. Maintaining archived course site records over time will require ongoing investment and attention, not just to store the bytes but to deal with format conversions that keep the archived materials usable in the face of software evolution.

A final set of questions revolves around the assignment of responsibility (and presumably resources) for preserving and providing continued access to course records. This will certainly vary from institution to institution. It may also vary depending on the intended fate of a specific course site record, with a faculty member's personal record of a site being handled very differently from a record that is being disseminated as public scholarly communication. In addition, stewardship occurs at multiple levels: the decision to retain a course site for a given purpose may be made by one individual or group, with the actual work of preserving the course site being carried out by another as a service function. A number of groups or organizations may reasonably become involved in one or both of these roles, including faculty or academic departments, registrars, information and instructional technology groups, records management, and the library. In this connection, a number of institutions now involve these various groups in initiatives to plan the deployment of institutional repositories to manage and provide access to the intellectual products of the institution. Course records provide an excellent example of what might be managed through such an institutional repository and an equally excellent case study of the complex policy problems that are framed by such efforts to organize and manage institutional information resources.

What It Means to Higher Education

The ability of learning management systems to create and provide access to permanent records of course activities is both an enormous opportunity and an enormous problem waiting to happen. It is essential to address the policy questions raised by LMS deployment in a comprehensive, thoughtful, and inclusive way through a campus-wide dialogue before crises occur. The issues here are complex and not well understood or well explored. An LMS is, among other things, a new tool for the creation and management of new forms of digital information: The issues surrounding these new information objects must be considered across the full life cycle of the objects. While many policy issues have been discussed in this bulletin, perhaps the most important first steps are these:

- Recognize that these are serious and important issues that won't go away and will not be solved by vague appeals to collegial traditions at the institution. Recognize also that the way institutions address these issues will be an important shaping

factor in the each institution's intellectual and academic culture, as well as the way it conveys that culture to its students.

- Clearly assign responsibility for framing and leading a campus-wide discussion and policy-formulation process, which will involve all sectors of the campus community. Virtually all members of the campus community will have a stake in these issues, but someone needs to organize and lead the discussion.

- Review and define policies pertaining to student work in a digital environment that includes learning management systems. Pay particular attention to questions pertaining to ownership and use of student work, student privacy, and student understanding of and agreement to both institutional and course-specific policies.

- Define organizational responsibilities for the preservation of course sites within the institution, both from decision-making (what should be preserved) and implementation (how actually to preserve it) perspectives. Identify where the resources will come from to meet these responsibilities.

- Discuss and consider appropriate uses of course site records within the institutional academic culture and, in particular, their potential roles as records for faculty, as reference materials for students, and as a form of broader scholarly communication. Do not assume that just because you can capture records you should do so; there are balances to be maintained that accommodate the spontaneity of interaction and the freedom of students and faculty to explore and test ideas.

Endnotes

1. Although LMSs differ from other approaches that capture aspects of classroom activity, many of the issues raised in this bulletin are also applicable to those approaches, such as video recording of classes for subsequent storage and replay across the network.

2. Groups like the Instructional Management System (IMS) project are doing important work in this area.

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