I. Introduction

This document is a preliminary report that compares the LMS systems Blackboard Vista and Moodle in several areas. The purpose of this document is to introduce some of the issues that would be involved if NCSU’s LMS strategy were to include a migration away from Vista and toward Moodle.

The primary areas on which this preliminary report will focus are as follows. Section II deals with some of the end user support issues that must be considered. Section III compares the instructional tools that are present in the two systems. Section IV looks at options for handling the migration of existing course content to a new LMS, and Section V examines some of the basic technical issues involved.

A campus-wide migration to a different LMS is obviously a large project with many elements that must be addressed to ensure that the migration is successful. This report is not intended to be a comprehensive look at every detail in such a project, but instead a preliminary look at some of the relevant issues that are evident at this relatively early stage. Section VI of this document includes a list of other issues, beyond the scope of this report, that would demand investigation as part of a migration project of this magnitude.

Finally, Section VII includes links to documents and resources related to Moodle that may be useful as further investigations in this area proceed.
II. End User Support

Training and supporting faculty in using Learning Management Systems is critical to the effective use of these systems. There are several issues that need consideration in moving between Vista and Moodle, namely the design philosophy behind each LMS, the amount and types of training we would need to provide, what other resources are available for support beyond DELTA, and Moodle’s compliance with NCSU’s accessibility requirements.

Blackboard Vista and Moodle offer many of the same tools for creating and delivering content but there are some significant differences in the ways courses are created and managed. The biggest difference between the two is the way content is presented and organized. Courses in Vista do not have much inherent structure to them, often not telling a student how to get from point A to B. Users often have to learn where to look for the correct course content or next activity, or else instructors have to explicitly define a structure that tells the student where to go next. Vista gives designers great flexibility in that it does not apply a structure to a course, but this can be a positive or a negative depending on the nature of the class and the level of attention given to instructional design principles during the class’s construction.

Conversely, the way courses are built in the Moodle environment requires that designers adhere to a more linear sequence in how they design a course. This means that a student’s experience of a course is necessarily more linear as well. From the very layout of the page it is usually obvious what the next activity is or what the student is supposed to do next. In Moodle, students have a clearer sense of what they are doing now, what they have just done, and where they are going next. For example, in a Moodle lesson, there might be a document to read, a discussion activity, and then a quiz to take. These items are presented as a simple list of activities so it is clear what to do next. This structure is not inherent to a Vista site presenting the same material. In Vista an instructor would create a Learning Module within a course to organize all of these activities. In Moodle the entire course is in essence a learning module, so there is always direction to the course and class activities.

Some of the other differences between Vista and Moodle are the ways courses are administered in each. Vista is dependent upon administrators, or other computer systems, to create the courses and populate them with students. All course backup and restoration operations are also dependent upon administrators. Moodle places much of this control in the hands of the instructors. In Moodle, instructors can create, backup, and restore courses themselves. These features and roles can be adjusted in Moodle to grant or deny instructors various course management privileges.

Training materials are another area of consideration. The differences between Vista and Moodle in terms of the user interface and course building principles are significant, and Vista users will need to be retrained in how to use Moodle effectively. Many of the concepts of Vista are applicable to Moodle, but there are many specifics of Moodle that
are markedly different, and faculty will need significant support in learning about these changes. Blackboard produces training material for Vista which we can and do use, such as training documents and online tutorials. We have also developed our own in-house support structure through workshops, online documentation, and Instructional House Calls. Training documentation in the Moodle community is open source and community created. The main sources are the Moodle Docs wiki to which anyone can contribute and also the Moodle Teacher Manual, an open source book on how to use Moodle. Migrating to Moodle would include the need to create workshop materials and online documentation, but the existing online material would be a good starting point for this. In addition, faculty who wished to learn about Moodle could use the open source resources themselves without having to go through DELTA.

In the context of NCSU’s course accessibility requirements, Moodle’s compliance with accessibility standards must be considered, both from content creators’ and a students’ points of view. Does Moodle allow instructors to easily create accessible course materials, and does its user interface permit accessible navigation of the site? Unfortunately, there is not an exhaustive evaluation of Moodle’s accessibility capabilities. Accessibility interest groups have spoken favorably of Moodle as being fairly accessible, and have noted that Moodle’s developers are receptive to accessibility concerns. In addition, accessibility issues can be tracked in the Moodle bug reporting site. Accessibility is an issue that definitely needs further investigation, since most of the evidence for Moodle being accessible is from informal sources and “word of mouth.”

**III. Tool Comparison**

This tool comparison aims to provide a broad sketch of the tools in the two LMS systems, and will focus primarily on those tools that are known to be in more widespread use at NCSU. In an internal DELTA report by Donna Petherbridge (“LMS Observations for Fall, 2006”), faculty use of particular LMS tools in the Vista toolset is measured according to the percentage of Vista sections in which the tool is active. The Vista tools cited in the report as having the heaviest use are Discussions (used in 98% of Vista sections), Grade Book (used in 60% of sections), Announcements (42%), Assignments (33%), Assessments (30%), and chat (7%). The report also estimates that 30% of Vista sections make use of content delivery features (including Vista-specific tools such as Learning Modules). In addition, experience tells us that class e-mail functionality (present in WolfWare, but not quite replicated by Vista’s Mail tool) is another feature that is important to many instructors.

**General issues**

In general, the functionalities present in Vista and Moodle are comparable, although there are numerous instances in which specific comparable tools function differently between the two systems. Often, analogous tools in the two systems offer functionality that is similar, but not exactly the same. For example, both Moodle and Vista provide a means
of making class announcements: Moodle uses a special area of the Forums tool, called the “News Forum,” while Vista uses a dedicated Announcements tool that is separate from its Discussions tool. Terminology is used differently between the two systems as well, and user education and support that is focused on facilitating this transition will be important.

From a support perspective, the need will exist to help faculty use LMS tools effectively, regardless of which LMS is used. Learning to use either system will involve some challenges for new users, as is the case for learning to use any such system. We believe that greater challenges will exist for users who are moving from one system to the other, rather than it being the case that one or the other system holds a significant advantage in this regard. A support approach that recognizes users’ perceived challenges in moving from one tool to another may be most appropriate, in order to minimize user frustration and succeed in a successful overall migration.

### Overall Functionality Comparison

<table>
<thead>
<tr>
<th>functionality</th>
<th>Moodle</th>
<th>Vista</th>
</tr>
</thead>
<tbody>
<tr>
<td>discussion boards</td>
<td>Yes, Forums</td>
<td>Yes, Discussions</td>
</tr>
<tr>
<td>chat rooms</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>grade book</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>structured lessons</td>
<td>Yes, Lessons (and Books add-on)</td>
<td>Yes, Learning Modules</td>
</tr>
<tr>
<td>announcements</td>
<td>Yes, News Forum</td>
<td>Yes, Announcements</td>
</tr>
<tr>
<td>online quizzing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>calendar</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>whiteboard</td>
<td>optional add-on</td>
<td>Yes</td>
</tr>
<tr>
<td>polling</td>
<td>Yes, Choice</td>
<td>Yes, Surveys</td>
</tr>
<tr>
<td>mail/messaging</td>
<td>Yes, uses external e-mail</td>
<td>Yes, Mail tool</td>
</tr>
<tr>
<td>assignment submission</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>student groups</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>profile page</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Specific tools

The tool descriptions that follow are not intended to be comprehensive analyses of each tool, but rather are meant to provide a quick comparison of some of the notable features.

### Discussions

The discussion board feature is arguably the most important communication tool in any LMS. In general, the discussion capabilities of Vista and Moodle are similar, although each has some features that the other lacks. Both systems allow for standard discussion
features, such as using HTML in posts, adding attachments to posts, and displaying messages in threaded or chronological view.

In general, the Vista Discussions tool is more sophisticated than the Moodle Forum tool, allowing for more complex arrangements of discussions. Vista also allows tighter integration between the Discussions tool and the Grade Book tool, including the ability to make Discussion topics gradable at the time at which the topics are created. Moodle 1.8 does not include gradable discussions but reportedly will include this feature in version 2.0. Moodle allows discussion forums to be subscribed to via e-mail or RSS, while Vista does not. Each system offers a small variety of discussion types to allow different sorts of online conversations to take place, such as Moodle’s “Q and A Forum,” which requires students to post their own messages before viewing other students' messages, or Vista’s “Class Blogs” which allow an alternative structure for discussions.

The sophistication of Vista’s Discussions tool relative to Moodle’s might be an advantage or a disadvantage, depending on the instructional needs and the technical skill of an individual user. Another consideration related to this issue is that the open nature of Moodle could conceivably allow us to customize the tool to meet our needs, whereas Vista’s proprietary code does not allow this kind of flexibility.

From a general training/support perspective, either tool is suitable for holding online discussions in an instructional setting, and either system (like any software tool) will require some amount of learning on the part of users who are new to the system. A more significant difficulty than learning either system individually may be experienced by users who learn one system and who then must switch to the other.

Grade Book

Both Moodle and Vista include a grade book feature and many of the expected features of an online grade book are present in both systems. Some common features to both systems are: automatic grade book column creation upon assignment creation; the ability to add grades for offline assignments; the ability to export to an external spreadsheet; and the ability to create various grading scales for courses.

In general, the Vista grade book is more sophisticated than the Moodle grade book, allowing tighter integration between other LMS features and a more refined design.

Announcements

Both systems include a mechanism to allow instructors to make class announcements, although the two systems use different approaches. In Moodle, announcements are posted to the News Forum, a special area within the Forums tool, while in Vista, announcements are posted within a separate Announcements tool. The Moodle News Forum, like all of its discussion forums, includes the option to deliver messages via e-mail or RSS syndication.
Assignments

Both systems include a mechanism to allow instructors to create assignments in which students must submit an electronic document by uploading it through the LMS. Both systems also integrate, to some degree, the assignment submission mechanism and the built-in Grade Book. Of all the Moodle tools, the Assignment tool is the most integrated with the Grade Book, while in Vista, numerous tools are similarly integrated.

Assessments

Both systems use a similar model for creating online assessments (quizzes), although some of the specific elements differ. In both systems, instructors can create a bank of questions and then construct quizzes by using questions from the question bank. Both systems include a variety of question types, such as true/false, matching, fill in the blank, short answer, etc.

Although both systems include a variety of common question types, each does include a small number of specific types that the other system does not replicate in exactly the same way. For example, Moodle includes the “Embedded answers” type which consists of a passage of text with various answers embedded within it, including multiple choice, short answers and numerical answers, while Vista includes the “Jumbled Sentence” type, in which students are presented with a sentence containing missing words and drop-down lists from which the correct words must be chosen.

Other assessment-related functionality is handled differently by the two systems as well. For example, Vista’s Assessments tool allows instructors to create Surveys, which are similar to Quizzes but are anonymous and non-graded. One way that instructors can use a Survey is to poll students anonymously. Moodle, on the other hand, has a separate “Choice” tool for polling students, which allows one question at a time (not an entire quiz) to be delivered to students.

Calendar

Both Moodle and Vista include a calendar tool that is integrated with other course elements. Depending on how the calendar is configured, instructors and/or students can post events to the class calendar. Some notable differences include Vista’s more robust features related to automatically linking calendar events with other course elements, or Moodle’s ability to create an RSS feed from calendar events.

Chat

Both Moodle and Vista include a synchronous chat feature. Some features are common to both systems, such as the ability to create multiple chat rooms, and the ability to create archive logs of chat room activity. In general, the Vista chat tool is more sophisticated, as it includes several features that the Moodle chat tool lacks, such as “handraise mode” and
an integrated whiteboard. To have whiteboard functionality in Moodle, it is necessary to use an optional add-on such as the one that allows integration with Elluminate.

**Content Delivery**

Both systems have mechanisms for delivering content (HTML files, Word documents, PDFs, etc.) to students. The ways in which content can be delivered varies according to the overall structure of the system: for example, Vista allows content files to be shared through the use of Folders or Learning Modules, while Moodle allows content files to be linked from “Blocks” in the course that can be time-based (like weekly lessons) or topic-based (like topical units).

Both systems include an area of the course, available to the instructor, that serves as a repository for uploaded documents and files. The Vista File Manager is more sophisticated than Moodle’s version: for example, in Moodle, files can be uploaded to the Files area, but not easily downloaded. The Vista File Manager interface provides much more robust controls for working with course files than Moodle provides.

**Mail**

Both systems provide a mechanism for the asynchronous sending and receiving of messages between members of a class, but the approaches taken by the two systems are different. Vista’s Mail tool is primarily an internal messaging system in the sense that it does not allow the sending and receiving of messages to and from external e-mail addresses. There are some exceptions to this rule; for example, individual users can choose to have their received messages forwarded to the external address in their Vista profile, and instructors can set certain tools to send notifications to an external e-mail address. Generally, however, the Vista Mail tool is intended for internal communication within Vista rather than integration with standard e-mail.

The Vista Mail tool provides a high level of organization for messages, a scheme that mimics a typical e-mail client, and includes a Sent folder, Drafts folder, etc. Moodle’s messaging functionality is not organized into a discrete “tool” in the way that Vista’s is; rather, it is intended to be used with external e-mail. Moodle users specify an e-mail address in their profile, and sending a message to a user is a matter of clicking a standard “mailto” link and sending the message to their external e-mail account. Forwarding one’s messages to an external e-mail address in this manner is an option in Vista, but it is the standard mail mechanism in Moodle.
IV. Migration Issues

Migrating existing content from Vista to Moodle will be akin to DELTA’s reVAMP initiative, in which we migrated faculty content from WebCT Campus Edition to WebCT Vista. Most of the migration will need to be done manually, with some tools providing assistance with specific tasks. There are also options for contracting third-parties to migrate content from one system to the other for us.

There are four main categories of items to consider when migrating content from one system to the other: files, quizzes, activities (assignments, discussions, chat) and course structure. Currently the only way to move files into Moodle is to do it manually with Moodle’s “Files” panel in each course. An efficient way to move the files is to zip up a course inside Vista, then unzip the package inside Moodle. Another option would be to create a WebDAV connection to Moodle. WebDAV would allow for files to be more easily moved between the two systems. The feasibility of creating this custom extension to Moodle needs to be investigated further.

Questions from quizzes, not the quizzes themselves, can be moved with the aid of Respondus. The process is not always seamless because of differences in question types between the systems, but for the most part the transfer of questions works quite well. Questions that do not have a corresponding question type in Moodle must be manually created. The actual quiz must be reconstructed manually once the questions are in Moodle.

Activities such as assignments, discussion boards, and chat rooms must be manually recreated within Moodle.

The final area to consider is the way the class is structured within Moodle. For example, how does a student move through a course, how are learning modules constructed, and how do you present content (handouts, media, lectures)? While Moodle and Vista share the same basic functionality when it comes to what tools are available, there are distinct differences between the ways in which courses are constructed is different. Except for the most basic of course sites, where files are simply uploaded for students to then download, the ways in which content and activities are organized may require course redesign decisions to be made when moving content from one site to another. In Moodle, material is always presented in a linear fashion, which may or may not correspond to how existing material in Vista is organized.

There are options for contracting third-parties to migrate our courses from one system to the other. Several companies have started offering these services as interest in Moodle among universities has increased. These types of services demand further evaluation in terms of their quality and cost-effectiveness.
V. Technical Issues

Hardware Requirements

Vista’s stated hardware requirements are:

<table>
<thead>
<tr>
<th>Database Server</th>
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</thead>
<tbody>
<tr>
<td>Processors</td>
<td>2 x 1.28 Ghz UltraSPARC IIIi</td>
</tr>
<tr>
<td>Memory</td>
<td>4 GB RAM</td>
</tr>
<tr>
<td>OS and Application Storage</td>
<td>2 x 73GB 10,000 RPM SCSI Drives (73GB local storage, RAID 1)</td>
</tr>
<tr>
<td>Database Storage</td>
<td>4 x 73GB 15,000 RPM SCSI Drives (146GB local storage, RAID 10)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Sun Solaris 10 Update 2 (Developer Cluster) or Sun Solaris 9 (compatible)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application Server</th>
<th>Administration Server</th>
<th>Managed Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors</td>
<td>1 x UltraSPARC IIIi</td>
<td>2 x 1.28 Ghz UltraSparc IIIi</td>
</tr>
<tr>
<td>Memory</td>
<td>1 GB RAM</td>
<td>4 GB RAM</td>
</tr>
<tr>
<td>Swap Space</td>
<td>1 GB (1 to 1.5x physical memory)</td>
<td>4 GB (1 to 1.5x physical memory)</td>
</tr>
<tr>
<td>OS and Application Storage</td>
<td>2 x 36GB 10,000 RPM SCSI Drives (36GB logical storage, RAID 1)</td>
<td>2 x 73GB 10,000 RPM SCSI Drives (73GB logical storage, RAID 1)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Sun Solaris 10 Update 2 (Developer Cluster) or Sun Solaris 9 (compatible)</td>
<td>Sun Solaris 10 Update 2 (Developer Cluster) or Sun Solaris 9 (compatible)</td>
</tr>
</tbody>
</table>

Moodle’s stated hardware requirements are (from http://docs.moodle.org):

- Disk space: 160MB free (min). You will require more free space to store your teaching materials.
- Memory: 256MB (min), 1GB (recommended). The general rule of thumb is that Moodle can support 50 concurrent users for every 1GB of RAM, but this will vary depending on your specific hardware and software combination.
- Processor – not specified

There are a couple of important considerations related to hardware requirements. First of all, Vista’s requirements are more along the lines of recommended system requirements while Moodle’s are true minimum requirements, so there is a bit of a discrepancy in the intentions of their recommendations. Vista’s requirements are tied to their 500 concurrent users per node limit, so the hardware requirements are higher. Particularly, the database storage needed is much higher for Vista because all of the files are stored in
the database. In Moodle, the database only stores links to files, so local system administrators have more flexibility with their file storage options.

Moodle is highly sensitive to memory size (as are most PHP applications), so hardware with more memory per machine will result in better system performance. But, it is important to consider that Vista’s definition of a concurrent user is different from Moodle’s. Moodle considers concurrent users to be defined, in the traditional sense, as users waiting for a response from the server. Vista, on the other hand, considers any user who has done something in the session time (usually set to 1 hour) to be considered “concurrent.”

Ultimately, the best hardware requirements for either system can be determined from load testing. No minimum requirements stated by Blackboard or by members of the Moodle community should be accepted as accurate without appropriate testing. Performance is highly dependent on number of concurrent users and what those users are doing. These metrics are likely significantly different across institutions. As we have found with Vista at NCSU, it is necessary to run a Web application for some time before a clear picture of the actual hardware requirements emerges. So, what is more important than initial hardware sizing is creating a flexible infrastructure so that usage can scale as needed. Both systems are highly scalable, but with different cost structures. Additional MySQL cluster nodes can be added with no licensing cost. Oracle’s RAC is licensed on a per-CPU basis.

Systems Support

An ideal skill-set for administrating Vista would include:
- Experience with Solaris administration, shell scripting, etc. (it is also possible that Linux experience would be useful)
- Experience with BEA WebLogic administration and performance tuning
- Experience with Oracle Database administration (including RAC)
- Java programming experience

An ideal skill-set for administrating Moodle would include:
- Experience with RHEL administration, shell scripting, etc
- Experience with Apache administration and performance tuning
- Experience with MySQL Database administration (including MySQL Cluster)
- PHP programming experience

The programming experience is a little more useful for Moodle than for Vista because the open nature of Moodle makes it entirely modifiable.

Technical Support

In the case of Blackboard, the company can be retained for “premium support” service on an annual basis for a fee. For Moodle, companies such as Remote Learner, Classroom Revolution and Moodle Rooms can be retained as support providers as well, also for a
fee. The main difference in troubleshooting is that, since Vista is a closed source system, there is a limit to what can be done in-house. Clients are entirely dependent on Blackboard support for any technical support and for any feature improvements and bug fixes. This means that there is no open competition for contracted support and there is very little debugging that can be done in-house. In the Moodle model, any company can provide contracted support and since the system is open, it is possible to debug in-house.

With an open source solution such as Moodle, there is a much higher incentive to building expertise in-house than with the Vista model. A institution might have the best Java programmers in-house, but they still cannot debug or change Vista’s code. In the case of Moodle, increased expertise in PHP and MySQL could have immediate dividends, since experienced developers could make modifications to the system and release them to the community (depending on the organization’s intellectual property policy). But, it is important to recognize that this increased expertise will pay dividends in any open application that involves the traditional LAMP architecture.

**Development Issues**

The development models for Vista and Moodle are significantly different. Upgrades for Vista come exclusively from Blackboard while upgrades to Moodle come from the community and are bundled together in periodic releases. This would mean that in order to make changes to Moodle, an organization would have to develop (or request) the change and then contribute it back to the community in the hope that it would be included in a future release. Traditionally, changes that add highly requested features or fix bugs are more readily accepted. In the Vista model, requests can be made for new features and bug fixes, but it is entirely up to Blackboard to decide when or how to implement them, or whether to implement them at all.

One common issue with running open source solutions is that the modifiable nature of the code makes it very easy to make changes that fix issues specific to the local institution. If local modifications of Moodle include a code change that is not rolled into an official release, the problem can arise of “forking” the local version of the code base away from future Moodle releases. The result is that, upon each new release of the core Moodle code, the local code changes must be re-applied to the core code at each upgrade. To compensate for this issue, Moodle provides a plug-in system that allows local installations to make customizations without changing the core Moodle code base. This means that as long as the plug-in API remains unchanged, the customizations will be retained through system upgrades. Of course, if local code changes are instead released to the community and are integrated with the core code, then no “forking” takes place.
VI. Areas for Further Investigation

In our evaluation of these two systems, we have necessarily limited our scope to a few major points of comparison, based on a relatively brief investigation and a relatively small investment of staff time. If NCSU decides to include an open source product such as Moodle in its overall LMS strategy, there would be many other issues to research. We also recommend that any major explorations of potential new LMS products include participation from stakeholders across campus. In particular, buy-in should be sought from faculty who will be using the system.

Questions for Further Investigation

- What is the current state of the LMS industry, and what can we predict about its future?
- What are other institutions doing with open source LMS? Are any using it at the scale required by NCSU? What can we learn from what others have already done?
- What can NCSU learn from other existing investigations, such as the current UNC TLTC open source evaluation project?
- What is involved in participating fully in the open source community, and creating code that can be shared with the rest of the community? Does NCSU aim to become an active participant in the community in this way, and if so, what are the ramifications in terms of what we do and how we do it?
- Is Moodle the only viable open source option, or are there other systems that should be investigated?
- How well would Moodle interact with other campus systems (R&R, AFS, etc.) and with other supported technologies (SLMS systems, clickers, Dreamweaver, CourseGenie, WebDAV, etc.)?
- How well does Moodle adhere to applicable laws and regulations, such as those related to student privacy and accessibility?
- How will buy-in for a major LMS migration be obtained from campus stakeholders? How will support structures for such a migration be planned, publicized, and implemented?
- What is the strategic marketing/branding plan for moving to a new campus LMS and is the timeline for this plan integrated with the overall LMS strategy?
- How will future LMS products on campus affect long-standing traditions with regard to course websites? For example, Moodle’s linear approach to course building is not the same as WolfWare’s “empty locker” model which allows complete freedom of site design. Is a course locker, into which instructors can put any materials they wish without regard for pedagogical effectiveness, an appropriate model for online instruction that we wish to support or encourage?

This list of questions is not meant to be comprehensive, but rather is meant to guide some of the investigations that might proceed as next steps from this preliminary report.
VII. Documents and Resources

Moodle Community: http://moodle.org

Online Moodle documentation (wiki):
http://docs.moodle.org/
http://docs.moodle.org/en/Teacher_documentation
http://docs.moodle.org/en/Administrator_documentation
http://docs.moodle.org/en/Developer_documentation

Moodle 1.8 documentation


Moodle Administrator demo: http://demo.moodle.org (username: admin; password: demo). This online Moodle installation refreshes every hour.

LMS Comparison from Brock University:
http://ctlet.brocku.ca/webct/LMS_Options_and_Comparisons

EduTools (LMS comparison site): http://www.edutools.info/item_list.jsp?pj=4

EduTools comparison of Vista and Moodle:
http://www.edutools.info/compare.jsp?pj=4&i=599,592


Humboldt State University, “Blackboard vs. Moodle: A Comparison of Satisfaction with Online Teaching and Learning Tools,” February 15, 2005:
http://www.humboldt.edu/%7Ejdv1/moodle/all.htm

Massachusetts Institute of Technology, “Peer Comparison of Course/Learning Management Systems, Course Materials Life Cycle, and Related Costs,” July 19, 2006:

Eduforge “Guidelines for Migrating to an Open Source Learning Content Management System”:

California State University, Chico site related to LMS Strategic Review:
http://www.csuchico.edu/tlp/LMS2/