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The Effects of Online Course Design on Student Course Satisfaction

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The Effects of Online Course Design on Student Course Satisfaction

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The quality of course design and organization often affects student success in the classroom as much as a student's ability to learn and apply course material. Students frequently must overcome poorly organized classes, including those organized within Learning Management Systems (LMSs) such as Blackboard. Ideally, instructors utilize LMSs and similar learning portals to optimize the amount of knowledge transfer, while minimizing the time students need to reach subject proficiency and the time instructors need to administer and to assess students. For example, searching for misleadingly labeled documents by navigating folders within folders can stress students and cause negative instructor reviews. We relate this to issues with "signal – to – noise ratio addressed in a previous work. Lamentably, while institutions of higher education regularly survey students for course feedback, a critical component most often missing is student user feedback on how well course design and organization contributed to the learning process. Based on a review of the literature, and previous experience, we developed multiple preliminary course structures that considered folder organization, the number of tabs to include, and kind of LMS features to use. We then recommend several easy-to-follow practices to help instructors improve their online course design to improve student learning and retention.

Introduction

Online learning management systems (LMSs) have become the de facto standard for course management and delivery at universities and other institutions of higher learning. [1] While not all instructors use LMSs or online tools, a significant number use them to share class material (e.g., slides or PDFs), assessments (e.g., assignments or quizzes), and feedback (e.g., grade posting or online critique). Moreover, LMSs allow instructors to alter the design of their course portal/website to match their preferences and teaching styles while retaining some standardization. For example, instructors control page organization, design, and content, while retaining the general layout and look of the page. They can change background and button colors using default themes, but not the themes themselves. They can edit the number of links in the menu and the number of folders within those links, while the menu style or location remain constant. Instructors choose functions to use (e.g., quizzes or assignment submission), but not how they work nor how they look to users. Finally, LMSs allow instructors to deliver courses synchronously or asynchronously; face–to–face in class, or virtually at a distance; or as a hybrid of all these.

The incredible flexibility of LMSs comes at a cost. Institutions typically employ only one LMS portal, with default design choices established by LMS administrators. Instructors though are

most often completely responsible for uploading and presenting it to students. Even in cases where two courses may have exactly the same content, course structures can be completely different. For example, one instructor may break down the content into weekly or thematic modules, while another would place all content onto a single page. Students, therefore, face the prospect of navigating multiple course structures to access instructional materials during a single term, even if all their instructors use the same template design.

An instructor's appreciation of human engineering, human-computer interaction (HCI), course design, and expertise in how to implement and deploy content and tools within an LMS can significantly impact the usability of a course design. This is part of the signal–to–noise ratio problem, where course design, in general, can affect learning processes. [2] We defined signal-to-noise ratio in learning as the amount of content required to achieve subject matter proficiency to amount of residual elements, e.g., non-essential, extraneous course materials and course structure. [2] Courses with a good balance of signal-to-noise ratio are transparent and easy-to-navigate, which result in true cognitive gains that both instructors and students can evaluate using their own metrics of achievement and improvement. [2]

During the Fall 2017, the California State Polytechnic University, Pomona (Cal Poly Pomona or CPP) had 25,894 students [3] most of whom used Blackboard Learn 9.1 during this time. Poor course design and organization causes students to waste significant time and energy navigating a course portal rather than devoted to knowledge assimilation. This can include searching for basic information such as where to submit an assignment, finding an instructor's office hours and location, or learning how to use an LMS feature. Adapting research on human factors in website and course design to LMS course structure could avoid such student issues and site discrepancies. Students from IE 225 – Fundamentals of Human Factors Engineering – class examined issues with Blackboard Learn 9.1 course design during the spring 2018 quarter at Cal Poly Pomona. This included peer surveys and time to complete certain tasks.

Understanding Student Users

Understanding the primary and secondary users of a product is an integral component of user research and webpage design. Primary users interact with the interface directly while secondary do not necessarily interact with the interface directly, but are affected by the primary user's interface use. [4] Students and instructors tradeoff between being primary and secondary users as both directly interact with the system as well as benefit from system use. For example, instructors affect students by "posting" materials for students, while students use the interface to send material such as assignments to instructors. We focused on students as primary system users because we surmised that course design affects student performance. Primary users would, therefore, range typically between 18 to 25 years, are both male and female, and have some college education. They would also tend to have experience navigating websites.

We defined the goals and objectives of this population based on Norman's three stages of webpage interaction. [4] First, what are the users' goals? [3] We generalized these into (1) search for item (e.g. lecture notes, syllabus, course material, assignment, etc.), (2) enter or upload

content (e.g. submit assignment, take test, and participate in a discussion board), and (3) check information (e.g. grades, feedback). Second, how do users interact with the interface to achieve their goal? [4] For example, to find a syllabus, students must log into the LMS, click a course link, search course menu, and click link. Lastly, how does the outcome compare to the expectation? [4] Did the student find the syllabus or not? If not, user did not know how to achieve the goal, which can frustrate and anger them. [4]

Instructors are secondary in this context because they deploy courses sites for student users. According to *Instructional Clarity and Organization: It's Not New or Fancy, But It Matters*, students "will talk about [their professor's disorganization] with other students and make inferences about the faculty member's commitment, which can ripple through their motivation, satisfaction with the institution, grades, and learning." This notion is aligned with studies reporting that course organization is among predictors of student satisfaction that also influence withdrawal rates. [5]–[7] Unfortunately, this can influence end–of–term evaluations. Therefore, it is crucial to consider course design from the student perspective when developing and deploying it. This includes considering an iterative course design cycle, where instructors ask for student feedback much like application development. The authors of this paper have used iterative course design faithfully, with good interactions and response/feedback from student users.

Preliminary Design Considerations

The page layout of a website directly relates to usability. [4] As noted, instructors have considerable flexibility over the appearance of their course design in an LMS. Yet, less than 5% of application users change default settings. [8] LMS administrators and instructional designer can, therefore, play a considerable role improving instructor course designs by carefully considering default design criteria from the get-go or by reminding instructors of them when helping them design their courses.

A primary consideration is the amount of content per page. Long pages that require scrolling reduce reader understanding. [4] Avoid using horizontal scrolling as most users dislike it. [4] Pages should be chunked instead, into meaningful information packets across several shorter pages to increase reader comprehension. [4] This is directly controllable by instructors and instructional designers.

Menus are best for navigating websites. Users navigate quickest when menus display all page options at once as a "table of contents" without scrolling. [4] LMSs offer instructors a design advantage when LMS administrators set menus to display on the left side of the page. Instructors can override the amount of content though, by what they include in menus and the order in which they appear. Broad–shallow menu structures are better than narrow– eep ones because people can quickly scan lists and choose an option rather than clicking through pages, especially when the list is hierarchical or alphabetical. [4] For example, instead of a single menu link for "Course Documents" with several folders for "homework," "project materials," "study guides," and "lecture notes," the menu should have one link per item, provided users do not have to scroll to see the entire menu. Additionally, lines should separate menus items into logical units, for example separating course documents from items like grades and the discussion boards.

Text styles can affect page legibility and readability. Fonts without finishing strokes (i.e., san serif) are easier to read on websites, while serif fonts are easier to read when printed. [4] Larger fonts improve readability with 14 points showing the best overall reading performance. 10 to 12 point font equally performed slightly worse than 14 point font, while 6 to 8 point fonts slow reading performance most. [4] Italic text also slows reading speed. Users also often confuse underlined text for hyperlinks. [4] Lastly, user attribute certain "personality traits" to fonts, with "all purpose" attributed to Arial, Verdana, and Calibri and "traditional" to Times New Roman, Georgia, and Cambria. [4] While professors directly control font type, style, and size, LMS administrators can assist them by using better default text choices such as limiting them to san serif for online use, making default font sizes between 12 and 14 points. Moreover, instructional designers should dissuade instructors from italicizing and underlining their text.

Background choices further affect text legibility. Higher contrast between background and text contributes to greater legibility. [4] Black text on white backgrounds work best on electronic monitors. [9] Instructors directly control font color; therefore, instructional designers should direct instructors to the benefit of using one of many tools that can test the contrast between a text color and background color for accessibility. LMS administrators also should maintain white background color and black text as the typical LMS default.

LMS administrators can significantly affect course designs by the use of themes, which affect default choices in backgrounds, buttons, banners, and the menus. User rate pages highly that employ complementary color schemes, monochromatic color schemes, or triadic color schemes. [4] There is also a strong correlation between user perception of aesthetics and perception of usability. [4] Since few users change default setting [8], providing instructors with proper default considerations can significantly improve any selections they make.

Accessibility Considerations

As instructors primarily post and maintain course content, is it essential for instructional designers to emphasize the correlation between content and subject comprehension. Key to this is accessibility, which provides multiple modes of content representation, such as audio descriptions for the visually impaired and captioning for the audibly impaired. Impairments vary though, with many not realizing their extent. For example, 8% of the male population has some form of color blindness, with 5% of the population unable to distinguish between the colors red and green. [4] LMS administrators and instructional designers should assist instructors in choosing pallets that are "colorblind friendly" or in using tools that convert a page's palette to a colorblind friendly one. [4]

Clarifying Learning Outcomes

Creating precisely designed learning outcomes is commonly encouraged. Yet, Hussey and Smith note in "The Trouble with Learning Outcomes," that learning objectives have been "misappropriated and adopted … to facilitate the managerial process," which has, "led to their distortion." Moreover, simply using "prescribed vocabulary of special descriptors … to serve as objective, measurable devices for monitoring performance," may be damaging. [10]

While we do not advocate skipping learning outcomes, we note the importance of producing outcomes that have clear metrics that are easily measurable, to provide both instructor and student a clear understanding of cognitive and physical gains. We noted the importance of using Learning Analytics in [2] that LMSs can readily provide and outline ways that instructors can develop them. We, therefore, encourage instructors to work with instructional designers to develop course sites that enable measurable learning outcomes that are clearly stated, and that they can easily measure and analyze using the LMS.

Example Designs

We based our example designs on Blackboard Learn 9.1 LMS as Cal Poly Pomona uses Blackboard as its LMS of choice. Our readers should be able to replicate these designs as other LMSs employ similar design tools. Those unfamiliar with creating course designs should seek the assistance of instructional designers for assistance.

Menu Example

An example of menu design on a Blackboard page is depicted in Figure 1. Note the clear name tabs and clear division by theme. This can be difficult to achieve when many different sections need top-level menu items.

Figure 1 Menu Example

Syllabus Example

Example of information that should be included in a course syllabus can be viewed in Figure 2. Formatting can vary but should take advantage of headers and other tags to enable accessibility. Note the Syllabus link in the Menu example shown in Figure 1.

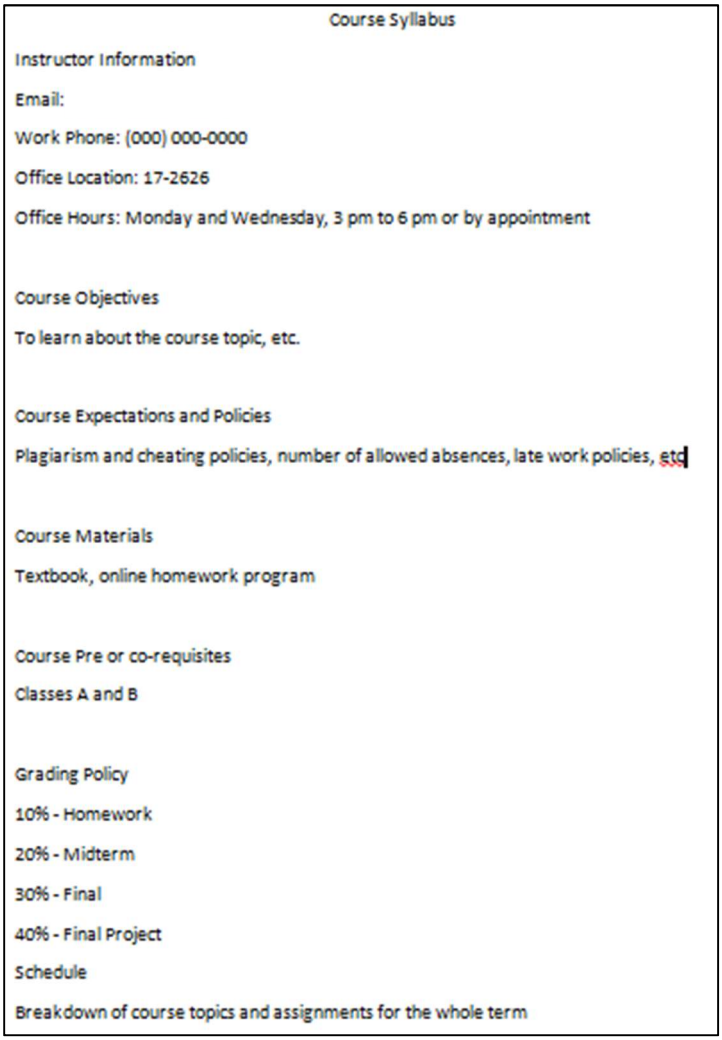

Figure 2 Syllabus Information Example

Instructor Contact Information Example

An example of an instructor contact component in Blackboard is illustrated in Figure 3. Note the Instructor Information link in the Menu example displayed in Figure 1.

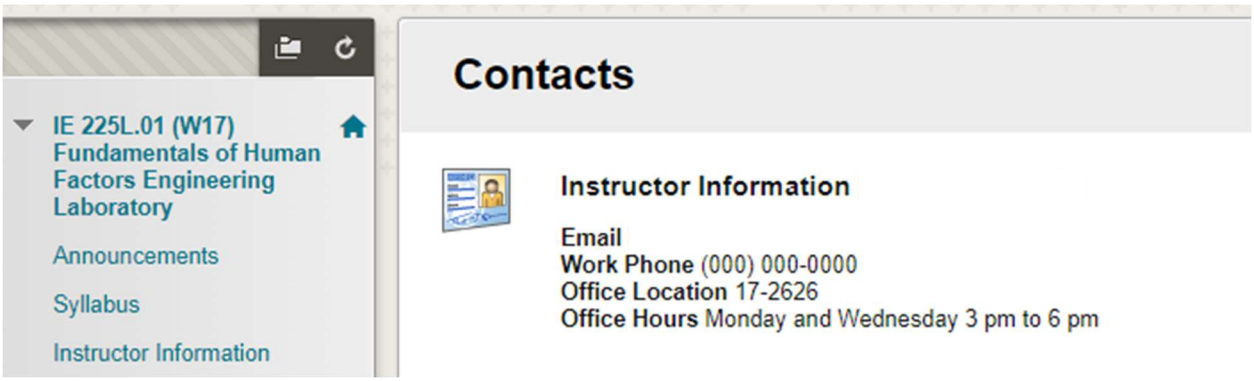

Figure 3 Sample Instructor Contact Information Example

Course Content Example

An example of Course Content using a weekly structure is displayed in Figure 4. We also expand Week 7 to show the materials for that week, consisting of Lecture Notes, Homework, Labs and Quizzed & Assessments sub-folders. We would test whether this is an optimal structure compared to others such as thematic or module.

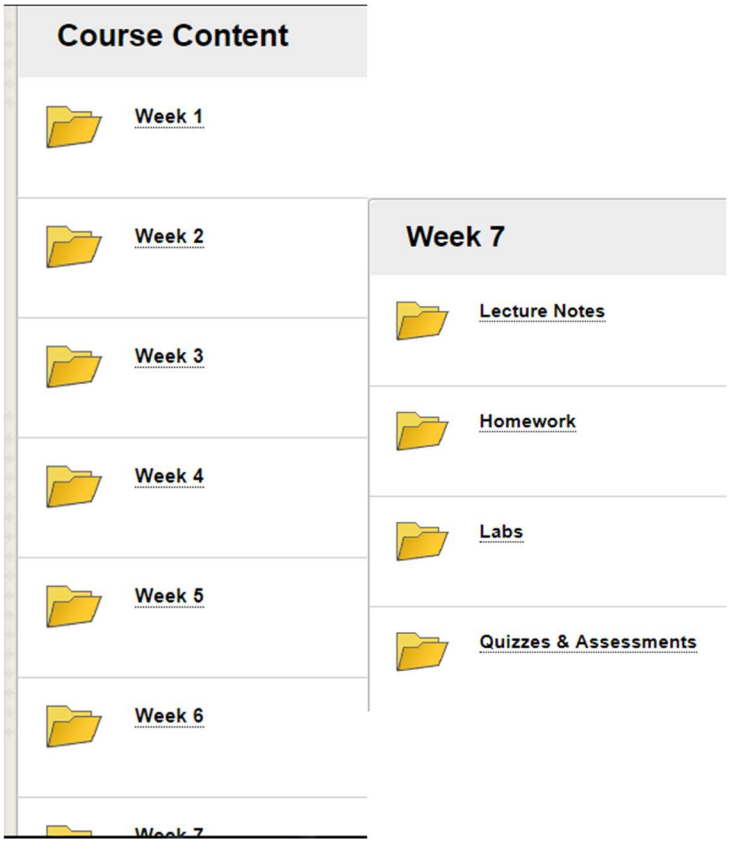

Figure 4 Weekly Course Content Example (with example week 7)

Lecture Note Example

This example expands the Lecture Notes example to show a document with a description of the topic those notes covered, as shown in Figure 5. In our context, Lecture Notes is placed within a weekly folder.

Figure 5 Lecture Note Example

Assessment Examples

Examples of homework, lab and quiz assessments can be viewed in Figure 6, Figure 7, and Figure 8. The homework assignment is in a Homework folder, with instructions on how to complete the assignment as well as how to submit it.

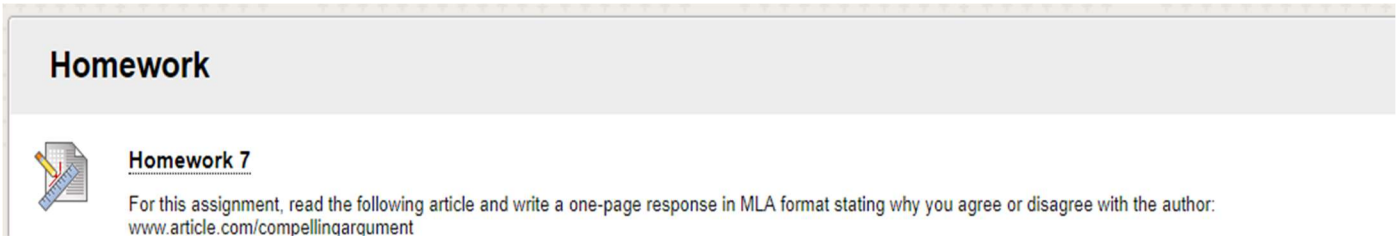

Figure 6 Homework Example Post

Figure 7 displays a lab document example found by following the Labs folder link. It includes instructions for the lab and where and when to submit it.

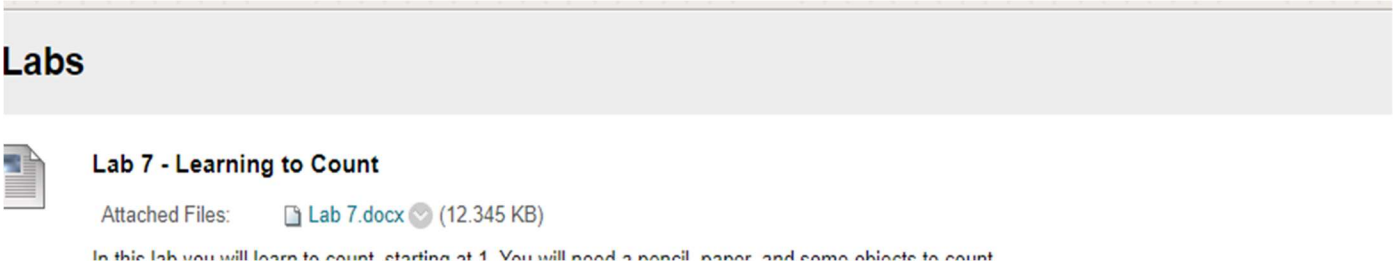

Figure 7 Lab Example Post

Figure 8 is an example quiz within a Quizzes & Assessments folder. Quiz should have a description of the topics upon which the student will be tested. Clicking the link produces instructions that tell students the number of points it is worth and how many attempts they have.

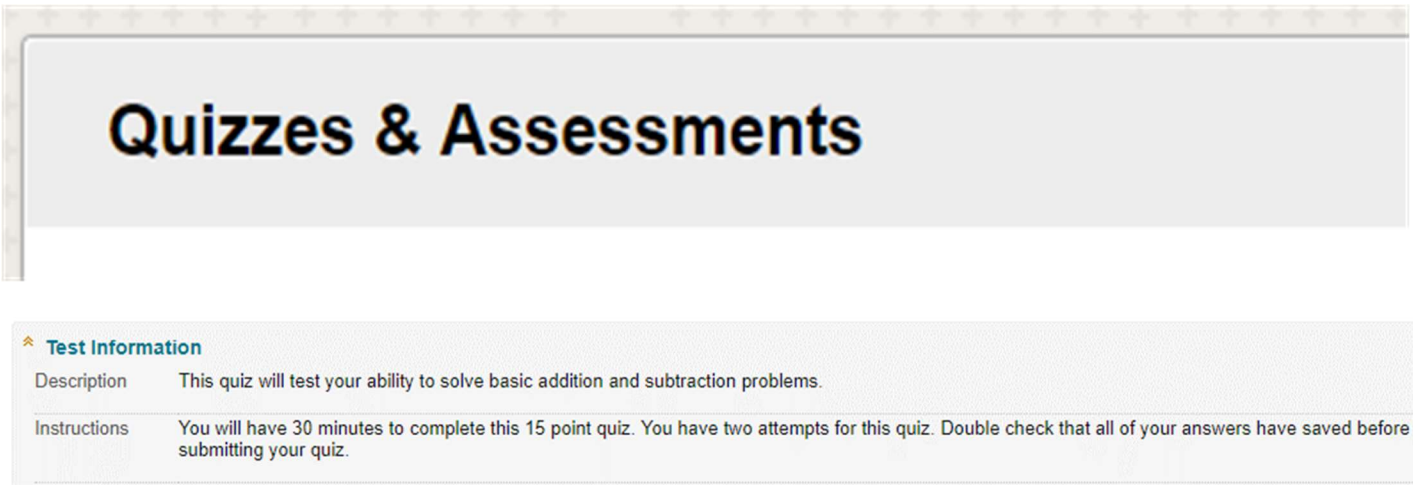

Figure 8 Quiz Example Post

Other Resources Examples

The Other Resources Link can be used for miscellaneous items depending on course needs, as illustrated by Figure 9. In this example, Figure 9 also displays study guides for exams.

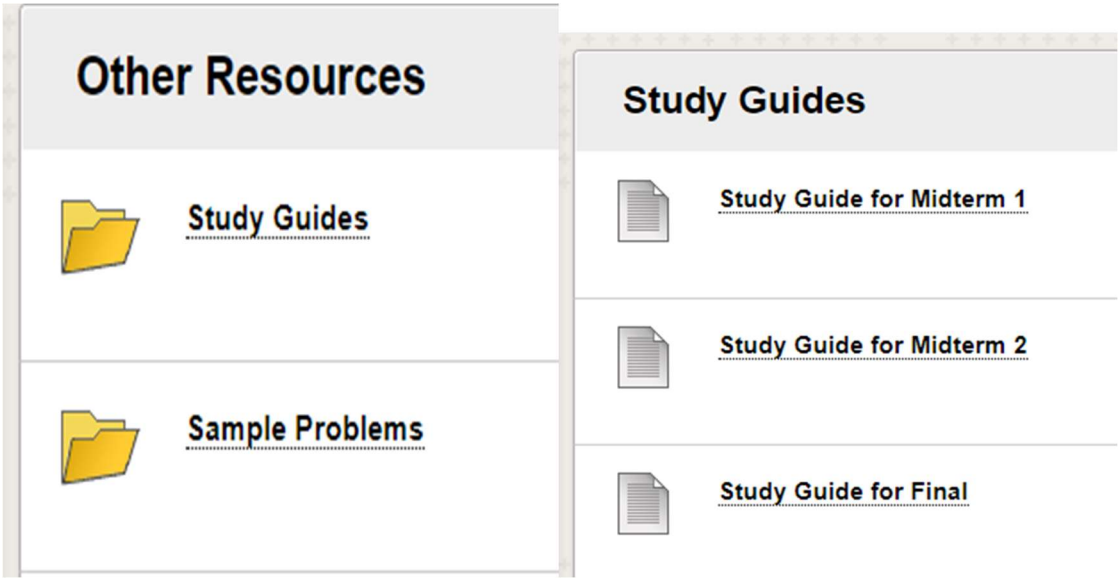

Figure 9 Other Resources Example

The Need for Student Evaluation of Course LMSs

Institutions of higher education regularly survey students for course feedback at the end of a course. This typically includes one question on the organization of the course. This does not extend into more details on the design of the course LMS. Based on our experiences in course design, user interaction and HCI, we advocate asking students for their feedback on a course design much like those conducted in a usability study. Such anonymous surveys are relatively easy to create and deploy within most LMSs, as well as online, using tools like SurveyMonkey.

Moreover, they can be included as part of a larger learning analytics study as we discussed in [2] to improve student outcomes and retention. We include some sample questions which we intend to use in an IRB approved study of students during the spring 2019 semester at Cal Poly Pomona.

Question 1: "Do you find that the organization of the instructor's LMS pages to be poor?" This question would gauge how often students experienced issues due course layout.

Question 2: "Which of the following have you encountered that made the LMS page difficult to navigate?
This question would examine what design elements could be problematic. From our experience, labels of tabs and folders, having multiple folders within folders, and having too many links to follow often confuse students during course navigation.

Question 3: "Which of the following has happened to you during the semester in the class? This question would examine predominant LMS issues that affect students. This includes finding assessments or labs, not knowing when assessments were due, and not knowing when assessments were submitted properly. For this reason, we recommended [2] that course calendars be a predominant feature within course design to provide students a means of managing course milestones/deadlines and providing a quick way for students to access them.

Question 4: "Which of the following has happened to you because the instructor used the LMS to communicate to you."
This question would examine how instructors use the LMS to communicate "mission critical" information to students outside of class. For example, students remember to do an assessment, or an instructor clarifies an assignment.

Question 6: "How do you prefer the course materials to be organized within the LMS?" This question would examine the organizational structure by which students preferred content. Our experiences suggest that by week or by module topic is preferred most. Still, we would ask to confirm this intuition and find optimal structures.

Question 7: "How long have you used LMSs?"
This would establish relevant user levels (demographics) to place the previous answers in context. We would expect student users with less experience (novices) to have different perspectives and expectations than those with much experience (experts).

LMSs also track student course access, as well as those links they use most. [2] This would be another tool instructors could use to gauge student–course interactivity to inform them whether students access the material they upload or not. For example, the *Quality Matters Higher Education Rubric*, [11] suggests including a "tour" link. However, students may not access an online tour because the information is contained in other sources such as a syllabus. Knowing whether material is accessed or not would allow instructors to simplify course design which is a key factor in usability design.

Discussion

This design case suggests how course design and structure could affect student success. We specifically strived to minimize the signal-to-noise ratio. Student feedback indicated room for improvements. Overall, we propose there are pedagogical implications for course design and organization that can more effectively optimize student satisfaction and learning experience.

Employ Logical Structure

Our student feedback indicated that course sites can sometimes be difficult to navigate. Many students noted the deep tiers of folders as troublesome. This sounds sensible as earlier studies have recommended clear course design and layout [12], especially when this aspect influences the effectiveness of learning environment. [13] In addition, course structure may be a reason explaining why students decide to withdraw from a course, especially in online learning. [14]
As our preliminary results agree with earlier literature, we recommend that instructors outline course content to minimize the number of clicks students require to achieve their goals. As many LMSs provide at least some statistics on how often links are accessed, instructors can use analytics approach to plan appropriately.

Use Clear Label on Folders and for Document Name

Our survey indicated that poorly named items affect them. This seems a reasonable insight as ambiguous label may affect the findability of course materials [15] that can demotivate students to navigate further. [16] Labels should be short, self-explanatory and clearly describe the content users will access. [17] We also suggest instructors use labels that match student expectations when clicked. For example, a “Syllabus” link should take the student to a course syllabus or the actual information contained in one. Naming it “Course Information” is much more ambiguous Similarly, a “Lab” folder link should go to a section with all materials students need to prepare, conduct a course lab, and possibly submit their lab reports throughout a term. Instructors can further clarify these labels by establishing an iterative design cycle with students as noted below.

Establish an iterative course design cycle

Developing an iterative design cycle is a critical component of usability design. (e.g. [18]) It has been our experience that treating students as “beta” testers is a good method of improving poor course design. It is therefore surprising that while we encountered many design guideline, specifications, and heuristics in our literature review; we found nothing substantial on integrating student user testing. For example, testing course navigation and links before release should be a regular practice and is relatively simple. When creating course link and folder labels, instructors can simply encourage students to provide feedback when they are confusing and how to improve them. LMSs often have tools to check course link validity. LMSs also provide anonymous surveys and discussion boards that allow students to post concerns even if they feel insecure about whether professors are sincere in their request. Our experience shows that students are very enthusiastic about reporting issues with course designs if an instructor asks them and makes

it clear that students are part of the learning process. Including such reports (once verified) as part of their course participation also helps.

Instructors worried about the time and effort it takes to create an iterative design cycle are encouraged to use "Course Copy" tools. These tools can replicate an entire existing course, all the way down to a single file, quickly and easily. Using these tools not only reduces the iterative design cycle time, but can greatly benefit constructing new courses by porting elements, e.g., course introductions, from preexisting courses. This feature is also extremely useful for instructors with multiple sessions of the same class, and jumpstarting instructors who have to create courses from scratch. While it still takes considerable time to create good LMS course designs, our experience has shown that the long-term investment is worth the time. For example, before the spring 2019 term at Cal Poly Pomona, we took about 2 hours to overhaul an existing course using a template account—a template account is an inactive account that an LMS administrator creates for an instructor to allow them to plan a course. This included revising and creating new course modules and creating a course calendar linked to course assessments. Once the overhaul was complete, **total time** to copy and deploy two separate versions of the same class for students to use was less than 15 minutes. While reader's time to do a similar task may vary, our experience has been that using course copy tools substantially reduces the time and effort to establish an iterative design cycle.

Foster Students' Time Management Skills through Scheduled Announcements

We recommended in [2] that course calendars be a predominant feature providing students a means of managing course milestones/deadlines and providing a quick way for students to access them. It is also imperative to label the due date for all assignments and quizzes links in an LMS. For example, any Blackboard course items with due dates is published automatically in the course calendar. Students can also download a Blackboard course calendar to add it to their own personal calendar app. This is not to spoon-feed the students, rather, concur with Dr. Mark Milliron as cited in [19] (p. 25) that proactive action is "about getting them the right resources at the right moment." This is a hallmark of good organizational practice, which seeks to enable employees in accomplishing their tasks. In fact, study has revealed that delivering scheduled announcements was found to engender a moderate impact on students' time management skill. [20] As we have already known, time management skill is one of the student traits associated with academic achievement. [21]

Conclusion

We examined the role of course design and organization in the learning process and its potential effect on students. We are limited though by a lack of empirical data. Our next step is to test our observations, which we plan to do during the spring and fall 2019 semesters at Cal Poly Pomona. Incorporating more direct student user feedback, akin to usability studies within commercial settings, would be a logical expansion, as would be using learning analytics to study how students interact with a course LMS or other learning portal. Developing and deploying useful metrics that ask students for feedback about how well the course design enabled them to acquire subject matter proficiency would also be useful.

We would first measure the time to locate key documents as well as critical information within them based on different course designs. We would also measure the time to locate modules, assessments, and current grades. We would also conduct student surveys about their assessment of different course designs. During the fall 2019 we would again ask students to assess different course designs as well as compare resulting grades from two session of the same class.

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